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Red Seal Occupational Standard

Motorcycle Technician

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Canada

PROGRAM PROGRAMME
EXCELLENCE
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RED SEAL OCCUPATIONAL STANDARD

MOTORCYCLE TECHNICIAN

Title: Motorcycle Technician

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FOREWORD

The Canadian Council of Directors of Apprenticeship (CCDA) recognizes this Red Seal Occupational Standard (RSOS) as the Red Seal standard for the Motorcycle Technician trade.

Background

The first National Conference on Apprenticeship in Trades and Industries, held in Ottawa in 1952, recommended that the federal government be requested to cooperate with provincial and territorial apprenticeship committees and officials in preparing analyses of a number of skilled occupations. Employment and Social Development Canada (ESDC) sponsors the Red Seal Program, which, under the guidance of the CCDA, develops a national occupational standard for each of the Red Seal trades.

Standards have the following objectives:

- to describe and group the tasks performed by skilled workers;
- to identify which tasks are performed in every province and territory;
- to develop instruments for use in the preparation of Interprovincial Red Seal Examinations and assessment tools for apprenticeship and certification authorities;
- to develop common tools for apprenticeship on-the-job and technical training in Canada;
- to facilitate the mobility of apprentices and skilled workers in Canada;
- to supply employers, employees, associations, industries, training institutions and governments with occupational standards.

Any questions, comments, or suggestions for changes, corrections, or revisions to this standard or any of its related products may be forwarded to:

Trades and Apprenticeship Division
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Phil Warnell	Nova Scotia
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Dave Gagné	Alberta
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This standard was prepared by the Apprenticeship and Sectoral Initiatives Directorate of ESDC. The coordinating, facilitating and processing of this standard were undertaken by employees of the standards development team of the Trades and Apprenticeship Division and of Prince Edward Island, the host jurisdiction for this trade.

STRUCTURE OF THE OCCUPATIONAL STANDARD

This standard contains the following sections:

Methodology: an overview of the process for development, review, validation and weighting of the standard

Description of the motorcycle technician trade: an overview of the trade's duties, work environment, job requirements, similar occupations and career progression

Trends in the motorcycle technician trade: some of the trends identified by industry as being the most important for workers in this trade

Essential Skills Summary: an overview of how each of the nine essential skills is applied in this trade

Roles and Opportunities for Skilled Trades in a Sustainable Future: an overarching description of how in the context of climate change, skilled trades play a large role in implementing solutions and adjusting to changes in the world. In addition to highlighting the importance of this awareness, the standard may also contain more details on activities, skills and knowledge elements that are specific to the trade

Industry Expected Performance: description of the expectations regarding the level of performance of the tasks, including information related to specific codes, regulations and standards that must be observed

Language Requirements: description of the language requirements for working and studying in this trade in Canada

Pie Chart of Red Seal Examination Weightings: a graph which depicts the national percentages of exam questions assigned to the major work activities

Task Matrix: a chart which outlines graphically the major work activities, tasks and sub-tasks of this standard

Major Work Activity (MWA): the largest division within the standard that is comprised of a distinct set of trade activities

Task: distinct actions that describe the activities within a major work activity

Task Descriptor: a general description of the task

Sub-task: distinct actions that describe the activities within a task

Skills:

Performance Criteria: description of the activities that are done as the sub-task is performed

Evidence of Attainment: proof that the activities of the sub-task meet the expected performance of a tradesperson who has reached journeyperson level

Knowledge:

Learning Outcomes: describes what should be learned relating to a sub-task while participating in technical or in-school training

Learning Objectives: topics to be covered during technical or in-school training in order to meet the learning outcomes for the sub-task

Range of Variables: elements that provide a more in-depth description of a term used in the performance criteria, evidence of attainment, learning outcomes, or learning objectives

Appendix A – Acronyms: a list of acronyms used in the standard with their full name

Appendix B – Tools and Equipment / Outils et équipement: a non-exhaustive list of tools and equipment used in this trade

Appendix C – Glossary / Glossaire: definitions or explanations of selected technical terms used in the standard

METHODOLOGY

Development of the Standard

A draft standard is developed by a broad group of trade representatives, including tradespeople, instructors and employers at a National Workshop led by a team of facilitators. This draft standard breaks down all the tasks performed in the occupation and describes the knowledge and abilities required for a tradesperson to demonstrate competence in the trade.

Online Survey

The draft standard is made available to stakeholders to review and validate the activities described in it. These stakeholders are invited to participate in this consultation through apprenticeship authorities, as well as national stakeholder groups.

Draft Review

The RSOS development team forwards a copy of the standard and its translation to provincial and territorial authorities who consult with industry representatives to review it. Their recommendations are assessed and incorporated into the standard.

Validation and Weighting

Participating provinces and territories also consult with industry to validate and weight the document for the purpose of planning the makeup of the Red Seal Interprovincial Examination for the trade. They validate and weight the major work activities (MWA), tasks and sub-tasks, of the standard as follows:

MWA	Each jurisdiction assigns a percentage of questions to each MWA for an examination that would cover the entire trade.
TASKS	Each jurisdiction assigns a percentage of exam questions to each task within a MWA.
SUB-TASKS	Each jurisdiction indicates, with a YES or NO, whether or not each sub-task is performed by skilled workers within the occupation in its jurisdiction.

The results of this exercise are submitted to the RSOS development team who then analyzes the data and incorporates it into the document. The RSOS provides the individual jurisdictional validation results as well as the national averages of all responses. The national averages for MWA and task weighting guide the Interprovincial Red Seal Examination plan for the trade.

The validation of the RSOS is used to identify common core sub-tasks across Canada for the occupation. If at least 70% of the responding jurisdictions' industry performs a sub-task, it shall be considered common core. Interprovincial Red Seal Examination questions are limited to the common core sub-tasks identified through this validation process.

Definitions for Validation and Weighting

YES	sub-task performed by qualified workers in the occupation in that province or territory
NO	sub-task not performed by qualified workers in the occupation in that province or territory
NV	standard Not Validated by that province or territory
ND	trade Not Designated in a province or territory
NOT COMMON CORE (NCC)	sub-task, task or MWA performed less than 70% of responding jurisdictions; these will not be tested by the Interprovincial Red Seal Examination for the trade
NATIONAL AVERAGE %	average percentage of questions assigned to each MWA and task in Interprovincial Red Seal Examination for the trade

Provincial/Territorial Abbreviations

NL	Newfoundland and Labrador
NS	Nova Scotia
PE	Prince Edward Island
NB	New Brunswick
QC	Quebec
ON	Ontario
MB	Manitoba
SK	Saskatchewan
AB	Alberta
BC	British Columbia
NT	Northwest Territories
YT	Yukon Territory
NU	Nunavut

DESCRIPTION OF THE MOTORCYCLE TECHNICIAN TRADE

“Motorcycle technician” is this trade’s official Red Seal occupational title approved by the CCDA. This standard covers tasks performed by motorcycle technicians. Please note that the official Red Seal name was changed from motorcycle mechanic to motorcycle technician by the CCDA in 2020.

Motorcycle technicians work primarily on two and three-wheeled motorcycles and other units such as motor scooters. They inspect, clean, test, assemble, diagnose, maintain and repair engines, transmissions, drive systems, steering assemblies, braking systems, chassis and suspension, electrical systems, vehicle management systems, fuel systems and exhaust systems. They may specialize in repairing, rebuilding, customizing or servicing these systems or assemblies.

Motorcycle technicians work with hand, power, pneumatic, measuring, diagnostic and testing tools, and shop equipment. Reference material, documentation, computers and software are also necessary tools in this trade.

Motorcycle technicians may work in service shops of motorcycle dealerships, distributers and retailers or in independent service establishments. They may specialize in specific makes and types.

The work environment may include noise, fumes, odours, hazardous compounds, drafts and vibrations; therefore, safety procedures are important. The work often requires considerable standing, bending, crawling, lifting, pulling and reaching.

Some important attributes of motorcycle technicians are good hand-eye coordination, mechanical aptitude, time management skills, document use, numeracy, logical thinking and decision-making skills, excellent communication and the ability to educate themselves as technology advances. They must also be competent to test ride motorcycles.

Experienced motorcycle technicians may advance to supervisory positions, service managers or instructors. Some technicians may open their own garage or motorcycle specialty shop. With additional training, motorcycle technicians can transfer their skills and knowledge to related units and equipment such as, but not limited to, all-terrain vehicles, snowmobiles, watercraft and outdoor power equipment.

TRENDS IN THE MOTORCYCLE TECHNICIAN TRADE

Technology

Electric Vehicle (EV) propulsion vehicles are new to the market, and it is expected that this type of motorcycle will become more popular and common as improvements are made to their range and capability. The EV will have batteries with increased energy density. The batteries will contain new material combinations and may require additional care during storage, charging and disposal.

Multi-wheeled leaning vehicles are new to the Canadian marketplace; therefore, motorcycle technicians may need to learn about the distinct features of these vehicles, especially those related to steering and suspension.

Rider assistance systems are no longer limited to high-performance motorcycles and are now common on a wide range of motorcycles. Along with these systems, more infotainment systems are keeping pace with consumer demands. The technology also allows the consumer to be easily updated on information such as servicing schedules and recalls.

There is an increasing use of technologies such as electrically-controlled suspension systems, fully automatic transmission systems and keyless starting systems.

LED lighting systems are more prevalent for efficiency and reduced electrical demands.

Combined stop/start engines have been introduced in a limited way, and may expand into more motorcycles in the future.

Work Practices

There is an increasing importance placed on communication skills and documentation of work. There are more information management systems used by the manufacturer and retailers to track the motorcycles and for service departments to plan work.

Motorcycle technicians must be far more computer literate to stay abreast of these new technologies.

There is an increased focus on full component replacement compared to repair and reconditioning components. This does not remove from the highly complex technical work performed, especially in the area of motorcycle diagnosis.

Changing demographics in the motorcycle consumer has meant that shops need to be more inclusive and offer a diverse range of products and services.

Safety and Environmental Trends

Environmental regulations governing waste materials are more stringent. There are more recycling and disposal requirements in the industry. There are more environmentally friendly solvents and cleaners being introduced in shops.

For worker health and safety, there are requirements for more frequent equipment inspection. There are also more requirements for air exchangers and carbon monoxide (CO) monitoring.

ESSENTIAL SKILLS SUMMARY

Essential skills are needed for work, learning and life. They provide the foundation for learning all other skills and enable people to evolve with their jobs and adapt to workplace change.

Through extensive research, the Government of Canada and other national and international agencies have identified and validated nine essential skills. These skills are used in nearly every occupation and throughout daily life in different ways.

The application of these skills may be described throughout this document within the skills and knowledge which support each sub-task of the trade. The following are summaries of the requirements in each of the essential skills, taken from the essential skills profile.

READING

Motorcycle technicians use reading skills to understand documents such as work orders, service manuals, training materials and service bulletins. They read regulations governing road worthiness, noise and emission standards of motorcycles and scooters.

DOCUMENT USE

Documents that motorcycle technicians work with include work orders, job estimates, inspection checklists, parts requisitions, real-time diagnostic charts, installation and service manuals. They also consult and study a variety of graphs, charts and technical drawings such as assembly, schematic and cut-away drawings.

WRITING

Motorcycle technicians write brief notes and descriptions. They may write notes to keep records of their observations and recommendations for themselves, others and clients. Many records are input through the computer keyboard but legible writing skills are a definite asset.

ORAL COMMUNICATION

Motorcycle technicians use oral communication skills to discuss job details with colleagues, apprentices, suppliers and clients.

NUMERACY

Motorcycle technicians use numeracy skills to compare and calculate serviceability of components, measurements of dimensions, revolutions per minute, speed, horsepower and torque. They estimate the effects that repairs and modifications will have on engine performance. They may calculate labour time to prepare repair quotes and invoices.

THINKING

Motorcycle technicians use problem-solving skills to determine customer requirements, and to explain the actions and repair procedures. Motorcycle technicians use decision-making skills to select the order of service and to select tools, parts and procedures needed to carry out the tasks. They use critical thinking skills to determine causes of failures, defects and deficiencies.

WORKING WITH OTHERS

Motorcycle technicians mostly work independently but coordinate their work with parts technicians and suppliers. They may provide advice and assistance to other technicians. They may also assist in mentoring apprentices.

DIGITAL TECHNOLOGY

Motorcycle technicians use databases to access details of customers' information and specifics of previously completed work. They use communications software such as email to exchange information with suppliers, manufacturers, colleagues and other motorcycle repair shops. They use diagnostic equipment that runs software applications. They also use the Internet to access specifications, technical service bulletins, recall notices, and service and instruction manuals.

CONTINUOUS LEARNING

Motorcycle technicians are required to keep up-to-date with technological advancements and legislation governing safety inspections and emissions. They may attend training to be certified repairers of specific motorcycles. They also learn from each other, by talking to colleagues, suppliers, service managers and by reading industry literature and repair manuals. Online training is also a necessary way for motorcycle technicians to learn about new products, procedures and skills.

Roles and Opportunities for Skilled Trades in a Sustainable Future

Climate change affects all of us. Trades play a large role in implementing solutions and adjusting to changes in the world.

Throughout this standard, there may be specific references to tasks, skills and knowledge that clearly show this trade's role in a more sustainable future. Each trade has different roles to play and contributions to make in their own way.

For example:

- Construction tradespeople need to consider the materials they are using, building methods, and improvements to mechanical and electrical installations. There are important changes to codes and standards to help meet the climate change goals and commitments set for 2030 and 2050. Retrofits and new construction of low-energy buildings provide enormous opportunities for workers in this sector. Concepts, such as energy efficiency and regarding buildings as systems are foundational.

- Automotive and mechanical trades are seeing a shift towards the electrification of vehicles and equipment. As a result, new skills and knowledge will be required for tradespeople working in this sector. There are mandates for sales of new light-duty zero-emission vehicles (ZEV) in Canada, with the goal of achieving 100% ZEV sales by 2035. Due to this mandate, the demand for these vehicles is growing quickly among consumers and fleets. With this escalating demand, the need for skilled workers to maintain and repair these vehicles is also increasing.

- In industrial and resource sectors, there is pressure to move towards increased electrification of industrial processes. Many industrial and commercial facilities are also being upgraded to improve energy efficiency in areas such as lighting systems, and new production processes and technologies. There are also opportunities in carbon capture, utilization and storage (CCUS), as well as the production and export of low-carbon hydrogen.

- Trades in the service sector may also need to be aware of responsible sourcing, as well as efficient use of products and materials. New ways of working better are always a part of the job.

There are fast-moving changes in guidelines, codes, regulations and specifications. Many are being implemented for the purpose of energy efficiency and climate change. Those that affect specific trades may be mentioned within the standard. Examples of these guidelines and legislation include:

- The National Energy Code of Canada for Buildings (NECB).

- The Canadian Net-Zero Emissions Accountability Act (CNZEAA).

- programs that encourage sustainable building design and construction such as Leadership in Energy and Environmental Design (LEED) and the Zero Carbon Building (ZCB) standards.

- the Montreal Protocol for phasing out R22 refrigerants.

- energy efficiency programs such as ENERGY STAR.

- principles of the United Nations Declaration for the Rights of Indigenous Peoples pertaining to energy sector development.

Apprentices and tradespeople need to increase their climate literacy and reinforce their own understanding of energy issues and environmental practices. It is important for them to understand why these changes are happening and their effect on trades' work. While individual tradespeople and apprentices may not be able to choose certain elements like; the architectural design of buildings, building material selection, regulatory requirements, use of electric vehicles and technologies, they must understand the impact of using these elements in their work. Impacts include using environmentally friendly products and following requirements related to the disposal and recycling of materials.

In apprenticeship, as well as in ongoing professional development, employers and instructors should encourage learning about these concepts, why they are important, how they are implemented, and the overarching targets they are aiming to achieve.

All in all, it's about doing the work better and building a better world.

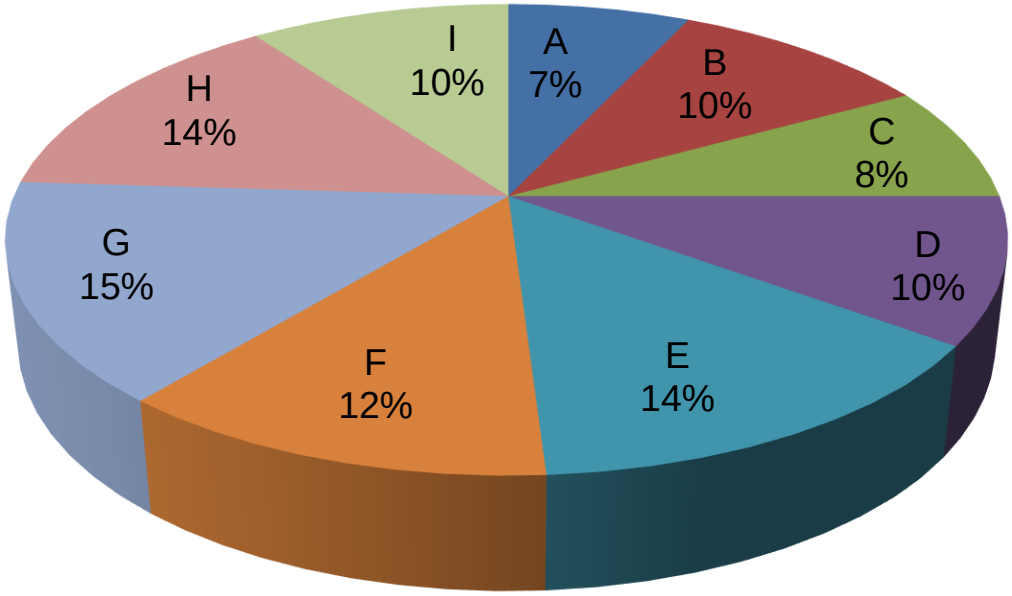
INDUSTRY EXPECTED PERFORMANCE

All tasks must be performed according to the applicable jurisdictional regulations and standards. All health and safety standards must be respected and observed. Work should be done efficiently and to a high quality without material waste or environmental damage. All requirements of employers, manufacturers, clients and quality control policies must be met. At a journeyperson level of performance, all tasks must be done with minimal direction and supervision. As a journeyperson progresses in their career there is an expectation they continue to upgrade their skills and knowledge to maintain pace with industry and promote continuous learning in their trade through mentoring of apprentices.

LANGUAGE REQUIREMENTS

It is expected that journeypersons are able to understand and communicate in either English or French, which are Canada's official languages. English or French are the common languages of business as well as languages of instruction in apprenticeship programs.

PIE CHART
OF RED SEAL EXAMINATION WEIGHTINGS



MWA A	Performs common occupational skills	7%
MWA B	Maintains chassis and suspension	10%
MWA C	Maintains wheels and tires	8%
MWA D	Maintains brakes	10%
MWA E	Maintains engines	14%
MWA F	Maintains power transfer	12%
MWA G	Maintains electrical systems	15%
MWA H	Maintains vehicle management systems	14%
MWA I	Maintains fuel and exhaust systems	10%

This pie chart represents a breakdown of the interprovincial Red Seal examination. Percentages are based on the collective input from workers from the trade from across Canada. The Task Matrix on the next pages indicates the breakdown of tasks and sub-tasks within each Major Work Activity and the breakdown of questions assigned to the Tasks. The Interprovincial examination for this trade has 130 questions.

MOTORCYCLE TECHNICIAN
TASK MATRIX AND WEIGHTINGS

A – Performs common occupational skills — 7%

Task A-1 **Performs safety-related functions** **19%**	**A-1.01 Maintains safe work environment**	**A-1.02 Uses personal protective equipment (PPE) and safety equipment**	
Task A-2 **Performs routine work practices** **31%**	**A-2.01 Uses trade-related consumables**	**A-2.02 Performs periodic maintenance**	**A-2.03 Performs storage procedures**
	A-2.04 Prepares new motorcycles	**A-2.05 Conducts safety inspection**	**A -2.06 Verifies repairs**
Task A-3 **Uses tools, equipment and documentation** **34%**	**A-3.01 Uses diagnostic tools and equipment**	**A-3.02 Uses precision measuring instruments**	**A-3.03 Uses hand tools**
	A-3.04 Uses heating/cutting tools and equipment	**A-3.05 Uses pneumatic and electric power tools and equipment**	**A-3.06 Uses shop equipment**
	A-3.07 Uses documentation		
Task A-4 **Uses communication and mentoring techniques** **16%**	**A-4.01 Uses communication techniques**	**A-4.02 Uses mentoring techniques**	

B – Maintains chassis and suspension — 10%

Task B-5 **Diagnoses chassis and components** **25%**	**B-5.01 Diagnoses frame**	**B-5.02 Diagnoses steering head**	**B-5.03 Diagnoses steering systems for three-wheel motorcycles**
	B-5.04 Diagnoses handle bars, foot rests and controls	**B-5.05 Diagnoses chassis ancillary and accessory components**	
Task B-6 **Services chassis and components** **23%**	**B-6.01 Services frame**	**B-6.02 Services steering head**	**B-6.03 Services steering systems for three-wheel motorcycles**
	B-6.04 Services handle bars, foot rests and controls	**B-6.05 Services chassis ancillary and accessory components**	
Task B-7 **Diagnoses suspension systems** **27%**	**B-7.01 Diagnoses front suspension components**	**B-7.02 Diagnoses front suspension components for three-wheel motorcycles**	**B-7.03 Diagnoses rear suspension components**
	B-7.04 Diagnoses swing arm		
Task B-8 **Services suspension systems** **25%**	**B-8.01 Services front suspension components**	**B-8.02 Services front suspension components for three-wheel motorcycles**	**B-8.03 Services rear suspension components**
	B-8.04 Services swing arm		

C – Maintains wheels and tires — 8%

Task C-9 **Diagnoses wheels and tires** **43%**	**C-9.01 Diagnoses tires**	**C-9.02 Diagnoses spoked wheels**	**C-9.03 Diagnoses one-piece wheels**
	C-9.04 Diagnoses multi-piece wheels		
Task C-10 **Services wheels and tires** **57%**	**C-10.01 Services tires**	**C-10.02 Services spoked wheels**	**C-10.03 Services one-piece wheels**
	C-10.04 Services multi-piece wheels		

D – Maintains brakes — 10%

Task D-11 **Diagnoses braking systems** **50%**	**D-11.01 Diagnoses hydraulic braking systems**	**D-11.02 Diagnoses mechanical braking systems**	**D-11.03 Diagnoses braking control systems**
Task D-12 **Services braking systems** **50%**	**D-12.01 Services hydraulic braking systems**	**D-12.02 Services mechanical braking systems**	**D-12.03 Services braking control systems**

E – Maintains engines

14%

Task E-13 **Diagnoses two-stroke and four-stroke engines** **48%**	**E-13.01 Diagnoses cylinder heads**	**E-13.02 Diagnoses valve systems on two-stroke engine**	**E-13.03 Diagnoses valve train on four-stroke engine**
	E-13.04 Diagnoses cylinders and pistons	**E-13.05 Diagnoses crankshaft assembly**	**E-13.06 Diagnoses counterbalance assemblies**
	E-13.07 Diagnoses engine cases	**E-13.08 Diagnoses lubrication system**	**E-13.09 Diagnoses cooling system**
Task E-14 **Services two-stroke and four-stroke engines** **52%**	**E-14.01 Services cylinder heads on four-stroke engine**	**E-14.02 Services valve systems on two-stroke engine**	**E-14.03 Services valve train on four-stroke engine**
	E-14.04 Services cylinders and pistons	**E-14.05 Services crankshaft assembly**	**E-14.06 Services counterbalance assemblies**
	E-14.07 Services engine cases	**E-14.08 Services lubrication system**	**E-14.09 Services cooling system**

F – Maintains power transfer

12%

Task F-15 **Diagnoses clutches and primary drive** **16%**	**F-15.01 Diagnoses primary drive and driven gears**	**F-15.02 Diagnoses primary drive chain and sprockets**	**F-15.03 Diagnoses primary drive belt and pulleys**
	F-15.04 Diagnoses manual clutches	**F-15.05 Diagnoses automatic clutches**	**F-15.06 Diagnoses kick start**
Task F-16 **Services clutches and primary drive** **16%**	**F-16.01 Services primary drive and driven gears**	**F-16.02 Services primary drive chain and sprockets**	**F-16.03 Services primary drive belt and pulleys**
	F-16.04 Services manual clutches	**F-16.05 Services automatic clutches**	**F-16.06 Services kick start**
Task F-17 **Diagnoses transmissions** **15%**	**F-17.01 Diagnoses constant mesh transmissions**	**F-17.02 Diagnoses continuously variable transmission (CVT)**	
Task F-18 **Services transmissions** **23%**	**F-18.01 Services constant mesh transmissions**	**F-18.02 Services continuously variable transmission (CVT)**	
Task F-19 **Diagnoses final drive** **12%**	**F-19.01 Diagnoses final drive chain and sprockets**	**F-19.02 Diagnoses final drive shaft and gears**	**F-19.03 Diagnoses final drive belt and pulleys**
Task F-20 **Services final drive** **18%**	**F-20.01 Services final drive chain and sprockets**	**F-20.02 Services final drive shaft and gears**	**F-20.03 Services final drive belt and pulleys**

G – Maintains electrical systems — 15%

Task G-21 **Diagnoses electrical systems** **67%**	G-21.01 Diagnoses battery and charging system	G-21.02 Diagnoses electrical ancillary and accessory components	G-21.03 Diagnoses wiring harness systems
	G-21.04 Diagnoses ignition system	G-21.05 Diagnoses electric starting system	
Task G-22 **Services electrical systems** **33%**	G-22.01 Services battery and charging system	G-22.02 Services electrical ancillary and accessory components	G-22.03 Services wiring harness systems
	G-22.04 Services ignition system	G-22.05 Services electric starting system	

H – Maintains vehicle management systems — 14%

Task H-23 **Diagnoses vehicle management systems** **60%**	H-23.01 Reads fault codes	H-23.02 Interprets fault code results	H-23.03 Tests system circuitry and components
Task H-24 **Services vehicle management systems** **40%**	H-24.01 Updates software	H-24.02 Services system circuitry and components	

I – Maintains fuel and exhaust systems

10%

Task I-25 **Diagnoses fuel and exhaust systems** **57%**	**I-25.01 Diagnoses fuel tanks and components**	**I-25.02 Diagnoses air delivery system**	**I-25.03 Diagnoses carburetor system**
	I-25.04 Diagnoses fuel injection system	**I-25.05 Diagnoses exhaust system**	
Task I-26 **Services fuel and exhaust systems** **43%**	**I-26.01 Services fuel tanks and components**	**I-26.02 Services air delivery system**	**I-26.03 Services carburetor system**
	I-26.04 Services fuel injection system	**I-26.05 Services exhaust system**	

Harmonization of Apprenticeship Training

Provincial and territorial apprenticeship authorities are each responsible for their respective apprenticeship programs. In the spirit of continual improvement, and to facilitate mobility among apprentices in Canada, participating authorities have agreed to work towards harmonizing certain aspects of their programs where possible. After consulting with their stakeholders in the trade, they have reached consensus on the following elements. Note that implementation of these elements may vary from jurisdiction to jurisdiction, depending on their own circumstances. For more information on the implementation in any province and territory, please contact that jurisdiction's apprenticeship authority.

1. Trade name

The official Red Seal name for this trade is Motorcycle Technician.

2. Number of Levels of Apprenticeship

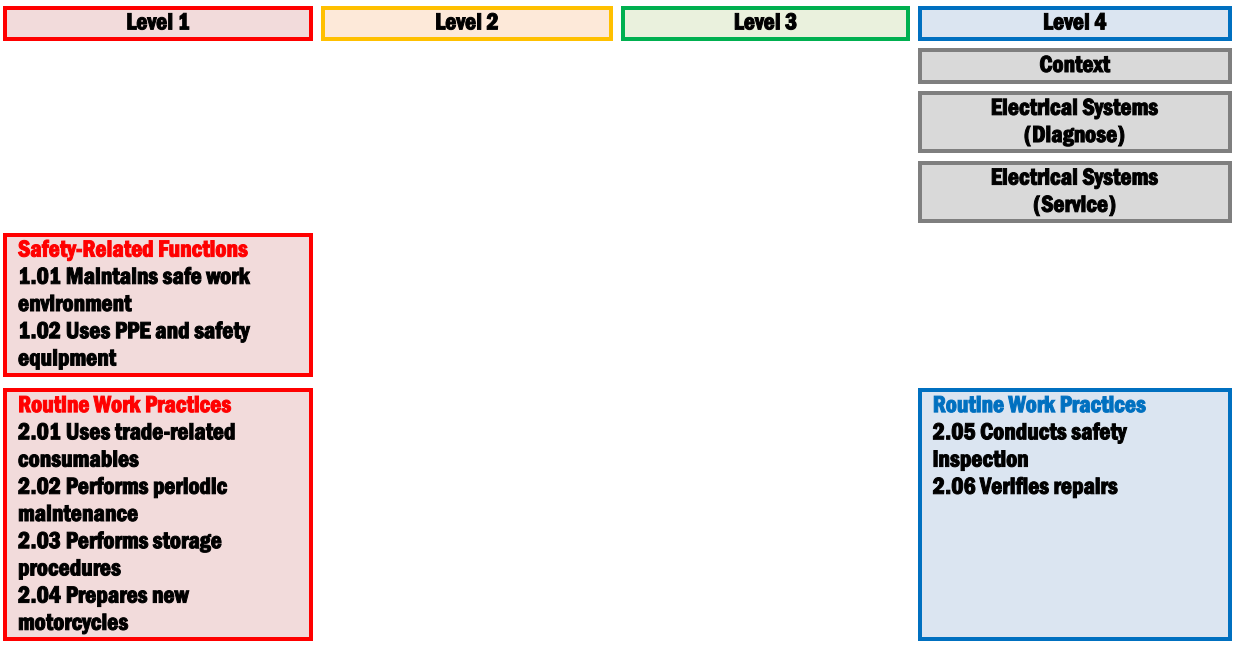
The number of levels of technical training recommended for this trade is 4 (four).

3. Total Training Hours During Apprenticeship Training

The total hours of training, including both on-the-job and in-school training for this trade is 6400.

4. Sequencing Topics and Related Sub-tasks

The topic titles in the table below are placed in a column for each apprenticeship level for technical training. Each topic is accompanied by the sub-tasks and their reference number. The topics in the grey shaded cells represent those that are covered "in context" with other training in the subsequent years.



Level 1	Level 2	Level 3	Level 4
Tools, Equipment and Documentation 3.01 Uses diagnostic tools and equipment 3.02 Uses precision measuring instruments 3.03 Uses hand tools 3.04 Uses heating/cutting tools and equipment 3.05 Uses pneumatic and electric power tools and equipment 3.06 Uses shop equipment 3.07 Uses documentation	**Tools, Equipment and Documentation** 3.01 Uses diagnostic tools and equipment 3.02 Uses precision measuring instruments 3.06 Uses shop equipment 3.07 Uses documentation	**Tools, Equipment and Documentation** 3.01 Uses diagnostic tools and equipment 3.02 Uses precision measuring instruments 3.06 Uses shop equipment 3.07 Uses documentation	**Tools, Equipment and Documentation** 3.01 Uses diagnostic tools and equipment 3.02 Uses precision measuring instruments 3.06 Uses shop equipment 3.07 Uses documentation
Communication 4.01 Uses communication techniques			**Mentoring** 4.02 Uses mentoring techniques
		Chassis and Components (Diagnose) 5.01 Diagnoses frame 5.02 Diagnoses steering head 5.03 Diagnoses steering systems for 3-wheel motorcycles 5.04 Diagnoses handle bars, foot rests and controls 5.05 Diagnoses chassis ancillary and accessory components	
	Chassis and Components (Service) 6.01 Services frame 6.02 Services steering head 6.03 Services steering systems for 3-wheel motorcycles 6.04 Services handle bars, foot rests and controls 6.05 Services chassis ancillary and accessory components		
		Suspension Systems (Diagnose) 7.01 Diagnoses front suspension components 7.02 Diagnoses front suspension components for 3-wheel motorcycles 7.03 Diagnoses rear suspension components 7.04 Diagnoses swing arm	

Level 1	Level 2	Level 3	Level 4
	Suspension Systems (Service) 8.01 Services front suspension components 8.02 Services front suspension components for 3-wheel motorcycles 8.03 Services rear suspension components 8.04 Services swing arm		
Wheels and Tires (Diagnose) 9.01 Diagnoses tires 9.03 Diagnoses one-piece wheels 9.04 Diagnoses multi-piece wheels		**Wheels and Tires (Diagnose)** 9.02 Diagnoses spoked wheels	
Wheels and Tires (Service) 10.01 Services tires 10.03 Services one-piece wheels 10.04 Services multi-piece wheels		**Wheels and Tires (Service)** 10.02 Services spoked wheels	
Braking Systems (Diagnose) 11.01 Diagnoses hydraulic braking systems 11.02 Diagnoses mechanical braking systems			**Braking Systems (Diagnose)** 11.03 Diagnoses braking control systems
Braking Systems (Service) 12.01 Services hydraulic braking systems 12.02 Services mechanical braking systems			**Braking Systems (Service)** 12.03 Services braking control systems
		Two-Stroke and Four-Stroke Engines (Diagnose) 13.01 Diagnoses cylinder heads (Two-Stroke) 13.02 Diagnoses valve systems on two-stroke engine 13.04 Diagnoses cylinders and pistons (Two-Stroke) 13.09 Diagnoses cooling system	**Two-Stroke and Four-Stroke Engines (Diagnose)** 13.01 Diagnoses cylinder heads (Four-Stroke) 13.03 Diagnoses valve train on four-stroke engine 13.04 Diagnoses cylinders and pistons (Four-Stroke) 13.05 Diagnoses crankshaft assembly 13.06 Diagnoses counterbalance assemblies 13.07 Diagnoses engine cases 13.08 Diagnoses lubrication system

Level 1	Level 2	Level 3	Level 4
	Two-Stroke and Four-Stroke Engines (Service) 14.02 Services valve systems on two-stroke engine 14.04 Services cylinders and pistons (Two-Stroke) 14.08 Services lubrication system (Two-Stroke) 14.09 Services cooling system	**Two-Stroke and Four-Stroke Engines (Service)** 14.01 Services cylinder heads on four-stroke engine 14.03 Services valve train on four-stroke engine 14.04 Services cylinders and pistons (Four-Stroke) 14.05 Services crankshaft assembly 14.06 Services counterbalance assemblies 14.07 Services engine cases 14.08 Services lubrication system (Four-Stroke)	
	Clutches and Primary Drive (Diagnose) 15.01 Diagnoses primary drive and driven gears 15.02 Diagnoses primary drive chain and sprockets 15.03 Diagnoses primary drive belt and pulleys 15.04 Diagnoses manual clutches 15.05 Diagnoses automatic clutches 15.06 Diagnoses kick start		
	Clutches and Primary Drive (Service) 16.01 Services primary drive and driven gears 16.02 Services primary drive chain and sprockets 16.03 Services primary drive belt and pulleys 16.04 Services manual clutches 16.05 Services automatic clutches 16.06 Services kick start		
	Transmissions (Diagnose) 17.02 Diagnoses continuously variable transmissions (CVT)		**Transmissions (Diagnose)** 17.01 Diagnoses constant mesh transmissions
	Transmissions (Service) 18.02 Services continuously variable transmissions (CVT)	**Transmissions (Service)** 18.01 Services constant mesh transmissions	**Transmissions (Service)** 18.01 Services constant mesh transmissions
Final Drive (Diagnose) 19.01 Diagnoses final drive chain and sprockets 19.03 Diagnoses final drive belt and pulleys		**Final Drive (Diagnose)** 19.02 Diagnoses final drive shaft and gears	

Level 1	Level 2	Level 3	Level 4
Final Drive (Service) 20.01 Services final drive chain and sprockets 20.03 Services final drive belt and pulleys		**Final Drive (Service)** 20.02 Services final drive shaft and gears	
Electrical Systems (Diagnose) 21.01 Diagnoses battery and charging system (battery) 21.02 Diagnoses electrical ancillary and accessory components	**Electrical Systems (Diagnose)** 21.01 Diagnoses battery and charging system (charging system) 21.02 Diagnoses electrical ancillary and accessory components 21.03 Diagnoses wiring harness systems 21.05 Diagnoses electric starting system	**Electrical Systems (Diagnose)** 21.02 Diagnoses electrical ancillary and accessory components 21.03 Diagnoses wiring harness systems 21.04 Diagnoses ignition system	
Electrical Systems (Service) 22.01 Services battery and charging system (battery) 22.02 Services electrical ancillary and accessory components	**Electrical Systems (Service)** 22.01 Services battery and charging system (charging system) 22.02 Services electrical ancillary and accessory components 22.03 Services wiring harness systems 22.05 Services electric starting system	**Electrical Systems (Service)** 22.02 Services electrical ancillary and accessory components 22.03 Services wiring harness systems 22.04 Services ignition system	
Vehicle Management Systems (Diagnose) 23.01 Reads fault codes			**Vehicle Management Systems (Diagnose)** 23.02 Interprets fault code results 23.03 Tests system circuitry and components
			Vehicle Management Systems (Service) 24.01 Updates software 24.02 Services system circuitry and components
		Fuel and Exhaust Systems (Diagnose) 25.01 Diagnoses fuel tanks and components 25.02 Diagnoses air delivery system 25.03 Diagnoses carburetor system 25.05 Diagnoses exhaust system	**Fuel and Exhaust Systems (Diagnose)** 25.04 Diagnoses fuel injection system

Level 1	Level 2	Level 3	Level 4
	Fuel and Exhaust Systems (Service) 26.01 Services fuel tanks and components 26.02 Services air delivery system 26.03 Services carburetor system 26.05 Services exhaust system		Fuel and Exhaust Systems (Service) 26.04 Services fuel injection system

Major Work Activity A

Performs common occupational skills

TASK A-1 Performs safety-related functions

TASK DESCRIPTOR

Motorcycle technicians carry out their duties following required safety procedures and jurisdictional regulations.

A-1.01 Maintains safe work environment

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
A-1.01.01P	follow ***safety procedures***	***safety procedures*** are followed according to safety data sheet (SDS) and workplace policies and procedures
A-1.01.02P	stabilize motorcycle using ***equipment***	motorcycle is stabilized using ***equipment*** to prevent it from tipping or falling
A-1.01.03P	perform ***general housekeeping***	***general housekeeping*** is performed according to workplace policies
A-1.01.04P	maintain personal and ***shared tools and equipment***	personal and ***shared tools and equipment*** are maintained to prevent personal injury
A-1.01.05P	identify and communicate ***general safety issues***	***general safety issues*** are identified and communicated according to workplace policies and procedures
A-1.01.06P	recycle and dispose of ***hazardous*** and ***non-hazardous waste and materials***	***hazardous*** and ***non-hazardous waste and materials*** are recycled and disposed of according to workplace policies and jurisdictional regulations

RANGE OF VARIABLES

safety procedures include: ensure proper ventilation, label hazardous materials, ensure adequate lighting, ensure clean environment

equipment includes: wheel clamps, stands, tie-downs

general housekeeping includes: keeping workstation tidy, free of tripping, falling and slipping hazards

shared tools and equipment include: hand tools, power tools, shop equipment, heating/cutting tools and equipment

general safety issues include: broken or unsafe shop equipment, unsafe environment, unsafe test ride

hazardous waste and materials include: oil, coolant, brake fluids, batteries, gasoline

non-hazardous waste and materials include: tires, brake pads, recyclables (steel, aluminum)

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
A-1.01.01L	demonstrate knowledge of maintaining safe work environment	describe safe work practices to maintain safe work environment
		identify workers' rights and responsibilities
		explain short and long term effects of exposure to ***hazardous waste and materials***, and noisy environments
A-1.01.02L	demonstrate knowledge of procedures to maintain safe work environment	describe procedures to stabilize motorcycle
		describe ***general housekeeping*** procedures
		describe procedures to maintain personal and ***shared tools and equipment***
		describe workplace practices and procedures
A-1.01.03L	demonstrate knowledge of regulatory requirements pertaining to safety	identify Workplace Hazardous Materials Information System (WHMIS) and describe its applications
		describe company safety policies and procedures, including safety training requirements and emergency procedures
		identify jurisdictional workplace health and safety acts and regulations
		describe jurisdictional regulations and procedures for disposal and recycling ***hazardous*** and ***non-hazardous waste and materials***
		describe liability for manufacturers, shops and journeypersons

RANGE OF VARIABLES

hazardous waste and materials include: oil, coolant, brake fluids, batteries, gasoline

general housekeeping includes: keeping workstation tidy, free of tripping, falling and slipping hazards

shared tools and equipment include: hand tools, power tools, shop equipment, heating/cutting tools and equipment

non-hazardous waste and materials include: tires, brake pads, recyclables (steel, aluminum)

A-1.02 Uses personal protective equipment (PPE) and safety equipment

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
A-1.02.01P	select and wear ***PPE***	***PPE*** is selected and worn when handling ***hazardous waste and materials***, working in noisy environments, and according to jurisdictional regulations
A-1.02.02P	use ***safety equipment***	***safety equipment*** is used according to jurisdictional regulations and manufacturers' instructions
A-1.02.03P	inspect, maintain and store ***PPE*** and ***safety equipment***	***PPE*** and ***safety equipment*** is inspected, maintained and stored according to workplace policies and procedures

RANGE OF VARIABLES

personal protective equipment (PPE) includes: eye and hearing protection, dust masks, coveralls, gloves, work boots, approved helmet

hazardous waste and materials include: oil, coolant, brake fluids, batteries, gasoline

safety equipment includes: fire extinguishers, eye wash stations, workplace mats, first aid kits

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
A-1.02.01L	demonstrate knowledge of ***PPE*** and ***safety equipment***, their applications, limitations and procedures for use	identify types of ***PPE*** and ***safety equipment***, and describe their applications, limitations and procedures for use
		identify location of ***PPE*** and ***safety equipment*** and on-site first aid stations
		describe workplace practices and procedures
A-1.02.02L	demonstrate knowledge of regulatory requirements pertaining to use of ***PPE*** and ***safety equipment***	identify WHMIS and describe its applications

	describe workplace safety policies and procedures, including safety training requirements and emergency procedures
	identify jurisdictional workplace health and safety acts and regulations

RANGE OF VARIABLES

personal protective equipment (PPE) includes: eye and hearing protection, dust masks, coveralls, gloves, work boots, approved helmet

safety equipment includes: fire extinguishers, eye wash stations, workplace mats, first aid kits

TASK A-2 Performs routine work practices

TASK DESCRIPTOR

Motorcycle technicians perform many tasks on a daily basis, which include maintenance, assembly of new motorcycles, storage and restoration of motorcycles to operating condition after storage. They also conduct safety inspections, verify repairs and provide reports and recommendations to supervisors and clients.

A-2.01 Uses trade-related consumables

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
A-2.01.01P	apply ***consumables***	***consumables*** are applied according to manufacturers' recommendations
A-2.01.02P	store and dispose of ***consumables***	***consumables*** are stored and disposed of according to manufacturers' guidelines and jurisdictional safety regulations

RANGE OF VARIABLES

consumables include: glues, sealants, paint, fasteners, sandpaper, electrical supplies, bonding and locking agents, solvents, cleaners

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
A-2.01.01L	demonstrate knowledge of ***consumables***, their applications and limitations	identify types of ***consumables***, and describe their applications and limitations
A-2.01.02L	demonstrate knowledge of procedures for use of ***consumables***	describe procedures to use ***consumables***
		describe procedures for storage and disposal of ***consumables***
		describe workplace practices and procedures
A-2.01.03L	demonstrate knowledge of regulatory requirements and manufacturers' guidelines for disposal and storage of ***consumables***	describe jurisdictional regulations and manufacturers' guidelines for disposal and storage of ***consumables***
		describe WHMIS regulations for use of ***consumables***

RANGE OF VARIABLES

consumables include: glues, sealants, paint, fasteners, sandpaper, electrical supplies, bonding and locking agents, solvents, cleaners

A-2.02 Performs periodic maintenance

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
A-2.02.01P	check ***settings***	***settings*** are checked according to manufacturers' specifications
A-2.02.02P	change ***fluids***	***fluids*** are changed according to condition of fluids and manufacturers' specifications
A-2.02.03P	change ***components***	***components*** are changed according to manufacturers' specifications
A-2.02.04P	adjust, clean and lubricate ***components***	***components*** are adjusted, cleaned and lubricated according to manufacturers' specifications
A-2.02.05P	check fault code history	fault code history is checked according to manufacturers' specifications
A-2.02.06P	test ride motorcycle	motorcycle is test ridden to confirm it performs to expectations

RANGE OF VARIABLES

settings include: tire pressure, fluid levels, fastener torques, chain and belt tension, cable adjustment, valve lash

fluids include: oils, coolant, brake fluids, fuel

components include: filters, spark plugs, tires, brake shoes, brake pads, belts, chains, cables, levers

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
A-2.02.01L	demonstrate knowledge of maintenance requirements	identify manufacturers' recommended maintenance schedules
		identify ***settings*** to be maintained
		identify ***components*** to be maintained and describe their function
A-2.02.02L	demonstrate knowledge of maintenance procedures	describe manufacturers' recommended maintenance procedures for ***components***
		describe workplace practices and procedures

RANGE OF VARIABLES

settings include: tire pressure, fluid levels, fastener torques, chain and belt tension, cable adjustment, valve lash

components include: filters, spark plugs, tires, brake shoes, brake pads, belts, chains, cables, levers

A-2.03 Performs storage procedures

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
A-2.03.01P	prepare motorcycle for short-term (seasonal) storage	motorcycle is prepared for short-term (seasonal) storage by performing ***procedures***
A-2.03.02P	prepare motorcycle for long-term storage	motorcycle is prepared for long-term storage by performing ***procedures***, in addition to those required for short-term (seasonal) storage
A-2.03.03P	apply ***protective coatings***	***protective coatings*** are applied according to product manufacturers' procedures
A-2.03.04P	protect motorcycle	motorcycle is protected using fitted cover

A-2.03.05P	return motorcycle into service after short-term (seasonal) storage	motorcycle is returned into service after short-term (seasonal) storage according to manufacturers' specifications
A-2.03.06P	return motorcycle into service after long-term storage	motorcycle is returned into service after long-term storage according to manufacturers' specifications

RANGE OF VARIABLES

procedures (for short-term storage) include: add fuel stabilizer, charge battery, change oil, fog internal components, perform visual inspection for service recommendations

procedures (for long-term storage) include: drain fuel system, remove battery, apply anti-corrosion consumables

protective coatings include: lubricants, wax, material specific protectant

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
A-2.03.01L	demonstrate knowledge of short and long-term storage ***procedures***	describe ***procedures*** to prepare motorcycle for short-term (seasonal) storage
		describe ***procedures*** to prepare motorcycle for long-term storage
		describe procedures to apply ***protective coatings***
		describe procedures to protect motorcycle
		describe procedures to return motorcycle into service after short-term (seasonal) storage
		describe procedure to return motorcycle into service after long-term storage
		describe workplace practices and procedures

RANGE OF VARIABLES

procedures (for short-term storage) include: add fuel stabilizer, charge battery, change oil, fog internal components, perform visual inspection for service recommendations

procedures (for long-term storage) include: drain fuel system, remove battery, apply anti-corrosion consumables

protective coatings include: lubricants, wax, material specific protectant

A-2.04 Prepares new motorcycles

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
A-2.04.01P	uncrate and check motorcycle for shipping damage	motorcycle is uncrated and checked for shipping damage
A-2.04.02P	install and adjust required components	required components are installed and adjusted according to manufacturers' assembly procedures
A-2.04.03P	prepare motorcycle for showroom	motorcycle is prepared for showroom by ***detailing*** according to workplace policies
A-2.04.04P	perform ***pre-delivery inspection (PDI) duties***	***pre-delivery inspection (PDI) duties*** are performed according to manufacturers' checklist
A-2.04.05P	install factory approved accessories	factory approved accessories are installed according to manufacturers' procedures
A-2.04.06P	test ride motorcycle	motorcycle is test ridden to confirm it performs to expectations

RANGE OF VARIABLES

detailing includes: remove protective coatings, wipe, wash, dry

pre-delivery inspection (PDI) duties include: fill and check fluids, service batteries, check fastener torque settings

KNOWLEDGE

	Learning Outcomes	Learning Objectives
A-2.04.01L	demonstrate knowledge of manufacturers' recommended uncrating and assembly procedures	describe manufacturers' recommended uncrating procedures
		describe manufacturers' recommended assembly procedures to install and adjust components
		describe workplace practices and procedures
A-2.04.02L	demonstrate knowledge of preparing motorcycle for showroom	describe ***detailing*** procedures to prepare motorcycle for showroom
		identify items contained in PDI checklist

RANGE OF VARIABLES

detailing includes: remove protective coatings, wipe, wash, dry

A-2.05 Conducts safety inspection

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
A-2.05.01P	inspect motorcycle	motorcycle is inspected according to jurisdictional safety standards
A-2.05.02P	identify ***safety issues***	***safety issues*** are identified

RANGE OF VARIABLES

safety issues include: broken lights and mirrors, tire wear, brake pad wear, oil leaks, tire pressure

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
A-2.05.01L	demonstrate knowledge of safety inspection procedures	identify and describe ***safety issues***
		describe procedures to perform jurisdictional safety inspection
		describe workplace practices and procedures
A-2.05.02L	demonstrate knowledge of regulatory requirements pertaining to safety inspections	identify jurisdictional safety inspection requirements

RANGE OF VARIABLES

safety issues include: broken lights and mirrors, tire wear, brake pad wear, oil leaks, tire pressure

A-2.06 Verifies repairs

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
A-2.06.01P	perform ***component bench tests***	***component bench tests*** are performed to confirm component function according to manufacturers' specifications and procedures
A-2.06.02P	perform ***system function tests***	***system function tests*** are performed according to manufacturers' specifications and procedures
A-2.06.03P	scan for fault codes	fault codes are identified using diagnostic tools and equipment
A-2.06.04P	assess road test results	road test results are assessed to confirm repairs have been completed

RANGE OF VARIABLES

component bench tests include: crankshaft run-out tests, clearances, relay continuity
system function tests include: braking, ignition, fuel delivery, charging, suspension

KNOWLEDGE

	Learning Outcomes	Learning Objectives
A-2.06.01L	demonstrate knowledge of repair verification procedures	describe procedures to perform ***component bench tests***
		describe procedures to perform ***system function tests***
		describe road test result assessment procedures
		describe procedures for clearing fault codes
		describe workplace practices and procedures

RANGE OF VARIABLES

component bench tests include: crankshaft run-out tests, clearances, relay continuity
system function tests include: braking, ignition, fuel delivery, charging, suspension

TASK A-3 Uses tools, equipment and documentation

TASK DESCRIPTOR

Tools and equipment must be used, maintained and stored in a safe manner to complete all tasks of the trade. Motorcycle technicians must be able to interpret information given by diagnostic tools and measurement instruments.

A-3.01 Uses diagnostic tools and equipment

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
A-3.01.01P	select and use ***diagnostic tools and equipment***	***diagnostic tools and equipment*** are selected and used according to manufacturers' procedures
A-3.01.02P	organize and store ***diagnostic tools and equipment***	***diagnostic tools and equipment*** are organized and stored so that they can be accessed efficiently and safely
A-3.01.03P	inspect ***diagnostic tools and equipment*** regularly to recognize wear, damage, defects or expiry	***diagnostic tools and equipment*** with wear, damage, defects or are expired, are identified according to manufacturers' information
A-3.01.04P	maintain ***diagnostic tools and equipment***	***diagnostic tools and equipment*** are maintained according to manufacturers' information
A-3.01.05P	identify, remove or replace defective and outdated ***diagnostic tools and equipment***	defective and outdated ***diagnostic tools and equipment*** are identified and communicated to management, and removed or replaced according to manufacturers' requirements
A-3.01.06P	calibrate ***diagnostic tools and equipment***	***diagnostic tools and equipment*** settings are calibrated to tool manufacturers' specifications
A-3.01.07P	operate ***diagnostic tools and equipment***	operation of ***diagnostic tools and equipment*** follows manufacturers' procedures

RANGE OF VARIABLES

diagnostic tools and equipment include: multimeters, leak-down tester, compression gauges, vacuum gauges, computers, diagnostic software, exhaust gas analyzer

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
A-3.01.01L	demonstrate knowledge of ***diagnostic tools and equipment***, their characteristics and applications	identify types of ***diagnostic tools and equipment***, and describe their characteristics and applications
A-3.01.02L	demonstrate knowledge of procedures to use ***diagnostic tools and equipment***	describe procedures to clean, organize, maintain and store ***diagnostic tools and equipment***
		describe safe operating procedures for ***diagnostic tools and equipment***
		describe procedures to replace worn, damaged or defective ***diagnostic tools and equipment***
		describe procedures to calibrate and update ***diagnostic tools and equipment***
		describe workplace practices and procedures

RANGE OF VARIABLES

diagnostic tools and equipment include: multimeters, leak-down tester, compression gauges, vacuum gauges, computers, diagnostic software, exhaust gas analyzer

A-3.02 Uses precision measuring instruments

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
A-3.02.01P	select and use ***precision measuring instruments***	***precision measuring instruments*** are selected and used according to manufacturers' specifications
A-3.02.02P	organize and store ***precision measuring instruments***	***precision measuring instruments*** are organized and stored so that they can be accessed efficiently and maintain their calibration
A-3.02.03P	inspect ***precision measuring instruments*** regularly to recognize wear, damage or defects	***precision measuring instruments*** with wear, damage or defects are identified according to manufacturers' specifications
A-3.02.04P	clean and maintain ***precision measuring instruments***	***precision measuring instruments*** are cleaned and maintained

A-3.02.05P	identify, remove or replace defective ***precision measuring instruments***	defective ***precision measuring instruments*** are identified and communicated to management, and removed or replaced according to manufacturers' specifications
A-3.02.06P	calibrate and zero ***precision measuring instruments***	***precision measuring instruments*** are calibrated and zeroed according to manufacturers' specifications
A-3.02.07P	operate ***precision measuring instruments***	operation of ***precision measuring instruments*** follows manufacturers' procedures
A-3.02.08P	interpret information obtained by ***precision measuring instruments***	information obtained by ***precision measuring instruments*** is interpreted

RANGE OF VARIABLES

precision measuring instruments include: micrometers, vernier calipers, bore gauges, dial indicators, feeler gauges

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
A-3.02.01L	demonstrate knowledge of ***precision measuring instruments***, their characteristics and applications	identify types of ***precision measuring instruments***, and describe their characteristics and applications
A-3.02.02L	demonstrate knowledge of procedures to use ***precision measuring instruments***	describe procedures to clean, organize, maintain and store ***precision measuring instruments***
		describe safe operating procedures for ***precision measuring instruments***
		describe procedures to replace worn, damaged or defective ***precision measuring instruments***
		describe procedures to calibrate and zero ***precision measuring instruments***
		describe procedures to interpret information obtained by ***precision measuring instruments***
		describe applications for digital and analog ***precision measuring instruments***
		describe workplace practices and procedures

RANGE OF VARIABLES

precision measuring instruments include: micrometers, vernier calipers, bore gauges, dial indicators, feeler gauges

A-3.03 Uses hand tools

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
A-3.03.01P	select and use ***hand tools***	***hand tools*** are selected and used in a safe manner and according to task
A-3.03.02P	organize and store ***hand tools***	***hand tools*** are organized and stored so that they can be accessed efficiently
A-3.03.03P	inspect ***hand tools*** regularly to identify wear, damage or defects	***hand tools*** with wear, damage or defects are identified
A-3.03.04P	clean and maintain ***hand tools***	***hand tools*** are cleaned and maintained
A-3.03.05P	identify, remove, repair or replace defective ***hand tools***	defective ***hand tools*** are identified and removed, repaired or replaced

RANGE OF VARIABLES

hand tools include: see Appendix B (Tools and Equipment)

KNOWLEDGE

	Learning Outcomes	Learning Objectives
A-3.03.01L	demonstrate knowledge of ***hand tools***, their characteristics and applications	identify types of ***hand tools***, and describe their characteristics and applications
A-3.03.02L	demonstrate knowledge of procedures to use ***hand tools***	describe procedures to clean, organize, maintain and store ***hand tools***
		describe safe operating procedures for ***hand tools***
		describe procedures to replace worn, damaged or defective ***hand tools***
		describe workplace practices and procedures

RANGE OF VARIABLES

hand tools include: see Appendix B (Tools and Equipment)

A-3.04 Uses heating/cutting tools and equipment

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
A-3.04.01P	select and use ***heating/cutting tools and equipment***	***heating/cutting tools and equipment*** are selected and used according to task
A-3.04.02P	organize and store ***heating/cutting tools and equipment***	***heating/cutting tools and equipment*** are organized so that they can be accessed efficiently and stored according to jurisdictional regulations
A-3.04.03P	inspect ***heating/cutting tools and equipment***	***heating/cutting tools and equipment*** with wear, damage or defects are identified
A-3.04.04P	clean and maintain ***heating/cutting tools and equipment***	***heating/cutting tools and equipment*** are cleaned and maintained
A-3.04.05P	identify, remove, repair or replace defective ***heating/cutting tools and equipment***	defective ***heating/cutting tools and equipment*** are identified and communicated to management, and removed, repaired or replaced according to manufacturers' procedures
A-3.04.06P	calibrate ***heating/cutting tools and equipment***	***heating/cutting tools and equipment*** are calibrated according to task and materials being used
A-3.04.07P	operate ***heating/cutting tools and equipment***	***heating/cutting tools and equipment*** are operated according to safety regulations

RANGE OF VARIABLES

heating/cutting tools and equipment include: See Appendix B (Tools and Equipment)

KNOWLEDGE

	Learning Outcomes	Learning Objectives
A-3.04.01L	demonstrate knowledge of ***heating/cutting tools and equipment***, their characteristics and applications	identify types of ***heating/cutting tools and equipment***, and describe their characteristics and applications
A-3.04.02L	demonstrate knowledge of procedures to use ***heating/cutting tools and equipment***	describe procedures to clean, organize, maintain and store ***heating/cutting tools and equipment***
		describe safe operating procedures for ***heating/cutting tools and equipment***

		describe procedures to replace or repair worn, damaged or defective ***heating/cutting tools and equipment***
		describe procedures to calibrate ***heating/cutting tools and equipment***
		describe workplace practices and procedures
A-3.04.03L	demonstrate knowledge of regulatory requirements pertaining to use of ***heating/cutting tools and equipment***	identify safety regulations pertaining to use of ***heating/cutting tools and equipment***

RANGE OF VARIABLES

heating/cutting tools and equipment include: See Appendix B (Tools and Equipment)

A-3.05 Uses pneumatic and electric power tools and equipment

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
A-3.05.01P	select and use ***pneumatic and electric power tools and equipment***	***pneumatic and electric power tools and equipment*** are selected and used according to task
A-3.05.02P	organize and store ***pneumatic and electric power tools and equipment***	***pneumatic and electric power tools and equipment*** are organized and stored safely so that they can be accessed efficiently
A-3.05.03P	inspect ***pneumatic and electric power tools and equipment***	***pneumatic and electric power tools and equipment*** with wear, damage or defects are identified according to safety regulations
A-3.05.04P	clean, lubricate and maintain ***pneumatic and electric power tools and equipment***	***pneumatic and electric power tools and equipment*** are cleaned, lubricated and maintained according to tool and equipment manufacturers' procedures
A-3.05.05P	identify, remove, repair or replace defective ***pneumatic and electric power tools and equipment***	defective ***pneumatic and electric power tools and equipment*** are identified and removed, repaired or replaced according to manufacturers' procedures
A-3.05.06P	operate ***pneumatic and electric power tools and equipment***	***pneumatic and electric power tools and equipment*** are operated according to safety regulations

RANGE OF VARIABLES

pneumatic and electric power tools and equipment include: See Appendix B (Tools and Equipment)

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
A-3.05.01L	demonstrate knowledge of ***pneumatic and electric power tools and equipment***, their characteristics and applications	identify types of ***pneumatic and electric power tools and equipment***, and describe their characteristics and applications
A-3.05.02L	demonstrate knowledge of procedures to use ***pneumatic and electric power tools and equipment***	describe procedures to clean, lubricate, organize, maintain and store ***pneumatic and electric power tools and equipment***
		describe safe operating procedures for ***pneumatic and electric power tools and equipment***
		describe procedures to replace or repair worn, damaged or defective ***pneumatic and electric power tools and equipment***
		describe workplace practices and procedures
A-3.05.03L	demonstrate knowledge of regulatory requirements pertaining to use of ***pneumatic and electric power tools and equipment***	identify safety regulations pertaining to use of ***pneumatic and electric power tools and equipment***

RANGE OF VARIABLES

pneumatic and electric power tools and equipment include: See Appendix B (Tools and Equipment)

A-3.06 Uses shop equipment

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
A-3.06.01P	select and use ***shop equipment***	***shop equipment*** is selected and used according to task and manufacturers' procedures
A-3.06.02P	organize and store ***shop equipment***	***shop equipment*** is organized so that it can be accessed efficiently and stored according to jurisdictional regulations

A-3.06.03P	inspect ***shop equipment***	***shop equipment*** with wear, damage, defects or are expired are identified according to safety regulations and manufacturers' information
A-3.06.04P	clean, lubricate and maintain ***shop equipment***	***shop equipment*** is cleaned, lubricated and maintained according to manufacturers' procedures
A-3.06.05P	identify, remove, repair or replace defective ***shop equipment***	defective ***shop equipment*** is identified and communicated to management, and removed, repaired or replaced according to manufacturers' information
A-3.06.06P	calibrate ***shop equipment***	***shop equipment*** is calibrated to equipment manufacturers' specifications
A-3.06.07P	operate ***shop equipment***	***shop equipment*** is operated according to safety regulations and manufacturers' procedures

RANGE OF VARIABLES

shop equipment includes: See Appendix B (Tools and Equipment)

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
A-3.06.01L	demonstrate knowledge of ***shop equipment***, their characteristics and applications	identify types of ***shop equipment***, and describe their characteristics and applications
A-3.06.02L	demonstrate knowledge of procedures to use ***shop equipment***	describe procedures to clean, lubricate, organize, maintain and store ***shop equipment***
		describe safe operating procedures for ***shop equipment***
		describe procedures to replace or repair worn, damaged or defective ***shop equipment***
		describe procedures to calibrate ***shop equipment***
		describe workplace practices and procedures
A-3.06.03L	demonstrate knowledge of regulatory requirements pertaining to use of ***shop equipment***	identify safety regulations pertaining to use of ***shop equipment***

RANGE OF VARIABLES

shop equipment includes: See Appendix B (Tools and Equipment)

A-3.07 Uses documentation

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
A-3.07.01P	interpret ***information in technical manuals/data sheets and bulletins***	***information in technical manuals/data sheets and bulletins*** is interpreted to aid in service and repair operations
A-3.07.02P	interpret trade terminology and information on work orders (repair orders) and estimates	trade terminology and information on work orders (repair orders) and estimates are interpreted to carry out service and repair procedures
A-3.07.03P	maintain service records and maintenance logs	service records and maintenance logs are maintained according to manufacturers' scheduled maintenance
A-3.07.04P	document diagnostic findings	diagnostic findings are documented to determine service required
A-3.07.05P	provide parts list and recommended repairs	parts list and recommended repairs are provided in writing

RANGE OF VARIABLES

information in technical manuals/data sheets and bulletins includes: product information, manufacturer-relevant information

KNOWLEDGE

	Learning Outcomes	Learning Objectives
A-3.07.01L	demonstrate knowledge of ***trade-related documentation*** and its use	identify and interpret sources of motorcycle-related information
		identify types of ***trade-related documentation***, and describe their purpose, applications and procedures for use
		identify and interpret ***information in technical manuals/data sheets and bulletins***
		identify information required for service records and maintenance logs
		identify types of ***reports***, and describe their purpose and applications
A-3.07.02L	demonstrate knowledge of procedures to prepare reports	identify diagnostic findings to determine service required

	describe procedures to prepare written estimate
	describe workplace practices and procedures

RANGE OF VARIABLES

trade-related documentation includes: manufacturers' specifications and recommendations, work orders (repair orders), equipment maintenance schedules, equipment maintenance records, safety recall bulletins, service bulletins

information in technical manuals/data sheets and bulletins includes: product information, manufacturer-relevant information

reports include: estimates, status reports

TASK A-4 Uses communication and mentoring techniques

TASK DESCRIPTOR

Learning in the trades is done primarily in the workplace with tradespeople passing on their skills and knowledge to apprentices, as well as sharing knowledge among themselves. Apprenticeship is, and always has been about mentoring – learning workplace skills and passing them on. Because of the importance of this to the trade, this task covers the activities related to communication in the workplace and mentoring skills.

A-4.01 Uses communication techniques

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
A-4.01.01P	demonstrate communication practices with individuals or in a group	instructions and messages are understood by all parties involved in communication
A-4.01.02P	listen using ***active listening*** practices	***active listening*** practices are utilized
A-4.01.03P	receive and respond to feedback on work	response to feedback indicates understanding and corrective measures are taken
A-4.01.04P	explain and provide feedback	explanation and feedback is provided and task is carried out as directed
A-4.01.05P	use questioning to improve communication	questions are used to enhance understanding, on-the-job training and goal setting

A-4.01.06P	participate in safety and information meetings	meetings are attended, information is relayed to workforce, and applied
A-4.01.07P	participate in customer contact providing explanation of service or repairs required	explanation of service or repairs required are communicated to customer in a clear and concise format

RANGE OF VARIABLES

active listening includes: hearing, interpreting, reflecting, responding, paraphrasing

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
A-4.01.01L	demonstrate knowledge of trade terminology	define terminology used in the trade
A-4.01.02L	demonstrate knowledge of effective communication practices	describe importance of using effective verbal and non-verbal communication with ***people in workplace***
		identify ***sources of information*** to effectively communicate
		identify communication and ***learning styles***
		describe effective listening and speaking skills
		identify ***personal responsibilities and attitudes*** that contribute to on-the-job success
		identify value of diversity in workplace
		identify communication that constitutes ***harassment*** and ***discrimination***

RANGE OF VARIABLES

people in workplace include: tradespeople, colleagues, apprentices, supervisors, customers, authorities having jurisdiction (AHJ), manufacturers

sources of information include: regulations, occupational health and safety requirements, AHJ requirements, drawings, specifications, company and customer documentation

learning styles include: seeing it, hearing it, trying it

personal responsibilities and attitudes include: asking questions, working safely, accepting constructive feedback, time management and punctuality, respect for authority, good stewardship of materials, tools and property, efficient work practice

harassment: as defined by the Canadian and jurisdictional Human Rights Commissions

discrimination: as defined by the Canadian Human Rights Act and jurisdictional human rights laws

A-4.02 Uses mentoring techniques

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
A-4.02.01P	identify and communicate learning objective and point of lesson	apprentice or learner can explain objective and point of lesson
A-4.02.02P	link lesson to other lessons and job	lesson order and unplanned learning opportunities are defined
A-4.02.03P	demonstrate performance of a skill to an apprentice or learner	***steps required to demonstrate a skill*** are performed
A-4.02.04P	set up conditions required for apprentice or learner to practice a skill	***practice conditions*** are set up so that skill can be practiced safely by apprentice or learner
A-4.02.05P	assess apprentice or learner's ability to perform tasks with increasing independence	performance of apprentice or learner improves with practice to a point where skill can be done with little supervision
A-4.02.06P	give supportive and corrective feedback	apprentice or learner adopts best practice after having been given supportive or corrective feedback
A-4.02.07P	support apprentices or learners in pursuing technical training opportunities	technical training is completed within timeframe prescribed by apprenticeship authority and manufacturers' timeframe
A-4.02.08P	support anti-***harassment*** in workplace	workplace is ***harassment*** and ***discrimination***-free
A-4.02.09P	assess apprentice or learner suitability to trade during probationary period	apprentice or learner is given feedback that helps them identify their own strengths and weaknesses and suitability for trade

RANGE OF VARIABLES

steps required to demonstrate a skill include: understanding the who, what, where, when, why, and how, explaining, showing, giving encouragement, following up to ensure skill is performed correctly

practice conditions are: guided, limited independence, full independence

harassment: as defined by the Canadian and jurisdictional Human Rights Commissions

discrimination: as defined by the Canadian Human Rights Act and jurisdictional human rights laws

KNOWLEDGE

	Learning Outcomes	Learning Objectives
A-4.02.01L	demonstrate knowledge of strategies for learning skills in workplace	describe importance of individual experience
		describe shared responsibilities for workplace learning

		determine one's own learning preferences and explain how these relate to learning new skills
		describe importance of different types of skills in workplace
		describe importance of ***essential skills*** in workplace
		identify different ***learning styles***
		identify different ***learning needs*** and strategies to meet them
		identify ***strategies to assist in learning a skill***
A-4.02.02L	demonstrate knowledge of strategies for ***teaching*** workplace ***skills***	identify different roles played by a workplace mentor
		describe ***teaching skills***
		identify how to choose a good time to present a lesson
		explain importance of linking lessons
		identify components of skill (context)
		describe considerations in setting up opportunities for skill practice
		explain importance of providing feedback
		identify techniques for giving effective feedback
		describe a skills assessment
		identify methods of assessing progress
		explain how to adjust lesson to different situations

RANGE OF VARIABLES

essential skills are: reading, document use, writing, oral communication, numeracy, thinking, working with others, digital technology, continuous learning

learning styles include: seeing it, hearing it, trying it

learning needs include: learning disabilities, learning preferences, language proficiency

strategies to assist in learning a skill include: understanding basic principles of instruction, developing coaching skills, being mature and patient, providing feedback

teaching skills include: identifying point of lesson, linking lessons, demonstrating skill, providing practice, giving feedback, assessing skills and progress

MAJOR WORK ACTIVITY B

Maintains chassis and suspension systems

TASK B-5 Diagnoses chassis and components

TASK DESCRIPTOR

Motorcycle technicians diagnose chassis components to detect faults such as misalignment, damage and defects. It is important to identify the repair and replacement procedures required for servicing.

B-5.01 Diagnoses frame

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
B-5.01.01P	identify ***faults***	***faults*** are identified by performing sensory inspection of frame to prevent ***issues*** according to manufacturers' specifications
B-5.01.02P	evaluate ***component*** conditions	***component*** conditions are evaluated according to manufacturers' specifications, by measuring frame using ***tools and equipment*** to identify trueness and straightness of frame
B-5.01.03P	determine ***causes of failure***	***causes of failure*** are determined according to interpretation of ***faults***
B-5.01.04P	determine ***servicing procedures***	***servicing procedures*** for ***components*** are determined according to manufacturers' specifications

RANGE OF VARIABLES

faults include: damage, misalignment (bent), cracks, corrosion, manufacturer defects
issues include: potential failure and injury, lack of performance
component includes: bushings, bearings, brackets
tools and equipment include: tape measures, straightedges, parallels, lasers, string
causes of failure include: impact, stress, manufacturer defects, corrosion
servicing procedures are: repair, replace

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
B-5.01.01L	demonstrate knowledge of frames and ***components***, and their characteristics and applications	identify ***types of frames*** and their ***components***, and describe their characteristics and applications
		identify ***frame materials***, and describe their characteristics and applications
B-5.01.02L	demonstrate knowledge of procedures to measure, inspect and diagnose frame	identify ***tools and equipment*** used to measure, inspect and diagnose frame and ***components***, and describe their procedures for use
		describe ***servicing procedures*** for frame and ***components***
		describe workplace practices and procedures

RANGE OF VARIABLES

types of frames include: cradle, backbone, stamped, perimeter, trellis
components include: bushings, bearings, brackets
frame materials include: aluminum, steel, titanium, composites, magnesium
tools and equipment include: tape measures, straightedges, parallels, lasers, string
servicing procedures are: repair, replace

B-5.02 Diagnoses steering head

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
B-5.02.01P	inspect steering head	steering head is inspected for ***faults*** by performing ***sensory inspections***
B-5.02.02P	measure bearing pre-load	bearing pre-load is measured using ***tools*** according to manufacturers' specifications and procedures
B-5.02.03P	determine ***servicing procedures***	***servicing procedures*** are determined according to ***faults*** identified

RANGE OF VARIABLES

faults include: damaged, notched, loose and worn bearings

sensory inspections include: listening for abnormal noises, feeling for rough movement or looseness, observing any unusual conditions

tools include: pull gauges, torque wrenches, hand tools

servicing procedures are: replace, lubricate, adjust

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
B-5.02.01L	demonstrate knowledge of steering head systems and their ***components***, characteristics, applications and operation	identify types of steering head systems, and describe their characteristics and applications
		describe steering geometry
		identify ***types of steering dampers***, and describe their characteristics and applications
		describe operation of steering dampers
		identify ***steering damper components***, and describe their characteristics and applications
B-5.02.02L	demonstrate knowledge of procedures to diagnose steering head systems	identify ***tools*** used to measure bearing pre-load and describe their procedures for use
		describe procedures to inspect steering head using ***sensory inspections***
		describe ***servicing procedures*** for steering head systems
		describe workplace practices and procedures

RANGE OF VARIABLES

components include: bearings, pivot shaft, seals, triple clamp

types of steering dampers are: hydraulic, hydro-electric

steering damper components include: seals, fluids, valves

tools include: pull gauges, torque wrenches, hand tools

sensory inspections include: listening for abnormal noises, feeling for rough movement or looseness, observing any unusual conditions

servicing procedures are: replace, lubricate, adjust

B-5.03 Diagnoses steering systems for three-wheel motorcycles

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
B-5.03.01P	inspect ***steering system components***	***steering system components*** are inspected for ***faults*** by performing ***sensory inspections*** and by using ***tools***
B-5.03.02P	check for fault codes	fault codes are checked using ***tools***
B-5.03.03P	check for ***alignment***	***alignment*** is checked using ***tools***
B-5.03.04P	determine ***servicing procedures***	***servicing procedures*** are determined according to ***faults*** identified

RANGE OF VARIABLES

steering system components include: tie rod, tie rod end, pitman arm, steering post, knuckle, power steering unit

faults include: loose, worn, bent, power steering malfunction

sensory inspections include: listening for abnormal noises, feeling for rough movement or looseness, observing any unusual conditions

tools include: straightedge, v-blocks, dial indicator, diagnostic software, alignment lasers, string, inclinometer

alignment is: wheel, caster, camber, toe

servicing procedures are: replace, lubricate, adjust, update software

KNOWLEDGE

	Learning Outcomes	Learning Objectives
B-5.03.01L	demonstrate knowledge of steering systems for three-wheel motorcycles and their ***components***, characteristics and applications	identify steering systems for three-wheel motorcycles and their ***components***, and describe their characteristics and applications
B-5.03.02L	demonstrate knowledge of procedures to diagnose steering systems for three-wheel motorcycles	identify ***tools*** used to measure steering ***alignment***, and describe their procedures for use
		describe procedures to inspect steering systems using ***sensory inspections***
		describe manufacturers' ***servicing procedures*** for steering systems
		describe workplace practices and procedures

RANGE OF VARIABLES

steering system components include: tie rod, tie rod end, pitman arm, steering post, knuckle, power steering unit

tools include: straightedge, v-blocks, dial indicator, diagnostic software, alignment lasers, string, inclinometer

alignment is: wheel, caster, camber, toe

sensory inspections include: listening for abnormal noises, feeling for rough movement or looseness, observing any unusual conditions

servicing procedures are: replace, lubricate, adjust, update software

B-5.04 Diagnoses handle bars, foot rests and controls

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
B-5.04.01P	determine ***damage***	***damage*** is determined by performing sensory inspection
B-5.04.02P	measure free play and alignment	free play and alignment are measured using ***tools and equipment***
B-5.04.03P	determine ***servicing procedures***	***servicing procedures*** are determined according to manufacturers' specifications

RANGE OF VARIABLES

damage includes: bent and cracked components, broken cables, bent controls

tools and equipment include: measuring tapes, straightedges, lasers, vernier calipers

servicing procedures include: straighten components, lubricate cables and pivot points

KNOWLEDGE

	Learning Outcomes	Learning Objectives
B-5.04.01L	demonstrate knowledge of handle bars, foot rests and controls, and their characteristics and applications	identify ***types of handle bars***, ***foot rests*** and controls, and describe their characteristics and applications
B-5.04.02L	demonstrate knowledge of procedures to diagnose handle bars, foot rests and controls	identify ***tools and equipment*** used to measure free play and alignment, and describe their procedures for use
		describe procedures to inspect handle bars, foot rests and controls
		describe procedures to diagnose handle bars, foot rests and controls

	describe manufacturers' ***servicing procedures*** for handle bars, foot rests and controls
	describe workplace practices and procedures

RANGE OF VARIABLES

types of handle bars include: beams, tubular, clip-on
types of foot rests include: rider, passenger, floor boards, pegs
tools and equipment include: measuring tapes, straightedges, lasers, vernier calipers
servicing procedures include: straighten components, lubricate cables and pivot points

B-5.05 Diagnoses chassis ancillary and accessory components

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
B-5.05.01P	detect ***faults***	***faults*** are detected by performing ***sensory inspections***
B-5.05.02P	evaluate component ***conditions***	component ***conditions*** are evaluated according to ***sensory inspections***
B-5.05.03P	inspect steering dampers	steering dampers are inspected by performing ***sensory inspections***
B-5.05.04P	inspect windshield	windshield is inspected to detect ***windshield faults***
B-5.05.05P	identify ***causes of failure***	***causes of failure*** are identified according to ***sensory inspections***
B-5.05.06P	determine ***servicing procedures***	***servicing procedures*** are determined according to component manufacturer

RANGE OF VARIABLES

faults include: excessive play of steering dampers, worn pivots on stands, bent engine guards, ripped saddlebags
sensory inspections include: listening for abnormal noises, feeling for rough movement or looseness, observing any unusual conditions
conditions include: leakage, binding, rust, seizure, wear, misalignment
windshield faults include: crazing, cracks, loose and bent mounts
causes of failure include: normal wear, physical damage, corrosion, improper care, modifications
servicing procedures include: lubricate pivot points, straighten components

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
B-5.05.01L	demonstrate knowledge of ***ancillary*** and ***accessory components***, their characteristics and applications	identify ***ancillary components***, and describe their characteristics and applications
		identify ***accessory components***, and describe their characteristics and applications
B-5.05.02L	demonstrate knowledge of procedures to diagnose ***ancillary*** and ***accessory components***	identify tools and equipment used to diagnose ***ancillary*** and ***accessory components***, and describe their procedures for use
		describe procedures to inspect ***ancillary*** and ***accessory components***
		describe procedures to diagnose ***ancillary*** and ***accessory components***
		describe component manufacturers' ***servicing procedures*** for ***ancillary*** and ***accessory components***
		describe workplace practices and procedures

RANGE OF VARIABLES

ancillary components include: engine guards, centre/side stands, stand spools
accessory components include: saddlebags, foot pegs, windshields, back rests

TASK B-6 Services chassis and components

TASK DESCRIPTOR

As a critical component, the frame is generally replaced if damaged. Motorcycle technicians may repair minor damages to components.

B-6.01 Services frame

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
B-6.01.01P	expose frame	frame is exposed by removing components to gain access to damaged area
B-6.01.02P	perform minor bracket and mount ***repairs***	minor bracket and mount ***repairs*** are performed according to workplace practices and procedures
B-6.01.03P	replace frame	frame is replaced when damage exceeds reference specifications
B-6.01.04P	remove and replace ***components***	***components*** are removed and replaced according to manufacturers' specifications
B-6.01.05P	lubricate ***components***	***components*** are lubricated to ensure smooth operation

RANGE OF VARIABLES

repairs include: straighten, weld
components include: bearings, races, bushings, seals

KNOWLEDGE

	Learning Outcomes	Learning Objectives
B-6.01.01L	demonstrate knowledge of frames and their ***components***, characteristics and applications	identify ***types of frames*** and their ***components***, and describe their characteristics and applications
		identify ***frame materials***, and describe their characteristics and applications
B-6.01.02L	demonstrate knowledge of procedures to service frames	identify ***tools and equipment*** used to service frames, and describe their procedures for use

	describe manufacturers' ***servicing procedures*** for frames and components
	describe workplace practices and procedures

RANGE OF VARIABLES

types of frames include: cradle, backbone, stamped, perimeter, trellis
components include: bearings, races, bushings, seals
frame materials include: aluminum, steel, titanium, composites, magnesium
tools and equipment include: torque wrench, bearing and seal driver, welding equipment
servicing procedures are: repair, replace, lubricate

B-6.02 Services steering head

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
B-6.02.01P	disassemble and reassemble ***peripheral components***	***peripheral components*** are disassembled to gain access to steering head and reassembled after service is performed
B-6.02.02P	repair or replace ***steering head components***	***steering head components*** are repaired or replaced according to manufacturers' procedures
B-6.02.03P	adjust steering head	steering head is adjusted according to manufacturers' specifications and procedures
B-6.02.04P	lubricate ***steering head components***	***steering head components*** are lubricated to ensure smooth operation
B-6.02.05P	test ride motorcycle	motorcycle is test ridden to confirm it performs to expectations

RANGE OF VARIABLES

peripheral components include: wheels, fenders, forks, fairings, handle bars
steering head components include: bearings, pivot shaft, seals, triple clamp

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
B-6.02.01L	demonstrate knowledge of steering head systems and their ***components***, characteristics and applications	identify types of steering head systems and their ***components***, and describe their characteristics and applications
		identify ***types of steering dampers***, and describe their characteristics, applications and operation
		identify ***steering damper components***, and describe their characteristics and applications
		identify ***steering head materials***, and describe their characteristics and applications
B-6.02.02L	demonstrate knowledge of procedures to service steering head systems and their ***components***	identify ***tools and equipment*** used to service frame and describe their procedures for use
		describe manufacturers' procedures to service steering head systems
		describe workplace practices and procedures

RANGE OF VARIABLES

steering head components include: bearings, pivot shaft, seals, triple clamp
types of steering dampers are: hydraulic, hydro-electric
steering damper components include: seals, fluids, valves
steering head materials include: steel, aluminum
tools and equipment include: torque wrench, bearing and seal driver, shop equipment

B-6.03 Services steering systems for three-wheel motorcycles

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
B-6.03.01P	disassemble and reassemble ***peripheral components***	***peripheral components*** are disassembled to gain access to ***steering system components*** and reassembled after service is performed
B-6.03.02P	repair or replace ***steering system components***	***steering system components*** are repaired or replaced according to diagnostic results and manufacturers' specifications

B-6.03.03P	adjust ***alignment*** of steering system	***alignment*** of steering system is adjusted using ***tools***
B-6.03.04P	reset steering to zero	steering is reset to zero using diagnostic software
B-6.03.05P	test ride motorcycle	motorcycle is test ridden to confirm it performs to expectations

RANGE OF VARIABLES

peripheral components include: wheels, fenders, forks, fairings

steering system components include: tie rod, tie rod end, pitman arm, steering post, knuckle, power steering unit

alignment (type) is: wheel, caster, camber, toe

tools include: diagnostic software, alignment lasers, string, inclinometer

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
B-6.03.01L	demonstrate knowledge of steering systems for three-wheel motorcycles and their ***components***, characteristics and applications	identify steering systems for three-wheel motorcycles and their ***components***, and describe their characteristics and applications
		identify electronic steering assist components, and describe their characteristics and applications
B-6.03.02L	demonstrate knowledge of procedures to service steering systems for three-wheel motorcycles	identify ***tools*** used to service steering systems for three-wheel motorcycles and describe their procedures for use
		describe manufacturers' procedures to service steering systems for three-wheel motorcycles
		describe workplace practices and procedures

RANGE OF VARIABLES

steering system components include: tie rod, tie rod end, pitman arm, steering post, knuckle, power steering unit

tools include: diagnostic software, alignment lasers, string, inclinometer

B-6.04 Services handle bars, foot rests and controls

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
B-6.04.01P	remove and replace handle bars, foot rests and controls	handle bars, foot rests and controls are removed and replaced if wear, defect or damage exceeds manufacturers' specifications
B-6.04.02P	repair minor damage	minor damage is repaired by straightening foot rest, mounts and controls
B-6.04.03P	adjust, clean and lubricate cables and pivot points	cables and pivot points are adjusted, cleaned and lubricated according to manufacturers' specifications
B-6.04.04P	test ride motorcycle	motorcycle is test ridden to verify correct operation of controls

KNOWLEDGE

	Learning Outcomes	Learning Objectives
B-6.04.01L	demonstrate knowledge of handle bars, foot rests and controls, their characteristics and applications	identify ***types of handle bars***, ***foot rests*** and controls, and describe their characteristics and applications
B-6.04.02L	demonstrate knowledge of procedures to service handle bars, foot rests and controls	identify ***tools and equipment*** used to service handle bars, foot rests and controls, and describe their procedures for use
		describe manufacturers' procedures to service handle bars, foot rests and controls
		describe workplace practices and procedures

RANGE OF VARIABLES

types of handle bars include: beams, tubular, clip-on
types of foot rests include: rider, passenger, floor boards, pegs
tools and equipment include: measuring tapes, vernier caliper, hand tools

B-6.05 Services chassis ancillary and accessory components

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
B-6.05.01P	remove and replace ***ancillary*** and ***accessory components***	***ancillary*** and ***accessory components*** are removed and replaced when damage exceeds manufacturers' specifications and jurisdictional safety standards
B-6.05.02P	repair, clean and secure windshield	windshield is repaired, cleaned and secured according to windshield manufacturers' procedures
B-6.05.03P	repair ***ancillary*** and ***accessory components***	***ancillary*** and ***accessory components*** are repaired according to manufacturers' procedures

RANGE OF VARIABLES

ancillary components include: engine guards, centre/side stands, stand spools
accessory components include: saddlebags, foot pegs, windshields, back rests

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
B-6.05.01L	demonstrate knowledge of ***ancillary*** and ***accessory components***	identify ***ancillary*** and ***accessory components***, and describe their characteristics and applications
B-6.05.02L	demonstrate knowledge of procedures to service ***ancillary*** and ***accessory components***	identify hand tools used to service ***ancillary*** and ***accessory components***, and describe their procedures for use
		describe manufacturers' procedures to service ***ancillary*** and ***accessory components***
		describe workplace practices and procedures

RANGE OF VARIABLES

ancillary components include: engine guards, centre/side stands, stand spools
accessory components include: saddlebags, foot pegs, windshields, back rests

TASK B-7 Diagnoses suspension systems

TASK DESCRIPTOR

Motorcycle technicians diagnose suspension systems to detect faults such as wear, misalignment, damage, defects and incorrect settings.

B-7.01 Diagnoses front suspension components

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
B-7.01.01P	determine diagnostic procedure	diagnostic procedure is determined according to defect
B-7.01.02P	identify ***failures***	***failures*** are identified by performing visual inspection and test driving motorcycle
B-7.01.03P	evaluate ***component conditions***	***component conditions*** are evaluated using ***tools and equipment***
B-7.01.04P	determine ***causes of failure***	***causes of failure*** are determined according to interpretation of diagnostic results
B-7.01.05P	determine ***servicing procedures***	***servicing procedures*** are determined according to manufacturers' procedures

RANGE OF VARIABLES

failures include: leaking seals, worn linkage bearings, damaged fork tubes (bent), wear

component conditions include: bent, seized, leaking, binding

tools and equipment include: straightedges, pressure gauges, dial gauges, hand tools, v-blocks, graduated cylinder

causes of failure include: broken or worn bushings, torn or damaged seals, improper maintenance

servicing procedures include: replace fork seals and oil, adjust damping rate, replace springs

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
B-7.01.01L	demonstrate knowledge of ***front suspension systems*** and their ***components***, characteristics, applications and operation	identify ***front suspension systems*** and their ***components***, and describe their characteristics, applications and operation
B-7.01.02L	demonstrate knowledge of procedures to diagnose ***front suspension systems*** and ***components***	identify ***tools and equipment*** used to diagnose ***front suspension systems*** and ***components***, and describe their procedures for use
		describe procedures to inspect ***front suspension systems*** and ***components***
		describe manufacturers' procedures to diagnose ***front suspension systems*** and ***components***
		describe workplace practices and procedures

RANGE OF VARIABLES

front suspension systems include: telescopic (conventional and cartridge), girder, leading link, springer forks

components include: bushings, fork springs, seals, fluid, valves, tubes

tools and equipment include: straightedges, pressure gauges, dial gauges, hand tools, v-blocks, graduated cylinder

B-7.02 Diagnoses front suspension components for three-wheel motorcycles

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
B-7.02.01P	determine diagnostic procedure	diagnostic procedure is determined according to defects
B-7.02.02P	identify ***failures***	***failures*** are identified by performing visual and sensory inspection, and test driving motorcycle
B-7.02.03P	evaluate ***component conditions***	***component conditions*** are evaluated using ***tools and equipment***

B-7.02.04P	determine ***causes of failure***	***causes of failure*** are determined according to interpretation of diagnostic results
B-7.02.05P	determine ***servicing procedure***	***servicing procedure*** is determined according to manufacturers' procedures

RANGE OF VARIABLES

failures include: leaking seals, wear, excessive play, bent, noise
component conditions include: bent, seized, leaking, binding, loose
tools and equipment include: straightedges, hand tools, tape measure, manufacturers' specialty tools
causes of failure include: collision, wear, improper maintenance
servicing procedure is: replace components

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
B-7.02.01L	demonstrate knowledge of front suspension systems for three-wheel motorcycles and their ***components***, characteristics, applications and operation	identify front suspension systems for three-wheel motorcycles and their ***components***, and describe their characteristics, applications and operation
		describe operation of front suspension systems for three-wheel motorcycles
B-7.02.02L	demonstrate knowledge of procedures to diagnose front suspension systems for three-wheel motorcycles and their ***components***	identify ***tools and equipment*** used to diagnose front suspension systems for three-wheel motorcycles and their ***components***, and describe their procedures for use
		describe procedures to inspect front suspension systems for three-wheel motorcycles and their ***components***
		describe manufacturers' procedures to diagnose front suspension systems for three-wheel motorcycles and their ***components***
		describe workplace practices and procedures

RANGE OF VARIABLES

components include: bushings, springs, shocks, knuckle, ball joint, wheel bearing, control arm, stabilizer link, sway bar
tools and equipment include: straightedges, hand tools, tape measure, manufacturers' specialty tools

B-7.03 Diagnoses rear suspension components

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
B-7.03.01P	determine diagnostic procedure	diagnostic procedure is determined according to defects
B-7.03.02P	identify ***failures***	***failures*** are identified by performing sensory inspection, using ***tools and equipment*** and test driving motorcycle
B-7.03.03P	determine ***causes of failure***	***causes of failure*** are determined according to interpretation of diagnostic results
B-7.03.04P	determine ***servicing procedures***	***servicing procedures*** are determined according to manufacturers' procedures

RANGE OF VARIABLES

failures include: worn linkage bearings, damaged springs, leaking seals, wear

tools and equipment include: tape measure, straightedges, sag and dial gauges, nitrogen recharging unit

causes of failure include: broken or worn bearings, improper maintenance

servicing procedures are: service or replace linkage bearings and bushings, recondition shocks

KNOWLEDGE

	Learning Outcomes	Learning Objectives
B-7.03.01L	demonstrate knowledge of ***rear suspension systems*** and their ***components***, characteristics, applications and operation	identify ***rear suspension systems*** and their ***components***, and describe their characteristics and applications
		describe operation of ***rear suspension systems***
		identify ***rear suspension shock absorbers***, and describe their characteristics and applications
		describe operation of ***rear suspension shock absorbers***
B-7.03.02L	demonstrate knowledge of procedures to diagnose ***rear suspension systems*** and ***components***	identify ***tools and equipment*** used to diagnose ***rear suspension systems*** and ***components***, and describe their procedures for use
		describe procedures to inspect ***rear suspension systems*** and ***components***

	describe manufacturers' procedures to diagnose ***rear suspension systems*** and ***components***
	describe workplace practices and procedures

RANGE OF VARIABLES

rear suspension systems include: linkage, direct (single shock, twin shock)

rear suspension system components include: bushings, shafts, swing arms, linkages, shocks, bearings, springs

rear suspension shock absorbers include: gas charged, hydraulic

tools and equipment include: tape measure, straightedges, sag and dial gauges, nitrogen recharging unit

B-7.04 Diagnoses swing arm

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
B-7.04.01P	determine diagnostic procedure	diagnostic procedure is determined according to defect
B-7.04.02P	identify ***failures***	***failures*** are identified by performing sensory inspection and using manufacturers' specifications
B-7.04.03P	determine ***causes of failure***	***causes of failure*** are determined according to interpretation of diagnostic results
B-7.04.04P	determine ***servicing procedures***	***servicing procedures*** are determined according to manufacturers' procedures

RANGE OF VARIABLES

failures include: worn bearings and bushings, physical damage, missing hardware

causes of failure include: broken or worn bearings, improper maintenance, collision

servicing procedures include: replace swing arm, replace components (bearings/bushings, axle and chain guard)

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
B-7.04.01L	demonstrate knowledge of swing arms, their characteristics and applications	identify ***types of swing arms***, and describe their characteristics and applications
		describe swing arm geometry and adjustment
B-7.04.02L	demonstrate knowledge of procedures to diagnose swing arms	identify tools used to diagnose swing arms, and describe their procedures for use
		describe procedures to inspect swing arms
		describe manufacturers' procedures to diagnose swing arms
		describe workplace practices and procedures

RANGE OF VARIABLES

types of swing arms are: single-sided, double-sided

TASK B-8 Services suspension systems

TASK DESCRIPTOR

Motorcycle technicians service suspension systems to resolve issues such as leakage, binding and noise caused by wear, misalignment, damage and defects.

B-8.01 Services front suspension components

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
B-8.01.01P	disassemble and reassemble ***peripheral components***	***peripheral components*** are disassembled and reassembled according to manufacturers' procedures
B-8.01.02P	remove and replace front suspension ***components***	front suspension ***components*** are removed and replaced according to diagnostic results

B-8.01.03P	adjust pre-load and damping	pre-load and damping are adjusted to tailor suspension performance to rider's specifications
B-8.01.04P	determine servicing procedures	servicing procedures are determined according to manufacturers' procedures

RANGE OF VARIABLES

peripheral components include: inner and outer fork tube, fork spring
components include: bushings, seals, fluid

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
B-8.01.01L	demonstrate knowledge of ***front suspension systems*** and their ***components***, characteristics, applications and operation	identify ***front suspension systems***, and their ***components***, and describe their characteristics and applications
		describe operation of ***front suspension systems***
B-8.01.02L	demonstrate knowledge of procedures to service ***front suspension components***	identify ***tools and equipment*** used to service ***front suspension components***, and describe their procedures for use
		describe manufacturers' procedures to service front suspension systems and ***components***
		describe workplace practices and procedures

RANGE OF VARIABLES

front suspension systems include: telescopic (conventional and cartridge), girder, leading link
front suspension components include: bushings, seals, fluid
tools and equipment include: fork seal driver, graduated cylinders, manufacturers' specialty tools

B-8.02 Services front suspension components for three-wheel motorcycles

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
B-8.02.01P	disassemble and reassemble ***peripheral components***	***peripheral components*** are disassembled and reassembled according to manufacturers' procedures
B-8.02.02P	remove and replace ***front suspension components***	***front suspension components*** are removed and replaced according to diagnostic results
B-8.02.03P	adjust pre-load	pre-load is adjusted to tailor suspension performance to rider's weight
B-8.02.04P	test ride motorcycle	motorcycle is test ridden to confirm it performs to expectations
B-8.02.05P	determine ***servicing procedures***	***servicing procedures*** are determined according to manufacturers' procedures

RANGE OF VARIABLES

peripheral components include: fairings, wheels, brakes

front suspension components include: bushings, springs, shocks, knuckle, ball joint, wheel bearing, control arm, stabilizer link, sway bar, seals

servicing procedures are: repair, replace, lubricate, adjust

KNOWLEDGE

	Learning Outcomes	Learning Objectives
B-8.02.01L	demonstrate knowledge of ***front suspension system*** for three-wheel motorcycles and their ***components***, characteristics, applications and operation	identify ***front suspension system*** for three-wheel motorcycles and ***components***, and describe their characteristics and applications
		describe operation ***front suspension system*** for three-wheel motorcycles
B-8.02.02L	demonstrate knowledge of procedures to service ***front suspension system*** for three-wheel motorcycle and their ***components***	identify ***tools and equipment*** used to service ***components*** of front suspension for three-wheel motorcycle, and describe their procedures for use
		describe manufacturers' procedures to service ***front suspension system*** for three-wheel motorcycle and their ***components***
		describe workplace practices and procedures

RANGE OF VARIABLES

front suspension systems include: telescopic (conventional and cartridge), girder, leading link

front suspension components include: bushings, springs, shocks, knuckle, ball joint, wheel bearing, control arm, stabilizer link, sway bar, seals

tools and equipment include: press, hand tools, manufacturers' specialty tools

B-8.03 Services rear suspension components

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
B-8.03.01P	remove and replace rear suspension ***peripheral components***	rear suspension ***peripheral components*** are removed and replaced according to diagnostic results
B-8.03.02P	disassemble and reassemble ***rear suspension system components***	***rear suspension system components*** are disassembled and reassembled according to manufacturers' procedures
B-8.03.03P	rebuild shocks	shocks are rebuilt according to shock manufacturers' specifications and procedures
B-8.03.04P	align axle in swing arm	axle in swing arm is aligned according to manufacturers' procedures
B-8.03.05P	determine ***servicing procedures***	***servicing procedures*** are determined according to manufacturers' procedures

RANGE OF VARIABLES

peripheral components include: wheel, brake, fenders, cables

rear suspension system components include: bushings, shafts, swing arms, linkages, shocks, bearings, springs

servicing procedures are: repair, replace, lubricate, adjust

KNOWLEDGE

	Learning Outcomes	Learning Objectives
B-8.03.01L	demonstrate knowledge of rear suspension systems and their ***components***, characteristics, applications and operation	identify rear suspension systems and their ***components***, and describe their characteristics and applications
		describe operation of rear suspension systems
B-8.03.02L	demonstrate knowledge of procedures to service rear suspension ***components***	identify ***tools and equipment*** used to service rear suspension ***components***, and describe their procedures for use

	describe manufacturers' procedures to service rear suspension systems and ***components***
	describe workplace practices and procedures

RANGE OF VARIABLES

rear suspension system components include: bushings, shafts, swing arms, linkages, shocks, bearings, springs

tools and equipment include: tape measure, straightedges, sag and dial gauges, nitrogen recharging unit

B-8.04 Services swing arm

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
B-8.04.01P	disassemble and reassemble ***peripheral components***	***peripheral components*** are disassembled and reassembled according to manufacturers' procedures
B-8.04.02P	remove and replace swing arms and ***components***	swing arms and ***components*** are removed and replaced according to diagnostic results and manufacturers' procedures
B-8.04.03P	align axle in swing arm	axle in swing arm is aligned according to manufacturers' procedures
B-8.04.04P	determine ***servicing procedures***	***servicing procedures*** are determined according to manufacturers' procedures

RANGE OF VARIABLES

peripheral components include: wheel, brake, fenders, cables

swing arm components include: bearings, bushings, shafts

servicing procedures are: repair, replace, lubricate

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
B-8.04.01L	demonstrate knowledge of swing arms, and their ***components***, characteristics and applications	identify ***types of swing arms***, and their ***components***, and describe their characteristics and applications
B-8.04.02L	demonstrate knowledge of procedures to service ***swing arm components***	identify hand tools used to service ***swing arm components***, and describe their procedures for use
		describe manufacturers' ***servicing procedures*** of ***swing arm components***
		describe workplace practices and procedures

RANGE OF VARIABLES

swing arm components include: bearings, bushings, shafts
types of swing arms include: single-sided, double-sided
servicing procedures are: repair, replace, lubricate

MAJOR WORK ACTIVITY C
Maintains wheels and tires

TASK C-9 Diagnoses wheels and tires

TASK DESCRIPTOR

Motorcycle technicians diagnose wheels and tires to identify problematic conditions and defects. Proper diagnosis is critical for effective repair.

C-9.01 Diagnoses tires

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
C-9.01.01P	determine ***tire conditions***	***tire conditions*** are determined by performing sensory inspection and road test, and using ***precision measuring equipment***
C-9.01.02P	determine ***causes of failure***	***causes of failure*** are determined according to sensory inspection and prior service records
C-9.01.03P	perform ***checks and measurements***	***checks and measurements*** are performed according to manufacturers' specifications
C-9.01.04P	determine ***servicing procedures***	***servicing procedures*** are determined according to jurisdictional safety requirements, and manufacturers' specifications and procedures

RANGE OF VARIABLES

tire conditions include: uneven wear, cracks, delamination, bead sealing, under inflation, separated belts, out-of-round, punctures, age/date code
precision measuring equipment include: tread depth gauge, air pressure gauge
causes of failure include: overloading, over/under inflating, heavy torqueing/braking
checks and measurements include: tread depth, tire pressure, balance, tire manufacturer date code
servicing procedures include: replace tire or tube, balance tire

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
C-9.01.01L	demonstrate knowledge of tires and their ***components***, characteristics and applications	identify ***types of tires***, and describe their characteristics and applications
		identify ***tire components***, and describe their characteristics and applications
		identify ***tire materials***, and describe their characteristics and applications
		identify types of pressure sensors, and describe their characteristics and applications
		identify ***tire inflation media***, and describe their characteristics and applications
		identify and describe ***manufacturers' specifications*** for tires
C-9.01.02L	demonstrate knowledge of procedures to diagnose tires	identify ***precision measuring equipment*** used to diagnose tires, and describe their procedures for use
		describe procedures to inspect tires
		describe procedures to diagnose tires
		describe manufacturers' ***servicing procedures*** for tires
		describe workplace practices and procedures

RANGE OF VARIABLES

tire components include: tube, rim band, rim locks, valve stem
types of tires include: bias ply, bias belted, radial, tube, tubeless, on and off-road
tire materials include: rubber compounds, nylon, aramids
tire inflation media include: air, nitrogen, mousse
manufacturers' specifications include: speed rating, load rating, tire size, recommended pressures
precision measuring equipment include: tread depth gauge, air pressure gauge
servicing procedures include: replace tire or tube, balance tire

C-9.02 Diagnoses spoked wheels

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
C-9.02.01P	determine ***conditions*** of ***wheel components***	***conditions*** are determined by performing sensory inspection
C-9.02.02P	determine radial and lateral run out, and end play	radial and lateral run out, and end play are determined using ***measuring tools and equipment*** according to manufacturers' specifications
C-9.02.03P	determine ***causes of failure***	***causes of failure*** are determined according to sensory inspection and service records
C-9.02.04P	evaluate ***ride quality***	***ride quality*** is evaluated by performing test ride
C-9.02.05P	determine ***servicing procedures***	***servicing procedures*** are determined according to manufacturers' specifications and procedures

RANGE OF VARIABLES

conditions include: worn bearings, cracked or deformed rims, damaged hubs, tire valve, missing and broken spokes

wheel components include: rims, hubs, bearings, spokes, spoke nipples, axles, rim locks, pressure sensors, reluctor, speedometer drive, cush drive, balancing weights

measuring tools and equipment include: dial gauge, truing stand, spoke torque wrench

causes of failure include: impact, lack of maintenance, stress, wear

ride quality includes: stability, vibration, noise, comfort

servicing procedures are: component replacement or repair

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
C-9.02.01L	demonstrate knowledge of spoked wheels and their ***components***, characteristics and applications	identify spoked wheels, and describe their characteristics and applications
		identify ***wheel components***, and describe their characteristics and applications
		identify ***wheel materials***, and describe their characteristics and applications
		describe structures of spoked wheels
C-9.02.02L	demonstrate knowledge of procedures to diagnose spoked wheels	identify tools and equipment used to diagnose spoked wheels, and describe their procedures for use

	describe procedures to inspect spoked wheels
	describe manufacturers' procedures to diagnose spoked wheels
	describe workplace practices and procedures

RANGE OF VARIABLES

wheel components include: rims, hubs, bearings, spokes, spoke nipples, axles, rim locks, pressure sensors, reluctor, speedometer drive, cush drive, balancing weights

wheel materials include: aluminum, steel

C-9.03 Diagnoses one-piece wheels

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
C-9.03.01P	determine ***conditions*** of one-piece wheels	***conditions*** are determined by performing sensory inspection
C-9.03.02P	determine radial and lateral run out, and end play	radial and lateral run out, and end play are determined by using ***measuring tools and equipment***
C-9.03.03P	determine ***causes of failure***	***causes of failure*** are determined according to sensory inspection and prior service records
C-9.03.04P	evaluate ***ride quality***	***ride quality*** is evaluated by performing test ride
C-9.03.05P	determine ***servicing procedures***	***servicing procedures*** are determined according to manufacturers' specifications and procedures

RANGE OF VARIABLES

conditions include: worn bearings, cracked, blistered and deformed rims, damaged hub, damaged tire valve, chipped or cracked paint

measuring tools and equipment include: dial gauge, truing stand

causes of failure include: impact, lack of maintenance, stress, wear, corrosion

ride quality includes: stability, vibration, noise, comfort

servicing procedures are: component replacement or repair

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
C-9.03.01L	demonstrate knowledge of one-piece wheels and their ***components***, characteristics and applications	identify ***types of one-piece wheels***, and describe their characteristics and applications
		identify ***wheel components***, and describe their characteristics and applications
		identify materials for one-piece wheels, and describe their characteristics and applications
C-9.03.02L	demonstrate knowledge of procedures to diagnose one-piece wheels	identify tools and equipment used to diagnose one-piece wheels, and describe their procedures for use
		describe procedures to inspect one-piece wheels
		describe procedures to diagnose one-piece wheels
		describe manufacturers' ***servicing procedures*** for one-piece wheels
		describe workplace practices and procedures

RANGE OF VARIABLES

types of one-piece wheels include: cast, forged, composites, aluminum, magnesium

wheel components include: bearings, spacers, speedometer drive, cush drive, pressure sensors, reluctor, balancing weights, axles

servicing procedures are: component replacement or repair

C-9.04 Diagnoses multi-piece wheels

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
C-9.04.01P	determine ***conditions*** of multi-piece wheels	***conditions*** are determined by performing sensory inspection
C-9.04.02P	determine radial and lateral run out, and end play	radial and lateral run out, and end play are determined by using ***measuring tools and equipment***
C-9.04.03P	evaluate ***wheel component*** condition	***wheel component*** condition is evaluated to determine if it can be serviced

C-9.04.04P	determine ***causes of failure***	***causes of failure*** are determined according to sensory inspection and prior service records
C-9.04.05P	evaluate ***ride quality***	***ride quality*** is evaluated by performing test ride
C-9.04.06P	determine ***servicing procedures***	***servicing procedures*** are determined according to manufacturers' specifications and procedures

RANGE OF VARIABLES

conditions include: worn bearings, cracked, blistered and deformed rims, damaged hub, damaged tire valve, chipped or cracked paint

measuring tools and equipment include: dial gauge, truing stand

wheel components include: bearings, fasteners, rims, hubs, seals, O-rings, valve, sensors (speed pressure) speedometer drive, cush drive

causes of failure include: deterioration of O-ring, impact, lack of maintenance, stress

ride quality includes: stability, vibration, noise, comfort

servicing procedures are: wheel component replacement or repair

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
C-9.04.01L	demonstrate knowledge of multi-piece wheels and their ***components***, characteristics and applications	identify ***types of multi-piece wheels***, and describe their characteristics and applications
		identify ***wheel components***, and describe their characteristics and applications
C-9.04.02L	demonstrate knowledge of procedures to diagnose multi-piece wheels	identify tools and equipment used to diagnose multi-piece wheels, and describe their procedures for use
		describe procedures to inspect multi-piece wheels
		describe procedures to diagnose multi-piece wheels
		describe manufacturers' ***servicing procedures*** for multi-piece wheels
		describe workplace practices and procedures

RANGE OF VARIABLES

wheel components include: bearings, fasteners, rims, hubs, seals, O-rings, valve, sensors (speed pressure) speedometer drive, cush drive

types of multi-piece wheels are: stamped steel (riveted, bolted)

servicing procedures are: wheel component replacement or repair

TASK C-10 Services wheels and tires

TASK DESCRIPTOR

Motorcycle technicians service wheels and tires to correct problematic conditions and defects. Proper service is critical.

C-10.01 Services tires

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
C-10.01.01P	remove and reinstall/replace ***tire components***	***tire components*** are removed and reinstalled/replaced according to ***manufacturers' specifications*** and AHJ regulations
C-10.01.02P	***repair*** tires	tires are ***repaired*** according to product manufacturers' procedures and recommendations
C-10.01.03P	select tire	tire is selected according to ***type of tire*** and ***manufacturers' specifications***

RANGE OF VARIABLES

tire components include: tube, rim band, rim locks
manufacturers' specifications include: speed rating, load rating, tire size, recommended pressures
repair includes: plugging, patching
types of tires include: bias ply, bias belted, radial, tube, tubeless

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
C-10.01.01L	demonstrate knowledge of tires and their ***components***, characteristics and applications	identify ***types of tires***, and describe their characteristics and applications
		identify ***tire components***, and describe their characteristics and applications
		identify ***tire materials***, and describe their characteristics and applications
		identify types of pressure sensors, and describe their characteristics and applications

		identify ***tire inflation media***, and describe their characteristics and applications
		identify and describe ***manufacturers' specifications*** for tires
		identify types and operation of mounting and balancing equipment
C-10.01.02L	demonstrate knowledge of procedures to service tires	identify ***tools and equipment*** used to service tires, and describe their procedures for use
		describe manufacturers' ***servicing procedures*** for tires
		describe workplace practices and procedures

RANGE OF VARIABLES

tire components include: tube, rim band, rim locks
types of tires include: bias ply, bias belted, radial, tube, tubeless
tire materials include: rubber compounds, nylon, aramids
tire inflation media include: air, nitrogen, mousse
manufacturers' specifications include: speed rating, load rating, tire size, recommended pressures
tools and equipment include: tire machine, tire irons, rim protectors, pressure gauges, air compressors, balancing machine
servicing procedures include: replace tire or tube, balance tire, repair tire

C-10.02 Services spoked wheels

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
C-10.02.01P	access wheels	wheels are accessed by removing and reinstalling ***wheel components*** according to manufacturers' specifications
C-10.02.02P	remove, and repair or replace ***wheel components***	***wheel components*** are removed, and repaired or replaced according to manufacturers' specifications

C-10.02.03P	adjust lateral and radial run-out, and offset	lateral and radial run-out, and offset are adjusted according to manufacturers' specifications
C-10.02.04P	***service wheel components***	***wheel components*** are ***serviced*** according to manufacturers' specifications, and workplace practices and procedures

RANGE OF VARIABLES

wheel components include: rims, hubs, bearings, spokes, spoke nipples, axles, rim locks, pressure sensors, reluctor, speedometer drive, cush drive, balancing weights

servicing procedures include: lubricate, replace, clean, align

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
C-10.02.01L	demonstrate knowledge of spoked wheels and their ***components***, characteristics and applications	identify spoked wheels, and describe their characteristics and applications
		identify ***wheel components***, and describe their characteristics and applications
		identify ***wheel materials***, and describe their characteristics and applications
		describe structures of spoked wheels
C-10.02.02L	demonstrate knowledge of procedures to service spoked wheels	identify tools and equipment used to service spoked wheels, and describe their procedures for use
		describe manufacturers' ***servicing procedures*** for spoked wheels
		describe workplace practices and procedures

RANGE OF VARIABLES

wheel components include: rims, hubs, bearings, spokes, spoke nipples, axles, rim locks, pressure sensors, reluctor, speedometer drive, cush drive, balancing weights

wheel materials include: aluminum, steel

servicing procedures include: lubricate, replace, clean, align

C-10.03 Services one-piece wheels

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
C-10.03.01P	access wheels	wheels are accessed by removing and reinstalling ***wheel components*** according to manufacturers' specifications
C-10.03.02P	remove, and repair or replace ***wheel components***	***wheel components*** are removed, and repaired or replaced to restore tolerance according to manufacturers' specifications
C-10.03.03P	service ***wheel components***	***wheel components*** are serviced using ***servicing procedures*** according to manufacturers' specifications

RANGE OF VARIABLES

wheel components include: bearings, spacers, speedometer drive, cush drive, pressure sensors, reluctor, balancing weights, axles

servicing procedures are: lubricate, replace, align

KNOWLEDGE

	Learning Outcomes	Learning Objectives
C-10.03.01L	demonstrate knowledge of one-piece wheels, their characteristics and applications	identify ***types of one-piece wheels***, and describe their characteristics and applications
		identify ***wheel components***, and describe their characteristics and applications
C-10.03.02L	demonstrate knowledge of procedures to service one-piece wheels	identify tools and equipment used to service one-piece wheels, and describe their procedures for use
		describe manufacturers' ***servicing procedures*** for one-piece wheels
		describe workplace practices and procedures

RANGE OF VARIABLES

types of one-piece wheels include: cast, forged, composites

wheel components include: bearings, spacers, speedometer drive, cush drive, pressure sensors, reluctor, balancing weights, axles

servicing procedures are: lubricate, replace, align

C-10.04 Services multi-piece wheels

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
C-10.04.01P	access wheels	wheels are accessed by removing and reinstalling ***wheel components*** according to manufacturers' specifications
C-10.04.02P	remove, and repair or replace ***wheel components***	***wheel components*** are removed, and repaired or replaced to restore tolerance according to manufacturers' specifications
C-10.04.03P	service ***wheel components***	***wheel components*** are serviced using ***servicing procedures*** according to manufacturers' specifications
C-10.04.04P	inspect rim assembly	rim assembly is inspected to verify structural integrity

RANGE OF VARIABLES

wheel components include: bearings, fasteners, rims, hubs, seals, O-rings, valve, pressure sensors***,*** reluctor***,*** speedometer drive, cush drive, axles

servicing procedures are: lubrication, replacement, alignment

KNOWLEDGE

	Learning Outcomes	Learning Objectives
C-10.04.01L	demonstrate knowledge of multi-piece wheels and their ***components***, characteristics and applications	identify ***types of multi-piece wheels***, and describe their characteristics and applications
		identify ***wheel components***, and describe their characteristics and applications
C-10.04.02L	demonstrate knowledge of procedures to service multi-piece wheels	identify tools and equipment used to service multi-piece wheels, and describe their procedures for use
		describe manufacturers' ***servicing procedures*** for multi-piece wheels
		describe workplace practices and procedures

RANGE OF VARIABLES

types of multi-piece wheels include**:** stamped (riveted, bolted)

wheel components include: bearings, fasteners, rims, hubs, seals, O-rings, valve, pressure sensors***,*** reluctor***,*** speedometer drive, cush drive, axles

servicing procedures are: lubrication, replacement, alignment

MAJOR WORK ACTIVITY D
Maintains brakes

TASK D-11 Diagnoses braking systems

TASK DESCRIPTOR
Motorcycle technicians diagnose braking systems to ensure proper function of braking components.

D-11.01 Diagnoses hydraulic braking systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
D-11.01.01P	determine condition of ***hydraulic brake system components***	***hydraulic brake system component*** conditions are determined by performing sensory inspection
D-11.01.02P	perform ***checks and measurements***	***checks and measurements*** are performed according to manufacturers' specifications using ***tools and equipment***
D-11.01.03P	inspect levers and pivots	levers and pivots are inspected to ensure freedom of movement
D-11.01.04P	determine ***causes of failure***	***causes of failure*** are determined according to sensory inspections, checks, measurements, and prior service records
D-11.01.05P	determine ***servicing procedures***	***servicing procedures*** are determined according to manufacturers' specifications and procedures

RANGE OF VARIABLES
hydraulic braking system components include: master cylinders, actuating lever/pedal, hoses, lines calipers, wheel cylinder, linkages, springs, rotors, drums, linings, sensors, switches, brake fluid
checks and measurements include: run-out, thickness, diameter
tools and equipment include: dial indicator, caliper, brake fluid tester
causes of failure include: contaminants, wear, leakage, seizing
servicing procedures are: replace component, repair

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
D-11.01.01L	demonstrate knowledge of hydraulic braking system and their ***components***, characteristics and applications	identify ***types of hydraulic braking systems***, and describe their characteristics and applications
		identify ***hydraulic braking system components***, and describe their characteristics and applications
		identify types of brake fluids, and describe their characteristics and applications
		identify ***pad composition***, and describe their characteristics and applications
D-11.01.02L	demonstrate knowledge of procedures to diagnose hydraulic braking systems	identify ***tools and equipment*** used to diagnose hydraulic braking systems, and describe their procedures for use
		describe procedures to inspect hydraulic braking systems
		describe manufacturers' procedures to diagnose hydraulic braking systems
		describe workplace practices and procedures

RANGE OF VARIABLES

types of hydraulic braking systems include: disc, drum, linked, ABS
hydraulic braking system components include: master cylinders, actuating lever/pedal, hoses, lines calipers, wheel cylinder, linkages, springs, rotors, drums, linings, sensors, switches, brake fluid
pad composition includes: organic, metal, sintered, ceramic, carbon fibre
tools and equipment include: dial indicator, caliper, brake fluid tester

D-11.02 Diagnoses mechanical braking systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
D-11.02.01P	determine condition of ***mechanical brake system components***	***mechanical brake system components*** conditions are determined by performing sensory inspection
D-11.02.02P	perform ***checks and measurements***	***checks and measurements*** are performed according to manufacturers' specifications using ***tools and equipment***

D-11.02.03P	inspect levers, pivots and cables	levers, pivots and cables are inspected to ensure freedom of movement
D-11.02.04P	determine ***causes of failure***	***causes of failure*** are determined according to sensory inspections, checks and measurements, and prior service records
D-11.02.05P	determine ***servicing procedures***	***servicing procedures*** are determined according to manufacturers' specifications and procedures

RANGE OF VARIABLES

mechanical braking system components include: actuating lever/pedal, calipers, linkages, springs, rotors, drums, linings, cables

checks and measurements include: run-out, thickness, diameter

tools and equipment include: dial indicator, vernier caliper, hand tools

causes of failure include: contaminants, wear, seizing

servicing procedures are: replace component, repair, adjust

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
D-11.02.01L	demonstrate knowledge of mechanical braking systems and their ***components***, characteristics and applications	identify ***types of mechanical braking systems***, and describe their characteristics and applications
		identify ***mechanical braking system components***, and describe their characteristics and applications
		identify ***pad compositions***, and describe their characteristics and applications
D-11.02.02L	demonstrate knowledge of procedures to diagnose mechanical braking systems	identify ***tools and equipment*** used to diagnose mechanical braking systems, and describe their procedures for use
		describe procedures to inspect mechanical braking systems
		describe manufacturers' procedures to diagnose mechanical braking systems
		describe workplace practices and procedures

RANGE OF VARIABLES

mechanical braking system components include: actuating lever/pedal, calipers, linkages, springs, rotors, drums, linings, cables

types of mechanical braking systems include: disc, drum, parking brake

pad compositions include: organic, metal, sintered, ceramic, carbon fibre

tools and equipment include: dial indicator, vernier caliper, hand tools

D-11.03 Diagnoses braking control systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
D-11.03.01P	determine condition of ***braking control system components***	***braking control system component*** conditions are determined by performing sensory inspections and using diagnostic tools
D-11.03.02P	perform ***checks and measurements***	***checks and measurements*** are performed according to manufacturers' specifications using ***tools and equipment***
D-11.03.03P	determine ***causes of failure***	***causes of failure*** are determined according to sensory inspections, checks and measurements, and prior service records
D-11.03.04P	determine ***servicing procedure***	***servicing procedures*** are determined according to manufacturers' specifications and procedures

RANGE OF VARIABLES

braking control system components include: pumps, electronic control unit (ECU), sensors, valves, wiring

checks and measurements include: system function check, air gap check, resistance, continuity

tools and equipment include: scan tool, multimeter, feeler gauge, peak volt adaptor

causes of failure include: contamination, corrosion, damage

servicing procedures are: replace component, repair

KNOWLEDGE

	Learning Outcomes	Learning Objectives
D-11.03.01L	demonstrate knowledge of braking control system and their ***components***, characteristics and applications	identify ***types of braking control systems***, and describe their characteristics and applications
		identify ***braking control system components***, and describe their characteristics and applications
D-11.03.02L	demonstrate knowledge of procedures to diagnose braking control systems	identify ***tools and equipment*** used to diagnose braking control systems, and describe their procedures for use
		describe procedures to inspect braking control systems
		describe procedures to diagnose braking control systems

	describe manufacturers' ***servicing procedures*** for braking control systems
	describe workplace practices and procedures

RANGE OF VARIABLES

braking control system components include: pumps, electronic control unit (ECU), sensors, valves, wiring
types of braking control systems include: linked (integrated), anti-lock braking (ABS)
tools and equipment include: scan tool, multimeter, feeler gauge, peak volt adaptor
servicing procedures are: replace component, repair

TASK D-12 Services braking systems

TASK DESCRIPTOR

Motorcycle technicians service braking systems to restore proper function of braking components.

D-12.01 Services hydraulic braking systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
D-12.01.01P	remove and install ***hydraulic braking system components***	***hydraulic braking system components*** are removed and installed according to manufacturers' specifications
D-12.01.02P	repair, recondition or replace ***hydraulic braking system components***	***hydraulic braking system components*** are repaired, reconditioned or replaced using ***tools and equipment*** according to manufacturers' specifications and procedures
D-12.01.03P	eliminate contaminants and air from system	contaminants and air are removed from hydraulic braking system by using ***tools and equipment*** to flush and bleed according to manufacturers' specifications and procedures

RANGE OF VARIABLES

hydraulic braking system components include: master cylinders, actuating lever/pedal, hoses, lines, brake fluid, calipers, wheel cylinder, linkages, springs, rotors, drums, linings, sensors, switches

tools and equipment include: vacuum pump, diagnostic software, hand tools

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
D-12.01.01L	demonstrate knowledge of hydraulic braking systems and their ***components***, characteristics and applications	identify ***types of hydraulic braking systems***, and describe their characteristics and applications
		identify ***hydraulic braking system components***, and describe their characteristics and applications
		identify types of brake fluids, and describe their characteristics and applications
		identify ***pad compositions***, and describe their characteristics and applications
		describe procedures for safe handling of brake fluid
D-12.01.02L	demonstrate knowledge of procedures to service hydraulic braking systems	identify ***tools and equipment*** used to service hydraulic braking systems, and describe their procedures for use
		describe manufacturers' ***servicing procedures*** for hydraulic braking systems
		describe workplace practices and procedures

RANGE OF VARIABLES

types of hydraulic braking systems include: disc, drum, linked, ABS

hydraulic braking system components include: master cylinders, actuating lever/pedal, hoses, lines, brake fluid, calipers, wheel cylinder, linkages, springs, rotors, drums, linings, sensors, switches

pad compositions include: organic, metal, sintered, ceramic, carbon fibre

tools and equipment include: vacuum pump, diagnostic software, hand tools

servicing procedures include: repair component, recondition, replace

D-12.02 Services mechanical braking systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
D-12.02.01P	remove and install ***mechanical braking system components***	***mechanical braking system components*** are removed and installed according to manufacturers' specifications
D-12.02.02P	repair, recondition or replace ***mechanical braking system components***	***mechanical braking system components*** are repaired, reconditioned or replaced using ***tools and equipment*** according to manufacturers' specifications and procedures

RANGE OF VARIABLES

mechanical braking system components include: actuating lever/pedal, calipers, linkages, springs, rotors, drums, linings, cables

tools and equipment include: cable luber, hand tools

KNOWLEDGE

	Learning Outcomes	Learning Objectives
D-12.02.01L	demonstrate knowledge of mechanical braking systems and their ***components***, characteristics and applications	identify ***types of mechanical braking systems***, and describe their characteristics and applications
		identify ***mechanical braking system components***, and describe their characteristics and applications
		identify ***pad composition*** and describe their characteristics and applications
D-12.02.02L	demonstrate knowledge of procedures to service mechanical braking systems	identify ***tools and equipment*** used to service mechanical braking systems, and describe their procedures for use
		describe manufacturers' ***servicing procedures*** for mechanical braking systems
		describe workplace practices and procedures

RANGE OF VARIABLES

mechanical braking system components include: actuating lever/pedal, calipers, linkages, springs, rotors, drums, linings, cables

types of mechanical braking systems include: disc, drum, parking brake

pad composition includes: organic, metal, sintered, ceramic

tools and equipment include: cable luber, hand tools

servicing procedures are: repair component, recondition, replace

D-12.03 Services braking control systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
D-12.03.01P	remove and install ***braking control system components***	***braking control system components*** are removed and installed according to manufacturers' specifications
D-12.03.02P	repair or replace ***braking control system components***	***braking control system components*** are repaired or replaced using ***tools and equipment*** according to manufacturers' specifications and procedures

RANGE OF VARIABLES

braking control system components include: pumps, ECU, sensors, reluctor, valves, wiring

tools and equipment include: diagnostic software, multimeter, peak volt adaptor

KNOWLEDGE

	Learning Outcomes	Learning Objectives
D-12.03.01L	demonstrate knowledge of braking control systems and their ***components***, characteristics and applications	identify ***types of braking control systems***, and describe their characteristics and applications
		identify ***braking control system components***, and describe their characteristics and applications
D-12.03.02L	demonstrate knowledge of procedures to service braking control systems	identify ***tools and equipment*** used to service braking control systems, and describe their procedures for use
		describe manufacturers' ***servicing procedures*** for braking control systems
		describe workplace practices and procedures

RANGE OF VARIABLES

types of braking control systems include: linked (integrated), ABS
braking control system components include: pumps, ECU, sensors, reluctor, valves, wiring
tools and equipment include: diagnostic software, multimeter, peak volt adaptor
servicing procedures are: replace component, repair, adjustd

MAJOR WORK ACTIVITY E

Maintains engines

TASK E-13 Diagnoses two-stroke and four-stroke engines

TASK DESCRIPTOR

Motorcycle technicians diagnose problems in two-stroke and four-stroke engines. They are required to have a comprehensive knowledge of engine components and their operation to diagnose failures.

E-13.01 Diagnoses cylinder heads

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
E-13.01.01P	verify fault and ***failure conditions***	cylinder heads are inspected to determine faults and ***failure conditions*** by performing ***sensory inspections*** and using ***measuring tools***
E-13.01.02P	evaluate two-stroke cylinder heads	two-stroke cylinder heads are evaluated according to manufacturers' specifications for ***failure conditions*** by performing ***sensory inspections*** and using ***measuring tools***
E-13.01.03P	evaluate four-stroke cylinder heads	four-stroke cylinder heads are evaluated according to manufacturers' specifications for ***failure conditions*** by performing ***sensory inspections*** and using ***measuring tools***
E-13.01.04P	determine ***causes of wear or failure***	***causes of wear or failure*** of cylinder head are determined according to interpretation of diagnostic results
E-13.01.05P	determine ***servicing procedures***	***servicing procedures*** are determined according to manufacturers' specifications

RANGE OF VARIABLES

failure conditions (two-stroke cylinder heads) include: cracking, warpage, leaks, carbon build-up, broken fasteners, failed gaskets, foreign object damage

failure conditions (four-stroke cylinder heads) include: weak valve spring, warpage, valve guide and seat wear, valve sealing, foreign object damage

sensory inspections include: listening for noises, feeling for vibrations, observing for wear and damage

measuring tools include: surface plates, dyes, pressure and bore gauges

causes of wear or failure include: insufficient lubrication, overheating

servicing procedures include: resurface, replace

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
E-13.01.01L	demonstrate knowledge of cylinder heads, and their ***components***, characteristics, applications and operation	identify ***types of cylinder heads***, and describe their characteristics and applications
		identify ***cylinder head components***, and describe their characteristics and applications
		describe cylinder head operation
E-13.01.02L	demonstrate knowledge of procedures to diagnose cylinder heads	identify ***measuring tools*** used to diagnose cylinder heads, and describe their procedures for use
		describe procedures to inspect cylinder heads
		describe procedures to diagnose cylinder heads
		describe manufacturers' ***servicing procedures*** for cylinder heads
		describe workplace practices and procedures

RANGE OF VARIABLES

cylinder head components include: valves, guides, decompressor, seals, fasteners

types of cylinder heads include: air or liquid cooled, single or multi-valve

measuring tools include: surface plates, dyes, pressure and bore gauges

servicing procedures include: resurface, replace

E-13.02 Diagnoses valve systems on two-stroke engine

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
E-13.02.01P	verify fault and ***failure conditions***	valve system is inspected for faults and ***failure conditions*** by performing ***sensory inspections*** and using ***measuring tools***
E-13.02.02P	evaluate ***failure conditions***	***failure conditions*** are evaluated by disassembling valve system
E-13.02.03P	determine ***causes of wear or failure*** of valve system	***causes of wear or failure*** of valve system is determined according to interpretation of diagnostic results
E-13.02.04P	determine ***servicing procedures***	***servicing procedures*** are determined according to manufacturers' specifications

RANGE OF VARIABLES

failure conditions (two-stroke engine valve) include: cracking, warpage, leaks, carbon build-up, broken fasteners, failed gaskets, foreign object damage

sensory inspections include: listening for noises, feeling for vibrations, observing for wear and damage

measuring tools include: surface plates, dyes, pressure and bore gauges

causes of wear or failure include: excessive lubricant, insufficient lubricant, over-rev

servicing procedures are: clean, replace, adjust

KNOWLEDGE

	Learning Outcomes	Learning Objectives
E-13.02.01L	demonstrate knowledge of valve systems on two-stroke engines and their components, characteristics, applications and operation	identify ***types of two-stroke valve systems***, and describe their characteristics and applications
		describe two-stroke valve system operation
E-13.02.02L	demonstrate knowledge of procedures to diagnose valve systems on two-stroke engines	identify tools and equipment used to diagnose valve systems on two-stroke engines, and describe their procedures for use
		describe procedures to inspect valve systems on two-stroke engines
		describe procedures to diagnose valve systems on two-stroke engines

	describe manufacturers' ***servicing procedures*** for valve systems on two-stroke engines
	describe workplace practices and procedures

RANGE OF VARIABLES

types of two-stroke valve systems include: reed valves, rotary valve, piston port, power valve actuators
servicing procedures are: clean, replace, adjust

E-13.03 Diagnoses valve train on four-stroke engine

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
E-13.03.01P	verify fault and ***failure conditions***	valve train is inspected for faults and ***failure conditions*** by performing ***sensory inspections*** and using ***measuring tools***
E-13.03.02P	confirm ***function***	***function*** is confirmed by checking valve train
E-13.03.03P	evaluate ***failure conditions***	***failure conditions*** are evaluated by disassembling valve train
E-13.03.04P	determine ***causes of wear or failure*** of valve train	***causes of wear or failure*** of valve train are determined according to interpretation of diagnostic results
E-13.03.05P	determine ***servicing procedures***	***servicing procedures are*** determined according to manufacturers' specifications and procedures

RANGE OF VARIABLES

failure conditions include: wear or failure of tensioners, valve stems, lifters
sensory inspections include: listening for noises, feeling for vibrations, observing for wear and damage
measuring tools include: surface plates, dyes, pressure and bore gauges
function includes: valve timing, valve lash, cam lobe wear
causes of wear or failure include: insufficient lubricant, overheating, over-rev
servicing procedures include: replace tensioner, chain, guide, valve and lifter

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
E-13.03.01L	demonstrate knowledge of valve train on four-stroke engines and their ***components***, characteristics, applications and operation	identify valve train on four-stroke engines, and describe their characteristics and applications
		identify ***four-stroke valve train components***, and describe their characteristics and applications
		describe four-stroke valve train operation
E-13.03.02L	demonstrate knowledge of procedures to diagnose valve train on four-stroke engines	identify tools and equipment used to diagnose valve train on four-stroke engines, and describe their procedures for use
		describe procedures to inspect valve train on four-stroke engines
		describe procedures to diagnose valve train on four-stroke engines
		describe manufacturers' ***servicing procedures*** for valve train on four-stroke engines
		describe workplace practices and procedures

RANGE OF VARIABLES

four-stroke valve train components include: valves, gears, cams, rockers, chains, belts
servicing procedures include: replace tensioner, chain, guide, valve and lifter

E-13.04 Diagnoses cylinders and pistons

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
E-13.04.01P	verify fault and ***failure conditions***	cylinders and pistons are inspected for faults and ***failure conditions*** by performing ***sensory inspections*** and using ***measuring tools***
E-13.04.02P	verify integrity of sealing	integrity of sealing is verified by checking piston, piston rings and cylinder using ***measuring tools***

E-13.04.03P	measure piston and cylinder wall clearance	piston and cylinder wall clearance is measured by disassembling cylinder and piston
E-13.04.04P	determine ***causes of wear or failure*** of piston, cylinder or rings	***causes of wear or failure*** of piston, cylinder or rings are determined according to interpretation of diagnostic results
E-13.04.05P	determine ***servicing procedures***	***servicing procedures*** are determined according to manufacturers' specifications

RANGE OF VARIABLES

failure conditions include: ring wear, piston cracking, detonation
sensory inspections include: looking for excessive smoke from exhaust, listening for noises, feeling for vibrations, observing for excessive wear and lack of power
measuring tools include: surface plates, dyes, pressure and bore gauges
causes of wear or failure include: insufficient air filtration, insufficient lubricant, overheating
servicing procedures include: bore, hone, re-plate, replace

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
E-13.04.01L	demonstrate knowledge of cylinders and ***pistons components***, and their characteristics, applications and operation	identify cylinders and ***piston components***, and describe their characteristics and applications
		identify ***types of cylinder materials***, and describe their characteristics and applications
		identify ***types of pistons***, and describe their characteristics and applications
		describe cylinder and piston operation
E-13.04.02L	demonstrate knowledge of procedures to diagnose cylinders and pistons	identify tools and equipment used to diagnose cylinders and pistons, and describe their procedures for use
		describe procedures to inspect cylinders and pistons
		describe procedures to diagnose cylinders and pistons
		describe manufacturers' ***servicing procedures*** for cylinders and pistons
		describe workplace practices and procedures

RANGE OF VARIABLES

piston components include: wrist pins, circlips, rings
types of cylinder materials include: cast iron, plated, aluminum, composite
types of pistons include: cast, forged
servicing procedures include: bore, hone, re-plate, replace

E-13.05 Diagnoses crankshaft assembly

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
E-13.05.01P	verify fault and ***failure conditions***	crankshaft assembly is inspected for fault and ***failure conditions*** by performing ***sensory inspections*** and using ***measuring and diagnostic tools***
E-13.05.02P	evaluate ***failure conditions***	***failure conditions*** are evaluated by checking crankshaft assembly using ***measuring and diagnostic tools***
E-13.05.03P	determine ***causes of abnormal wear or failure***	***causes of abnormal wear or failure*** of crankshaft are determined according to interpretation of diagnostic results
E-13.05.04P	determine ***servicing procedures***	***servicing procedures*** are determined according to manufacturers' specifications

RANGE OF VARIABLES

failure conditions include: bearing wear, run-out, twisting, out-of-phase
sensory inspections include: listening for noises, feeling for vibrations
measuring and diagnostic tools include: v-blocks, micrometers, plastigage, dial indicators, stethoscopes, feeler gauge
causes of abnormal wear or failure include: insufficient lubricant, over-rev, overheating, detonation
servicing procedures include: re-build, replace

KNOWLEDGE

	Learning Outcomes	Learning Objectives
E-13.05.01L	demonstrate knowledge of ***crankshaft assembly*** and their ***components***, characteristics, applications and operation	identify types of ***crankshaft assemblies***, and describe their characteristics and applications
		identify ***crankshaft components***, and describe their characteristics and applications
		describe crankshaft operation
E-13.05.02L	demonstrate knowledge of procedures to diagnose ***crankshaft assembly***	identify ***measuring and diagnostic tools*** used to diagnose crankshaft assembly, and describe their procedures for use
		describe procedures to inspect ***crankshaft assembly***
		describe procedures to diagnose ***crankshaft assembly***

	describe manufacturers' ***servicing procedures*** for ***crankshaft assembly***
	describe workplace practices and procedures

RANGE OF VARIABLES

crankshaft assemblies include: roller, plain bearing, single and multi-cylinder, forged, pressed

crankshaft components include: connecting rods, labyrinth seals, flywheels, thrust washers, wrist pin bearings

measuring and diagnostic tools include: v-blocks, micrometers, plastigage, dial indicators, stethoscopes, feeler gauge

servicing procedures include: re-build, replace

E-13.06 Diagnoses counterbalance assemblies

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
E-13.06.01P	verify fault and ***failure conditions***	counterbalance assemblies are inspected for fault and ***failure conditions*** by performing ***sensory inspections*** and using ***measuring and diagnostic tools***
E-13.06.02P	evaluate ***failure conditions***	***failure conditions*** are evaluated by checking counterbalance assemblies using ***measuring and diagnostic tools***
E-13.06.03P	determine ***causes of wear or failure***	***causes of wear or failure*** of counterbalance assemblies are determined according to interpretation of diagnostic results
E-13.06.04P	determine ***servicing procedures***	***servicing procedures*** are determined according to manufacturers' specifications and procedures

RANGE OF VARIABLES

failure conditions include: run-out, out-of-time, excessive bearing clearance

sensory inspections include: listening for noises, feeling for vibrations, looking for signs of abnormal wear

measuring and diagnostic tools include: dial indicators, stethoscopes, v-blocks, micrometers, plastigage

causes of wear or failure include: insufficient lubricant, chain wear, chain tension

servicing procedures are: re-time, replace, adjust balancer

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
E-13.06.01L	demonstrate knowledge of ***counterbalance assemblies*** and their components, characteristics, applications and operation	identify *types of* ***counterbalance assemblies***, and describe their characteristics and applications
		identify counterbalance components, and describe their characteristics and applications
		describe counterbalance operation
E-13.06.02L	demonstrate knowledge of procedures to diagnose ***counterbalance assemblies***	identify ***measuring and diagnostic tools*** to diagnose **counterbalance assemblies**, and describe their procedures for use
		describe procedures to diagnose ***counterbalance assemblies***
		describe manufacturers' ***servicing procedures*** for counterbalance assemblies
		describe workplace practices and procedures

RANGE OF VARIABLES

counterbalance assemblies include: gear or chain driven, bearings, single or multi-counterweights

measuring and diagnostic tools include: dial indicators, stethoscopes, v-blocks, micrometers, plastigage

servicing procedures are: re-time, replace, adjust balancer

E-13.07 Diagnoses engine cases

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
E-13.07.01P	inspect engine cases	engine cases are inspected for ***failure conditions*** by performing ***sensory inspections***
E-13.07.02P	inspect for ***failure conditions***	***failure conditions*** are inspected by checking engine cases using ***measuring and diagnostic tools***
E-13.07.03P	check crankcase sealing	crankcase sealing is checked by using ***measuring and diagnostic tools***

E-13.07.04P	determine ***causes of failure*** of engine cases	***causes of failure*** of engine cases are determined according to interpretation of diagnostic results
E-13.07.05P	determine ***servicing procedures***	***servicing procedures*** are determined according to manufacturers' specifications and procedures

RANGE OF VARIABLES

failure conditions include: warping, cracking, structural integrity, excessive bearing clearance

sensory inspections include: listening for noises, feeling for vibrations, observing for oil leaks, cracks, loose or broken fasteners

measuring and diagnostic tools include: surface plates, dyes, sealing plugs, gauges (pressure, bore, vacuum)

causes of failure include: insufficient lubricant, overheating, incorrect fastener torque

servicing procedures are: replace thread, weld, replace engine case

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
E-13.07.01L	demonstrate knowledge of engine cases and their ***components***, characteristics and applications	identify ***types of engine cases***, and describe their characteristics and applications
		identify ***engine case components***, and describe their characteristics and applications
		describe engine case function
E-13.07.02L	demonstrate knowledge of procedures to diagnose engine cases	identify ***measuring and diagnostic tools*** to diagnose engine cases, and describe their procedures for use
		describe procedures to inspect engine cases
		describe procedures to diagnose engine cases
		describe manufacturers' ***servicing procedures*** for engine cases
		describe workplace practices and procedures

RANGE OF VARIABLES

types of engine cases include: single or multi-cylinder, vertical or horizontal split

engine case components include: bearing bosses, covers, case seals, fasteners

measuring and diagnostic tools include: surface plates, dyes, sealing plugs, gauges (pressure, bore, vacuum)

servicing procedures are: replace thread, weld, replace engine case

E-13.08 Diagnoses lubrication system

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
E-13.08.01P	inspect lubrication system	lubrication system is inspected for ***failure conditions*** by performing ***sensory inspections***
E-13.08.02P	check lubrication system	lubrication system is checked for ***failure conditions*** using an oil pressure gauge
E-13.08.03P	check integrity of delivery pipes and jets	integrity of delivery pipes and jets are checked visually for adequate flow
E-13.08.04P	check adjustment of two-stroke engine oil pump	adjustment of two-stroke engine oil pump is checked for volume using ***measuring and diagnostic tools***
E-13.08.05P	check oil pump	oil pump is checked for wear or failure using ***measuring and diagnostic tools*** and ***sensory inspections***

RANGE OF VARIABLES

failure conditions include: low, high or no oil pressure

sensory inspections include: listening for noises, feeling for vibrations, observing for oil leaks, incorrect oil type

measuring and diagnostic tools include: feeler gauges, micrometers, graduated cylinders, dyes

KNOWLEDGE

	Learning Outcomes	Learning Objectives
E-13.08.01L	demonstrate knowledge of ***lubrication systems*** and their ***components***, characteristics, applications and operation	identify ***lubrication systems***, and describe their ***components***, characteristics and applications
		describe ***lubrication system*** operation
E-13.08.02L	demonstrate knowledge of procedures to diagnose **lubrication systems**	identify ***measuring and diagnostic tools*** used to diagnose ***lubrication systems***, and describe their procedures for use
		describe procedures to inspect ***lubrication systems***
		describe procedures to diagnose ***lubrication systems***

	describe manufacturers' ***servicing procedures*** for ***lubrication systems***
	describe workplace practices and procedures

RANGE OF VARIABLES

lubrication systems include: intake injection, positive bearing injection, wet sump, dry sump
lubrication system components include: pumps, oil tanks, filters, oil coolers, lines, check valves
measuring and diagnostic tools include: feeler gauges, micrometers, graduated cylinders, dyes
servicing procedures are: replace, verify operation, adjust, clean

E-13.09 Diagnoses cooling system

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
E-13.09.01P	inspect ***cooling system***	***cooling system*** is inspected for ***failure conditions*** by performing ***sensory inspections***
E-13.09.02P	check ***cooling system***	***cooling system*** is checked for ***failure conditions*** using ***measuring and diagnostic tools***
E-13.09.03P	determine ***causes of failure*** of cooling function	***causes of failure*** of cooling function are determined according to interpretation of diagnostic results
E-13.09.04P	determine ***servicing procedures***	***servicing procedures*** are determined according to manufacturers' specifications and procedures

RANGE OF VARIABLES

cooling systems include: air, liquid-cooled (oil, coolant)
failure conditions include: improper coolant, leaks, damaged components
sensory inspections include: listening for noises, fan operation, coolant leaks
measuring and diagnostic tools include: cooling system pressure gauges, infrared thermometer, refractometer
causes of failure include: insufficient air or coolant flow, incorrect coolant mix, inoperable fan or failed thermostat
servicing procedures are: flush and replace coolant

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
E-13.09.01L	demonstrate knowledge of ***cooling systems*** and their ***components***, characteristics, applications and operation	identify ***cooling systems***, and describe their characteristics and applications
		identify ***cooling system components***, and describe their characteristics and applications
		describe ***cooling system*** operation
E-13.09.02L	demonstrate knowledge of procedures to diagnose ***cooling system***	identify ***measuring and diagnostic tools*** used to diagnose ***cooling system***, and describe their procedures for use
		describe procedures to inspect ***cooling system***
		describe procedures to diagnose ***cooling system***
		describe manufacturers' ***servicing procedures*** for ***cooling system***
		describe workplace practices and procedures

RANGE OF VARIABLES

cooling systems include: air, liquid-cooled (oil, coolant)

cooling system components include: pumps, lines, seals, radiators, cooling fins, thermostats, thermostatic switches, heat exchanger

measuring and diagnostic tools include: cooling system pressure gauges, infrared thermometer, refractometer

servicing procedures are: flush and replace coolant

TASK E-14 Services two-stroke and four-stroke engines

TASK DESCRIPTOR

Motorcycle technicians service components in two-stroke and four-stroke engines. Two-stroke engines have fewer moving parts and therefore have fewer components to maintain.

E-14.01 Services cylinder heads on four-stroke engine

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
E-14.01.01P	verify mating surface	mating surface returned from machining is verified using ***measuring tools***
E-14.01.02P	replace ***cylinder head components***	***cylinder head components*** are replaced according to manufacturers' procedures
E-14.01.03P	perform decarbonization	decarbonization is performed using ***equipment***
E-14.01.04P	set tolerances	tolerances are set according to manufacturers' specifications
E-14.01.05P	replace cylinder head	cylinder head is replaced using ***tools***
E-14.01.06P	confirm operation	operation is confirmed by a functional test according to manufacturers' specifications

RANGE OF VARIABLES

measuring tools include: surface plate, straightedge
cylinder head components include: valves, guides, decompressor, seals
equipment includes: wire brush, abrasive pad, glass bead cleaners, hydraulic presses
tools include: torque wrenches, socket set, pullers

KNOWLEDGE

	Learning Outcomes	Learning Objectives
E-14.01.01L	demonstrate knowledge of ***cylinder heads*** and their ***components***, characteristics, applications and operation	identify ***cylinder heads***, and describe their characteristics and applications
		identify ***cylinder head components***, and describe their characteristics and applications
		describe cylinder head operation

E-14.01.02L	demonstrate knowledge of procedures to service cylinder heads	identify ***tools*** and ***equipment*** used to service cylinder heads, and describe their procedures for use
		describe manufacturers' ***servicing procedures*** for cylinder heads
		describe workplace practices and procedures

RANGE OF VARIABLES

cylinder heads include: air or liquid cooled, single or multi-valve
cylinder head components include: valves, guides, decompressor, seals
tools include: torque wrenches, socket set, pullers
equipment includes: wire brush, abrasive pad, glass bead cleaners, hydraulic presses
servicing procedures include: decarbonize, replace

E-14.02 Services valve systems on two-stroke engine

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
E-14.02.01P	clean valve assemblies	valve assemblies are cleaned according to manufacturers' specifications and procedures using ***equipment***
E-14.02.02P	replace damaged or worn parts	damaged or worn parts are replaced according to manufacturers' procedures using ***tools***
E-14.02.03P	set tolerances	tolerances are set according to manufacturers' specifications
E-14.02.04P	confirm operation	operation is confirmed by functional test according to manufacturers' specifications and procedures

RANGE OF VARIABLES

equipment includes: wire brush, abrasive pad, glass bead cleaners
tools include: pullers, hand tools

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
E-14.02.01L	demonstrate knowledge of ***valve systems*** on two-stroke engines and their ***components***, characteristics, applications and operation	identify ***two-stroke valve systems***, and describe their characteristics and applications
		identify ***two-stroke valve system components***, and describe their characteristics and applications
		describe two-stroke valve system operation
E-14.02.02L	demonstrate knowledge of procedures to service valve systems on two-stroke engines	identify ***tools*** and ***equipment*** used to service valve systems on two-stroke engines, and describe their procedures for use
		describe manufacturers' ***servicing procedures*** for valve systems on two-stroke engines
		describe workplace practices and procedures

RANGE OF VARIABLES

two-stroke valve systems include: reed valve, rotary valve, piston port, power valve
two-stroke valve system components include: reeds, rotary valves, power valve actuators
tools include: pullers, hand tools
equipment includes: wire brush, abrasive pad, glass bead cleaners
servicing procedures include: clean, replace

E-14.03 Services valve train on four-stroke engine

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
E-14.03.01P	clean valve train components	valve train components are cleaned according to manufacturers' procedures using ***equipment***
E-14.03.02P	replace ***components***	***components*** are replaced according to manufacturers' procedures
E-14.03.03P	replace valve train components	valve train components are replaced according to manufacturers' procedures using ***tools***

E-14.03.04P	set tolerances	tolerances are set according to manufacturers' specifications and procedures
E-14.03.05P	confirm operation	operation is confirmed by functional test according to manufacturers' specifications and procedures

RANGE OF VARIABLES

equipment includes: wire brush, abrasive pad, glass bead cleaners
components include: valves, gears, cams, rockers, chains, belts, springs
tools include: valve grinders, valve and seat cutters, spring compressors, torque wrenches

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
E-14.03.01L	demonstrate knowledge of valve train on four-stroke engines and their ***components***, characteristics, applications and operation	identify valve train on four-stroke engines, and describe their characteristics and applications
		identify four-stroke valve train ***components***, and describe their characteristics and applications
		describe four-stroke valve train operation
E-14.03.02L	demonstrate knowledge of procedures to service valve train on four-stroke engines	identify ***tools*** used to service valve train on four-stroke engines, and describe their procedures for use
		describe manufacturers' ***servicing procedures*** for valve train on four-stroke engines
		describe workplace practices and procedures

RANGE OF VARIABLES

components include: valves, gears, cams, rockers, chains, belts, springs
tools include: valve grinders, valve and seat cutters, spring compressors, torque wrenches
servicing procedures include: replace tensioner or chain

E-14.04 Services cylinders and pistons

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
E-14.04.01P	replace cylinder and ***piston components***	cylinder and ***piston components*** are replaced according to manufacturers' specifications using ***specialty tools***
E-14.04.02P	confirm fit of piston, cylinder or rings	piston, cylinder or rings are replaced and fit is confirmed according to manufacturers' specifications and procedures using ***measuring tools***

RANGE OF VARIABLES

piston components include: wrist pins, circlips, rings
specialty tools include: wrist pin puller, ring compressors
measuring tools include: micrometer, bore gauges, feeler gauges

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
E-14.04.01L	demonstrate knowledge of cylinders, pistons, and their ***components***, characteristics, applications and operation	identify ***piston components***, and describe their characteristics and applications
		identify ***types of cylinder materials***, and describe their characteristics and applications
		identify ***types of pistons***, and describe their characteristics and applications
		describe cylinder and piston operation
E-14.04.02L	demonstrate knowledge of procedures to service cylinder and pistons	identify ***specialty tools*** used to service cylinder and pistons, and describe their procedures for use
		describe manufacturers' ***servicing procedures*** for cylinder and pistons
		describe workplace practices and procedures

RANGE OF VARIABLES

piston components include: wrist pins, circlips, rings
types of cylinder materials include: cast iron, plated, aluminum
types of pistons include: cast, forged
specialty tools include: wrist pin puller, ring compressors
servicing procedures include: repair, replace

E-14.05 Services crankshaft assembly

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
E-14.05.01P	check reconditioned or replacement ***crankshaft assemblies***	reconditioned or replacement ***crankshaft assemblies*** are checked for defects according to manufacturers' specifications
E-14.05.02P	replace ***crankshaft assemblies***	***crankshaft assemblies*** are replaced according to manufacturers' specifications using ***tools***
E-14.05.03P	set tolerances	tolerances are set according to manufacturers' specifications

RANGE OF VARIABLES

crankshaft assemblies include: roller, plain bearing, single and multi-cylinder, forged, pressed
tools include: pullers, bore gauges, feeler gauges, plastigages

KNOWLEDGE

	Learning Outcomes	Learning Objectives
E-14.05.01L	demonstrate knowledge of ***crankshaft assemblies*** and their ***components***, characteristics, applications and operation	identify ***crankshaft assemblies***, and describe their characteristics and applications
		identify ***crankshaft assembly components***, and describe their characteristics and applications
		describe crankshaft operation
E-14.05.02L	demonstrate knowledge of procedures to service ***crankshaft assemblies***	identify ***tools*** and equipment used to service ***crankshaft assemblies***, and describe their procedures for use

	describe manufacturers' ***servicing procedures*** for ***crankshaft assemblies***
	describe workplace practices and procedures

RANGE OF VARIABLES

crankshaft assemblies include: roller, plain bearing, single and multi-cylinder, forged, pressed

crankshaft assembly components include: connecting rods, labyrinth seals, flywheels, thrust washers, bearings

tools include: pullers, bore gauges, feeler gauges, plastigages

servicing procedures include: repair, replace

E-14.06 Services counterbalance assemblies

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
E-14.06.01P	replace counterbalance shafts and bearings	counterbalance shafts and bearings are replaced using ***tools***
E-14.06.02P	set tolerances and timing	tolerances and timing are set according to manufacturers' specifications and procedures

RANGE OF VARIABLES

tools include: pullers, bore gauges, feeler gauges, plastigage

KNOWLEDGE

	Learning Outcomes	Learning Objectives
E-14.06.01L	demonstrate knowledge of ***counterbalance assemblies*** and their ***components***, characteristics, applications and operation	identify ***counterbalance assemblies***, and describe their characteristics and applications
		identify ***counterbalance assembly components***, and describe their characteristics and applications
		describe counterbalance operation
E-14.06.02L	demonstrate knowledge of procedures to service ***counterbalance assemblies***	identify ***tools*** used to service ***counterbalance assemblies***, and describe their procedures for use

	describe manufacturers' ***servicing procedures*** for counterbalance assemblies
	describe workplace practices and procedures

RANGE OF VARIABLES

counterbalance assemblies include: gear or chain driven, single or multi-counterweights
counterbalance assembly components include: gears, chains, bearings
tools include: pullers, bore gauges, feeler gauges, plastigage
servicing procedures include: time or replace balancer, adjust backlash

E-14.07 Services engine cases

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
E-14.07.01P	replace engine cases	engine cases are replaced using ***tools***
E-14.07.02P	replace bearings and seals	bearings and seals are replaced according to manufacturers' specifications and procedures
E-14.07.03P	torque ***fasteners***	***fasteners*** are torqued according to manufacturers' specifications and procedures

RANGE OF VARIABLES

tools include: pullers, drivers
fasteners include: bolts, studs

KNOWLEDGE

	Learning Outcomes	Learning Objectives
E-14.07.01L	demonstrate knowledge of ***engine cases*** and their ***components***, characteristics and applications	identify ***engine cases***, and describe their characteristics and applications
		identify ***engine case components***, and describe their characteristics and applications
		describe ***engine case*** function
E-14.07.02L	demonstrate knowledge of procedures to service ***engine cases***	identify ***tools*** used to service ***engine cases***, and describe their procedures for use

	describe manufacturers' ***servicing procedures*** for ***engine cases***
	describe workplace practices and procedures

RANGE OF VARIABLES

engine cases include: single or multi-cylinder, vertical or horizontal split
engine case components include: bearings, bearing bosses, covers, case seals, threads
tools include: pullers, drivers
servicing procedures include: repair threads, replace bearings

E-14.08 Services lubrication system

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
E-14.08.01P	clean ***components***	***components*** are cleaned according to manufacturers' procedures
E-14.08.02P	replace ***components***	***components*** are replaced according to manufacturers' procedures using ***tools***
E-14.08.03P	adjust oil flow rate	oil flow rate is set according to manufacturers' specifications and procedures

RANGE OF VARIABLES

components include: check valves, pipes, jets, oil galleries, pumps, gears, rotors, bearings, chains
tools include: pullers, torque wrenches, feeler gauges

KNOWLEDGE

	Learning Outcomes	Learning Objectives
E-14.08.01L	demonstrate knowledge of ***lubrication systems*** and their ***components***, characteristics, applications and operation	identify ***lubrication systems***, and describe their characteristics and applications
		identify ***lubrication system components***, and describe their characteristics and applications
		describe ***lubrication system*** operation
E-14.08.02L	demonstrate knowledge of procedures to service ***lubrication systems***	identify ***tools*** used to service ***lubrication systems***, and describe their procedures for use

	describe manufacturers' ***servicing procedures*** for ***lubrication systems***
	describe workplace practices and procedures

RANGE OF VARIABLES

lubrication systems include: intake injection, positive bearing injection, wet sump, dry sump
lubrication system components include: pumps, oil tanks, filters, oil coolers, lines, cables
tools include: pullers, torque wrenches, feeler gauges
servicing procedures include: replace, adjust, clean

E-14.09 Services cooling system

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
E-14.09.01P	mix coolant	coolant is mixed according to manufacturers' specifications
E-14.09.02P	flush and refill ***cooling system***	***cooling system*** is flushed and refilled according to manufacturers' procedures using ***equipment***
E-14.09.03P	remove airflow obstructions	airflow obstructions are removed using ***methods*** according to manufacturers' procedures
E-14.09.04P	replace ***cooling system components***	***cooling system components*** are replaced according to manufacturers' procedures using ***tools***
E-14.09.05P	repair ***cooling system components***	***cooling system components*** are repaired according to manufacturers' procedures

RANGE OF VARIABLES

cooling systems include: air, liquid-cooled (oil, coolant)
equipment includes: coolant recovery systems, flushing system
methods include: cleaning, combing
cooling system components include: pumps, lines, seals, radiators, cooling fins, thermostats, fans, ducts, shrouds, heat exchangers
tools include: pullers, drivers**,** funnels, hoses

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
E-14.09.01L	demonstrate knowledge of ***cooling systems*** and their ***components***, characteristics, applications and operation	identify ***cooling systems***, and describe their characteristics and applications
		identify ***cooling system components***, and describe their characteristics and applications
		describe ***cooling system*** operation
E-14.09.02L	demonstrate knowledge of procedures to service ***cooling systems***	identify ***tools*** and ***equipment*** used to service ***cooling systems***, and describe their procedures for use
		describe manufacturers' ***servicing procedures*** for cooling systems
		describe workplace practices and procedures

RANGE OF VARIABLES

cooling systems include: air, liquid-cooled (oil, coolant)

cooling system components include: pumps, lines, seals, radiators, cooling fins, thermostats, fans, ducts, shrouds, heat exchangers

tools include: pullers, drivers**,** funnels, hoses

equipment includes: coolant recovery systems, flushing system

servicing procedures include: replace pump or thermostat, service coolant, clean radiator

MAJOR WORK ACTIVITY F
Maintains power transfer

TASK F-15 Diagnoses clutches and primary drive

TASK DESCRIPTOR

Motorcycle technicians diagnose clutches and primary drives to determine irregularities in the transfer of power from the engine crankshaft through the transmission to the final drive.

F-15.01 Diagnoses primary drive and driven gears

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
F-15.01.01P	determine defects, faults and wear	primary drive and driven gears are inspected for defects, faults and wear by performing ***sensory inspections***
F-15.01.02P	inspect primary drive and driven gears	primary drive and driven gears are inspected for ***conditions*** by using ***tools and equipment***
F-15.01.03P	identify ***causes of failure***	***causes of failure*** of primary drive and driven gears are identified according to interpretation of diagnostic results
F-15.01.04P	determine ***servicing procedures***	***servicing procedures*** are determined according to manufacturers' specifications and procedures

RANGE OF VARIABLES

sensory inspections include: listening for noises, feeling for vibrations, looking for contamination in oil

conditions include: cracks, pits, burrs

tools and equipment include: borescopes, dial gauges, stethoscope

causes of failure include: inadequate lubrication, excessive play, contributory damage from related or unrelated component failure

servicing procedures include: replace gears

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
F-15.01.01L	demonstrate knowledge of primary drive gear system and their ***components***, characteristics, applications and operation	identify primary drive gear system, and describe its characteristics and applications
		identify ***primary drive gear system components***, and describe their characteristics and applications
		describe primary drive system operation
		explain primary drive ratio
F-15.01.02L	demonstrate knowledge of procedures to diagnose primary drive and driven gears	identify ***tools and equipment*** used to diagnose primary drive and driven gears, and describe their procedures for use
		describe procedures to inspect primary drive and driven gears
		describe procedures to diagnose primary drive and driven gears
		describe manufacturers' ***servicing procedures*** for primary drive and driven gears
		describe workplace practices and procedures

RANGE OF VARIABLES

primary drive gear system components include: drive gears, driven gears, spring-loaded backlash gear, clutch baskets

tools and equipment include: borescopes, dial gauges, stethoscope

servicing procedures include: replace gears

F-15.02 Diagnoses primary drive chain and sprockets

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
F-15.02.01P	determine defects, faults and wear	primary drive chains and sprockets are inspected for defects, faults and wear by performing ***sensory inspections***
F-15.02.02P	evaluate drive chain	drive chain is evaluated for ***conditions*** by checking measurements according to manufacturers' specifications

F-15.02.03P	identify ***causes of failure***	***causes of failure*** of primary drive chains and sprockets are determined according to interpretation of diagnostic results
F-15.02.04P	determine ***servicing procedures***	***servicing procedures*** are determined according to manufacturers' procedures

RANGE OF VARIABLES

sensory inspections include: listening for noises, feeling for vibrations or excessive movement (free play), looking for contamination in oil

conditions include: sprocket wear, chain wear, tensioner defects***,*** misalignment

causes of failure include: lack of lubrication, improper tension, lack of maintenance, defective compensator

servicing procedures include: lubricate, adjust, replace chain, replace sprocket, replace tensioner component

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
F-15.02.01L	demonstrate knowledge of primary drive chains and sprocket system and their ***components***, characteristics, applications and operation	identify primary drive chains and sprocket system, and describe their characteristics and applications
		identify ***primary chain drive components***, and describe their characteristics and applications
		describe primary drive system operation
F-15.02.02L	demonstrate knowledge of procedures to diagnose primary drive chains and sprockets	identify tools and equipment used to diagnose primary drive chains and sprockets, and describe their procedures for use
		describe procedures to inspect primary drive chains and sprockets
		describe procedures to diagnose primary drive chains and sprockets
		describe manufacturers' ***servicing procedures*** for primary drive chains and sprockets
		describe workplace practices and procedures

RANGE OF VARIABLES

primary chain drive components include: chains, tensioners (slider), sprockets, clutch basket

servicing procedures include: lubricate, adjust, replace chain, replace sprocket, replace tensioner component

F-15.03 Diagnoses primary drive belts and pulleys

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
F-15.03.01P	determine defects, faults and wear	primary drive belts and pulleys are inspected for defects, faults and wear by performing ***sensory inspections***
F-15.03.02P	evaluate primary drive belts and pulleys	primary drive belts and pulleys are evaluated for ***conditions*** according to manufacturers' specifications
F-15.03.03P	identify ***causes of failure***	***causes of failure*** of primary drive belts and pulleys are identified according to interpretation of diagnostic results
F-15.03.04P	determine ***servicing procedures***	***servicing procedures*** are determined according to manufacturers' procedures

RANGE OF VARIABLES

sensory inspections include: listening for noises, feeling for vibrations, looking for damaged belts and pulleys, oil contamination

conditions include: belt separation, cracking, worn pulleys, pulley misalignment

causes of failure include: improper installation, contributory damage from related component failure

servicing procedures include: adjust, clean, replace belt and pulley

KNOWLEDGE

	Learning Outcomes	Learning Objectives
F-15.03.01L	demonstrate knowledge of primary belt drive systems and their characteristics, applications and operation	identify primary belt drive system, and describe its characteristics and applications
		identify primary drive belts and pulleys, and describe their characteristics and applications
		describe primary drive system operation
F-15.03.02L	demonstrate knowledge of procedures to diagnose primary drive belts and pulleys	identify tools and equipment used to diagnose primary drive belts and pulleys, and describe their procedures for use
		describe procedures to inspect primary drive belts and pulleys
		describe procedures to diagnose primary drive belts and pulleys

	describe manufacturers' ***servicing procedures*** for primary drive belts and pulleys
	describe workplace practices and procedures

RANGE OF VARIABLES

servicing procedures include: adjust, clean, replace belt and pulley

F-15.04 Diagnoses manual clutches

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
F-15.04.01P	determine defects, faults and wear	manual clutches are inspected for defects, faults and wear by performing ***sensory inspections***
F-15.04.02P	perform test ride	test ride results are assessed for ***faulty clutch operation***
F-15.04.03P	evaluate component ***conditions***	components are evaluated for ***conditions*** by disassembling clutch systems according to manufacturers' procedures
F-15.04.04P	perform ***checks and measurements***	***checks and measurements*** are performed using ***tools and equipment*** according to manufacturers' specifications
F-15.04.05P	identify ***causes of failure***	***causes of failure*** of manual clutches are determined according to interpretation of diagnostic results
F-15.04.06P	determine ***servicing procedures***	***servicing procedures*** are determined according to manufacturers' specifications and procedures

RANGE OF VARIABLES

sensory inspections include: listening for noises, feeling for vibrations, looking for oil contamination, smelling for burnt components, observing for worn parts

faulty clutch operation includes: slippage, dragging, shuddering

conditions include: breakage, wear, overheating

checks and measurements include: friction plate (thickness, overheating, tab width), steel plates (overheating, warping), spring free length/condition, diaphragm springs

tools and equipment include: feeler gauges, surface plates, calipers, pullers, clutch hub holder

causes of failure include: clutch maladjustment, lack of maintenance, contributory damage from related component failure, incorrect oil level and type

servicing procedures include: adjust, clean, replace

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
F-15.04.01L	demonstrate knowledge of manual clutches and their ***components***, characteristics, applications and operation	identify ***types of clutch systems***, and describe their characteristics and applications
		identify ***types of manual clutches***, and describe their characteristics and applications
		identify ***clutch components***, and describe their characteristics and applications
		identify ***types of release mechanisms***, and describe their characteristics and applications
		describe manual clutch operation
F-15.04.02L	demonstrate knowledge of procedures to diagnose manual clutches	identify ***tools and equipment*** used to diagnose manual clutches, and describe their procedures for use
		describe procedures to inspect manual clutches
		describe procedures to diagnose manual clutches
		describe manufacturers' ***servicing procedures*** for manual clutches
		describe workplace practices and procedures

RANGE OF VARIABLES

clutch components include: springs, fibre and metal plates, pressure plate, hub, basket, release mechanisms
types of clutch systems are: manual, automatic, semi-automatic
types of manual clutches include: wet, dry, single, multi plate, torque-limiting (slipper)
types of release mechanisms include: hydraulic, ball and ramp, cable operated lever, rack and pinion
tools and equipment include: feeler gauges, surface plates, calipers, pullers, clutch hub holder
servicing procedures include: adjust, clean, replace

F-15.05 Diagnoses automatic clutches

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
F-15.05.01P	determine defects, faults and wear	automatic clutches are inspected for defects, faults and wear by performing ***sensory inspections***
F-15.05.02P	perform test ride	test ride results are evaluated for ***faulty clutch operation***
F-15.05.03P	evaluate ***automatic clutch system components***	***automatic clutch system components*** are evaluated for ***conditions*** by disassembling clutch systems according to manufacturers' procedures
F-15.05.04P	perform ***checks and measurements***	***checks and measurements*** are performed using ***tools and equipment*** according to manufacturers' specifications
F-15.05.05P	identify ***causes of failure***	***causes of failure*** of automatic clutches are identified according to interpretation of diagnostic results
F-15.05.06P	determine ***servicing procedures***	***servicing procedures*** are determined according to manufacturers' procedures

RANGE OF VARIABLES

sensory inspections include: listening for noises, feeling for vibrations, looking for oil contamination, smelling for burnt components

faulty clutch operation includes: slippage, dragging, shuddering, improper engagement revolutions per minute (RPM)

automatic clutch system components include: friction shoes, drums, springs, weights

conditions include: breakage, wear, overheating

checks and measurements include: friction material, drum diameter, spring free length/condition

tools and equipment include: vernier calipers, feeler gauges, clutch holder

causes of failure include: clutch maladjustment, lack of maintenance, contributory damage from related component failure

servicing procedures are: adjust, clean, replace

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
F-15.05.01L	demonstrate knowledge of automatic clutches and their ***components***, characteristics, applications and operation	identify automatic clutches, and describe their characteristics and applications
		identify ***automatic clutch system components***, and describe their characteristics and applications
		describe automatic clutch operation
F-15.05.02L	demonstrate knowledge of procedures to diagnose automatic clutches	identify ***tools and equipment*** used to diagnose automatic clutches, and describe their procedures for use
		describe procedures to inspect automatic clutches
		describe procedures to diagnose automatic clutches
		describe manufacturers' ***servicing procedures*** for automatic clutches
		describe workplace practices and procedures

RANGE OF VARIABLES

automatic clutch system components include: friction shoes, drums, springs, weights

tools and equipment include: vernier calipers, feeler gauges, clutch holder

servicing procedures are: adjust, clean, replace

F-15.06 Diagnoses kick start

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
F-15.06.01P	inspect ***kick start components***	***kick start components*** are visually inspected for abnormalities, operation and wear
F-15.06.02P	check for ***abnormal operations***	kick start systems are checked for ***abnormal operations*** by performing function test
F-15.06.03P	evaluate ***kick start components***	***kick start components*** are evaluated for damage or wear according to manufacturers' specifications
F-15.06.04P	identify ***causes of failure***	***causes of failure*** of kick start systems are identified according to interpretation of diagnostic results
F-15.06.05P	determine ***servicing procedures***	***servicing procedures*** are determined according to manufacturers' procedures

RANGE OF VARIABLES

kick start components include: shaft, bushings, gears, ratcheting gears, ball and spring, springs, levers, fasteners, ratchet stop

abnormal operations include: binding, spline wear, locking, engagement issues

causes of failure include: corrosion, wear, lack of lubrication, defective components

servicing procedures are: lubricate, clean, replace

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
F-15.06.01L	demonstrate knowledge of kick starts and their ***components***, characteristics, applications and operation	identify kick starts, and describe their characteristics and applications
		identify ***kick start components***, and describe their characteristics and applications
		describe kick start operation
F-15.06.02L	demonstrate knowledge of procedures to diagnose kick starts	identify tools and equipment used to diagnose kick starts, and describe their procedures for use
		describe procedures to inspect kick starts
		describe procedures to diagnose kick starts

	describe manufacturers' ***servicing procedures*** for kick starts
	describe workplace practices and procedures

RANGE OF VARIABLES

kick start components include: shaft, bushings, gears, ratcheting gears, ball and spring, springs, levers, fasteners, ratchet stop

servicing procedures are: lubricate, clean, replace

TASK F-16 Services clutches and primary drive

TASK DESCRIPTOR

Motorcycle technicians service clutches and primary drives to ensure an efficient and proper transfer of power from the engine crankshaft through the transmission to the final drive.

F-16.01 Services primary drive and driven gears

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
F-16.01.01P	access primary drive and driven gears	primary drive and driven gears are accessed according to manufacturers' procedures
F-16.01.02P	remove and replace defective ***primary drive gear system components***	***primary drive gear system components*** are removed and replaced according to manufacturers' procedures
F-16.01.03P	verify repair	repair is verified according to manufacturers' specifications

RANGE OF VARIABLES

primary drive gear system components include: drive gears, driven gears, spring-loaded backlash gear, clutch baskets

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
F-16.01.01L	demonstrate knowledge of primary drive gear system and their ***components***, characteristics and applications	identify primary drive gear system, and describe its characteristics and applications
		identify ***primary drive gear system components***, and describe their characteristics and applications
		describe primary drive system operation
		explain primary drive ratio
F-16.01.02L	demonstrate knowledge of procedures to service primary drive and driven gears	identify ***tools and equipment*** used to service primary drive and driven gears, and describe their procedures for use
		describe manufacturers' ***servicing procedures*** for primary drive and driven gears
		describe workplace practices and procedures

RANGE OF VARIABLES

primary drive gear system components include: drive gears, driven gears, spring-loaded backlash gear, clutch baskets

tools and equipment include: gear holders, gear pullers

servicing procedures include: replace gears and related components

F-16.02 Services primary drive chain and sprockets

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
F-16.02.01P	access ***primary chain drive systems components***	***primary chain drive systems components*** are accessed according to manufacturers' procedures
F-16.02.02P	lubricate and adjust chains and sprockets	chains and sprockets are lubricated and adjusted according to manufacturers' procedures
F-16.02.03P	remove, and repair or replace ***primary chain drive systems components***	***primary chain drive systems components*** are removed, and repaired or replaced according to manufacturers' procedures

F-16.02.04P	adjust alignment of primary drive chain and sprockets	alignment of primary drive chain and sprockets are adjusted according to manufacturers' procedures
F-16.02.05P	remove, and repair or replace damaged ***related components***	damaged ***related components*** are removed, and repaired or replaced according to manufacturers' procedures

RANGE OF VARIABLES

primary chain drive systems components include: chains, tensioners (slider), sprockets, clutch basket
related components include: O-rings, gaskets

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
F-16.02.01L	demonstrate knowledge of primary drive chains and sprocket system and their ***components***, characteristics, applications and operation	identify primary drive chains and sprocket system, and describe their characteristics and applications
		identify ***primary chain drive components***, and describe their characteristics and applications
		describe primary drive system operation
F-16.02.02L	demonstrate knowledge of procedures to service primary drive chains and sprockets	identify tools and equipment used to service primary drive chains and sprockets, and describe their procedures for use
		describe manufacturers' ***servicing procedures*** for primary drive chains and sprockets
		describe workplace practices and procedures

RANGE OF VARIABLES

primary chain drive components include: chains, tensioners (slider), sprockets, clutch basket
servicing procedures include: lubricate, adjust, replace chain, replace sprocket, replace tensioner component

F-16.03 Services primary drive belts and pulleys

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
F-16.03.01P	access primary drive belts and pulleys	primary drive belts and pulleys are accessed according to manufacturers' procedures
F-16.03.02P	maintain primary drive belts and pulleys	primary drive belts and pulleys are maintained according to manufacturers' specifications
F-16.03.03P	disassemble, and repair or replace primary drive belts and pulleys	primary drive belts and pulleys are disassembled, and repaired or replaced according to manufacturers' procedures
F-16.03.04P	adjust alignment of primary drive belts and pulleys	alignment of primary drive belts and pulleys are adjusted according to manufacturers' procedures

KNOWLEDGE

	Learning Outcomes	Learning Objectives
F-16.03.01L	demonstrate knowledge of primary belt drive systems and their characteristics, applications and operation	identify primary belt drive system, and describe its characteristics and applications
		identify primary drive belts and pulleys, and describe their characteristics and applications
		describe primary drive system operation
F-16.03.02L	demonstrate knowledge of procedures to service primary drive belts and pulleys	identify ***tools and equipment*** used to service primary drive belts and pulleys, and describe their procedures for use
		describe manufacturers' ***servicing procedures*** for primary drive belts and pulleys
		describe workplace practices and procedures

RANGE OF VARIABLES

tools and equipment include: feeler gauges, surface plates, vernier caliper, pullers, clutch hub holder
servicing procedures include: adjust, clean, replace belt and pulley

F-16.04 Services manual clutches

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
F-16.04.01P	access ***clutch components***	***clutch components*** are accessed according to manufacturers' procedures
F-16.04.02P	remove, inspect, measure, and reinstall or replace ***clutch components***	***clutch components*** are removed, inspected, measured, and reinstalled or replaced according to manufacturers' specifications and procedures
F-16.04.03P	adjust ***clutch components***	***clutch components*** are adjusted according to manufacturers' procedures
F-16.04.04P	replace hydraulic fluids and lubricate clutch release mechanisms	hydraulic fluids are replaced and clutch release mechanisms lubricated according to manufacturers' specifications and procedures
F-16.04.05P	clean ***clutch components***	***clutch components*** are cleaned according to manufacturers' procedures

RANGE OF VARIABLES

clutch components include: springs, fibre and metal plates, pressure plate, hub, basket, release mechanisms, actuators

KNOWLEDGE

	Learning Outcomes	Learning Objectives
F-16.04.01L	demonstrate knowledge of manual clutches and their ***components***, characteristics, applications and operation	identify ***types of clutch systems***, and describe their characteristics and applications
		identify ***types of manual clutches***, and describe their characteristics and applications
		identify types of ***clutch components***, and describe their characteristics and applications
		identify ***types of release mechanisms***, and describe their characteristics and applications
		describe manual clutch operation
F-16.04.02L	demonstrate knowledge of procedures to service manual clutches	identify ***tools and equipment*** used to service manual clutches, and describe their procedures for use

	describe manufacturers' ***servicing procedures*** for manual clutches
	describe workplace practices and procedures

RANGE OF VARIABLES

clutch components include: springs, fibre and metal plates, pressure plate, hub, basket, release mechanisms, actuators
types of clutch systems are: manual, automatic, semi-automatic
types of manual clutches include: wet, dry, single, multi plate, torque-limiting (slipper)
types of release mechanisms include: hydraulic, ball and ramp, cable operated lever, rack and pinion
tools and equipment include: feeler gauges, surface plates, vernier caliper, pullers, clutch hub holder
servicing procedures include: adjust, clean, replace worn and damaged components

F-16.05 Services automatic clutches

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
F-16.05.01P	access ***automatic clutch system components***	***automatic clutch system components*** are accessed according to manufacturers' procedures
F-16.05.02P	remove, inspect, measure, and replace or reinstall ***automatic clutch system components***	***automatic clutch system components*** are removed, inspected, measured, and replaced or reinstalled according to manufacturers' specifications and procedures
F-16.05.03P	adjust ***automatic clutch system components***	***automatic clutch system components*** are adjusted according to manufacturers' specifications and procedures
F-16.05.04P	clean ***automatic clutch system components***	***automatic clutch system components*** are cleaned according to manufacturers' specifications and procedures

RANGE OF VARIABLES

automatic clutch system components include: friction shoes, drums, springs, weights

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
F-16.05.01L	demonstrate knowledge of automatic clutches and their ***components***, characteristics, applications and operation	identify automatic clutches, and describe their characteristics and applications
		identify ***automatic clutch system components***, and describe their characteristics and applications
		describe automatic clutch operation
F-16.05.02L	demonstrate knowledge of procedures to service automatic clutches	identify ***tools and equipment*** used to service automatic clutches, and describe their procedures for use
		describe manufacturers' ***servicing procedures*** for automatic clutches
		describe workplace practices and procedures

RANGE OF VARIABLES

automatic clutch system components include: friction shoes, drums, springs, weights
tools and equipment include: vernier caliper, feeler gauges, clutch holder
servicing procedures are: adjust, clean, replace

F-16.06 Services kick start

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
F-16.06.01P	access ***kick start components***	***kick start components*** are accessed according to manufacturers' procedures
F-16.06.02P	remove, inspect, measure, and replace or reinstall ***kick start components***	***kick start components*** are removed, inspected, measured, and replaced or reinstalled according to manufacturers' specifications and procedures
F-16.06.03P	clean and lubricate levers, detents and decompression system components	levers, detents and decompression system components are cleaned and lubricated according to manufacturers' procedures

RANGE OF VARIABLES

kick start components include: shaft, bushings, gears, ratcheting gears, ball and spring, springs, levers, fasteners, ratchet stop

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
F-16.06.01L	demonstrate knowledge of kick starts and their ***components***, characteristics, applications and operation	identify kick starts, and describe their characteristics and applications
		identify ***kick start components***, and describe their characteristics and applications
		describe kick start operation
F-16.06.02L	demonstrate knowledge of procedures to service kick starts	identify tools and equipment used to service kick starts, and describe their procedures for use
		describe manufacturers' ***servicing procedures*** for kick starts
		describe workplace practices and procedures

RANGE OF VARIABLES

kick start components include: shaft, bushings, gears, ratcheting gears, ball and spring, springs, levers, fasteners, ratchet stop

servicing procedures are: lubricate, clean, replace

TASK F-17 Diagnoses transmissions

TASK DESCRIPTOR

Motorcycle technicians need to be familiar with the operation of constant mesh and continuously variable transmissions (CVT) to determine course of repair.

F-17.01 Diagnoses constant mesh transmissions

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
F-17.01.01P	determine defects, faults and wear	constant mesh transmissions are inspected for defects, faults and wear by performing ***sensory inspections*** and test ride
F-17.01.02P	evaluate ***constant mesh transmission components***	***conditions*** of ***constant mesh transmission components*** are evaluated according to manufacturers' procedures
F-17.01.03P	perform ***measurements***	***measurements*** are performed according to manufacturers' specifications and procedures
F-17.01.04P	identify ***causes of failure***	***causes of failure*** of ***constant mesh transmission components*** are determined according to interpretation of diagnostic results
F-17.01.05P	determine ***servicing procedures***	***servicing procedures*** are determined according to manufacturers' procedures

RANGE OF VARIABLES

sensory inspections include: listening for noises, feeling for vibrations, looking for leaks

constant mesh transmission components include: shifter mechanisms (automatic and manual), gears, shafts, circlips, washers, seals, bearings, shift forks, shift drum, bushings

conditions include: broken or worn gears, worn bearings, damaged shift forks, drum, worn engagement dogs, bent shafts

measurements include: shaft end play, gear shimming, fork clearance, shaft runout

causes of failure include: impact damage, improper operation, lubrication failure (lack of), overload

servicing procedures are: adjust or replace components

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
F-17.01.01L	demonstrate knowledge of constant mesh transmissions and their ***components***, characteristics, applications and operation	identify constant mesh transmissions, and describe its characteristics and applications
		identify ***constant mesh transmission components***, and describe their characteristics and applications
		describe constant mesh transmission operation
F-17.01.02L	demonstrate knowledge of procedures to diagnose constant mesh transmissions	identify ***tools and equipment*** used to diagnose constant mesh transmissions and ***components***, and describe their procedures for use
		describe procedures to inspect constant mesh transmissions
		describe procedures to diagnose constant mesh transmissions
		describe manufacturers' ***servicing procedures*** for constant mesh transmissions
		describe workplace practices and procedures

RANGE OF VARIABLES

constant mesh transmission components include: shifter mechanisms (automatic and manual), gears, shafts, circlips, washers, seals, bearings, shift forks, shift drum, bushings

tools and equipment include: dial indicator, feeler gauge, V-blocks, vernier caliper, micrometer, multimeter, diagnostic software

servicing procedures are: adjust or replace components

F-17.02 Diagnoses continuously variable transmission (CVT)

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
F-17.02.01P	determine defects, faults and wear	CVT is inspected for defects, faults and wear by performing ***sensory inspections***
F-17.02.02P	access ***CVT components***	***CVT components*** are accessed according to manufacturers' procedures

F-17.02.03P	evaluate ***CVT components***	***conditions*** of ***CVT components*** are evaluated using tools and equipment according to manufacturers' specifications and procedures
F-17.02.04P	perform ***measurements***	***measurements*** are performed according to manufacturers' specifications and procedures
F-17.02.05P	identify ***causes of failure***	***causes of failure*** of ***CVT components*** are determined according to interpretation of diagnostic results
F-17.02.06P	determine ***servicing procedure***	***servicing procedures*** are determined according to manufacturers' procedures

RANGE OF VARIABLES

sensory inspections include: listening for noises, feeling for vibrations, smelling for burnt rubber, feeling for correct engagement

CVT components include: v-belt, rollers, sheave bushings, springs, sheaves, helix, weights

conditions include: worn or binding sheaves, worn belts, worn weights

measurements include: belt width, spring free length, weight diameter

causes of failure include: improper operation, contamination

servicing procedures include: repair or replace components, clean

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
F-17.02.01L	demonstrate knowledge of CVTs and their ***components***, characteristics, applications and operation	identify CVTs, and describe their characteristics and applications
		identify ***CVT components***, and describe their characteristics and applications
		describe CVT operation
F-17.02.02L	demonstrate knowledge of procedures to diagnose CVTs	identify tools and equipment used to diagnose CVTs and their ***components***, and describe their procedures for use
		describe procedures to inspect CVTs and their ***components***
		describe procedures to diagnose CVTs and their ***components***
		describe manufacturers' ***servicing procedures*** for CVTs
		describe workplace practices and procedures

RANGE OF VARIABLES

CVT components include: v-belt, rollers, sheave bushings, springs, sheaves, helix, weights

servicing procedures include: repair or replace components, clean

TASK F-18 Services transmissions

TASK DESCRIPTOR

Motorcycle technicians replace and service components of constant mesh transmissions and CVT.

F-18.01 Services constant mesh transmissions

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
F-18.01.01P	replace damaged, defective or worn ***constant mesh transmission components***	damaged, defective or worn ***constant mesh transmission components*** are replaced according to manufacturers' procedures
F-18.01.02P	reassemble transmission	transmission is reassembled according to manufacturers' procedures

RANGE OF VARIABLES

constant mesh transmission components include: shifter mechanisms, gears, shafts, circlips, washers, seals, bearings, shift forks, shift drum, bushings

KNOWLEDGE

	Learning Outcomes	Learning Objectives
F-18.01.01L	demonstrate knowledge of constant mesh transmissions and their ***components***, characteristics, applications and operation	identify constant mesh transmissions, and describe their characteristics and applications
		identify ***constant mesh transmission components***, and describe their characteristics and applications
		describe constant mesh transmissions operation
F-18.01.02L	demonstrate knowledge of procedures to service constant mesh transmissions	identify ***tools and equipment*** used to service constant mesh transmissions, and describe their procedures for use
		describe manufacturers' ***servicing procedures*** for constant mesh transmissions
		describe workplace practices and procedures

RANGE OF VARIABLES

constant mesh transmission components include: shifter mechanisms, gears, shafts, circlips, washers, seals, bearings, shift forks, shift drum, bushings

tools and equipment include: dial indicator, feeler gauge, V-blocks, vernier caliper, micrometer

servicing procedures are: replace components

F-18.02 Services continuously variable transmission

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
F-18.02.01P	replace ***CVT components***	***CVT components*** are replaced according to diagnostic results and manufacturers' specifications and procedures
F-18.02.02P	clean ***CVT components***	***CVT components*** are cleaned according to manufacturers' procedures
F-18.02.03P	perform CVT calibration	CVT calibration is performed according to manufacturers' specifications and procedures
F-18.02.04P	reassemble CVT	CVT is reassembled according to manufacturers' specifications and procedures

RANGE OF VARIABLES

CVT components include: v-belt, rollers, sheave bushings, springs, sheaves, helix, weights

KNOWLEDGE

	Learning Outcomes	Learning Objectives
F-18.02.01L	demonstrate knowledge of CVTs and their ***components***, characteristics, applications and operation	identify CVTs, and describe their characteristics and applications
		identify ***CVT components***, and describe their characteristics and applications
		describe CVT operation
F-18.02.02L	demonstrate knowledge of procedures to service CVTs	identify tools and equipment used to service CVTs, and describe their procedures for use
		describe ***servicing procedures*** for CVTs

	describe manufacturers' specifications and procedures
	describe workplace practices and procedures

RANGE OF VARIABLES

CVT components include: v-belt, rollers, sheave bushings, springs, sheaves, helix, weights
servicing procedures include: repair or replace components

TASK F-19 Diagnoses final drive

TASK DESCRIPTOR

Final drive encompasses shaft, chain and belt systems. Motorcycle technicians are required to understand the differences and functions of these systems in order to correctly diagnose problems.

F-19.01 Diagnoses final drive chain and sprockets

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
F-19.01.01P	determine defects, faults and wear	final drive chain and sprockets are inspected for defects, faults and wear by performing ***sensory inspections*** and test ride
F-19.01.02P	inspect final drive chain and sprockets	final drive chain and sprockets are inspected for ***conditions*** by using ***tools***
F-19.01.03P	identify ***causes of failure***	***causes of failure*** of final drive chain and sprockets are determined according to interpretation of diagnostic results
F-19.01.04P	determine ***servicing procedures***	***servicing procedures*** are determined according to manufacturers' specifications and procedures

RANGE OF VARIABLES

sensory inspections include: listening for noises, feeling for vibrations, observing for wear or damage
conditions include: worn, loose or broken
tools include: measuring tools, hand tools
causes of failure include: insufficient lubrication, wear, maladjustment, misalignment
servicing procedures are: adjust or replace, clean, lubricate

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
F-19.01.01L	demonstrate knowledge of final drive chain and sprockets and their characteristics, applications and operation	identify final drive chain and sprockets, and describe their characteristics and applications
		identify ***types of final drive chains***, and describe their characteristics and applications
		describe final drive chain and sprocket operation
		explain final drive ratio
F-19.01.02L	demonstrate knowledge of procedures to diagnose final drive chain and sprockets	identify tools used to diagnose final drive chain and sprockets, and describe their procedures for use
		describe procedures to inspect final drive chain and sprockets
		describe procedures to diagnose final drive chain and sprockets
		describe manufacturers' ***servicing procedures*** for final drive chain and sprockets
		describe workplace practices and procedures

RANGE OF VARIABLES

types of final drive chains include: O-ring, non O-ring
servicing procedures are: adjust or replace, clean, lubricate

F-19.02 Diagnoses final drive shaft and gears

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
F-19.02.01P	determine defects, faults and wear	final drive shaft and gears, and their ***components*** are inspected for defects, faults and wear by performing ***sensory inspections*** and test ride
F-19.02.02P	inspect fluid	fluid is inspected for ***contaminants*** and levels
F-19.02.03P	evaluate ***final drive shaft and gear components***	***final drive shaft and gear components*** are evaluated for ***conditions*** according to manufacturers' specifications and procedures using ***tools***
F-19.02.04P	determine ***causes of failure***	***causes of failure*** of drive shaft and gears are determined according to interpretation of diagnostic results
F-19.02.05P	determine ***servicing procedures***	***servicing procedures*** are determined according to manufacturers' procedures

RANGE OF VARIABLES

final drive shaft and gear components include: shafts, universal joints, bearings, seals, gears, shims

sensory inspections include: listening for noises, feeling for vibrations, observing for fluid leaks or damage, excessive play

contaminants include: metal filings, water, abnormal colour

conditions include: cracking, wear, gear pitting, excessive play, leaking

tools include: micrometers, dial gauges, vernier caliper, manufacturers' specialty tools, machinist dye, torque wrench

causes of failure include: insufficient or incorrect lubricant, wear, seal failure

servicing procedures include: adjust backlash, adjust tooth contact pattern, replace gears and joints, adjust bearing preload

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
F-19.02.01L	demonstrate knowledge of final drive shaft, gears and their ***components***, characteristics, applications and operation	identify final drive shaft and gears, and describe their characteristics and applications
		identify ***final drive shaft and gear components***, and describe their characteristics and applications
		describe operation of final drive shaft and gears

F-19.02.02L	demonstrate knowledge of procedures to diagnose final drive shaft and gears	identify ***tools*** used to diagnose final drive shaft and gears, and describe their procedures for use
		describe procedures to inspect final drive shaft and gears
		describe procedures to diagnose final drive shaft and gears
		describe manufacturers' ***servicing procedures*** for final drive shaft and gears
		describe workplace practices and procedures

RANGE OF VARIABLES

final drive shaft and gear components include: shafts, universal joints, bearings, seals, gears, shims

tools include: micrometers, dial gauges, vernier caliper, manufacturers' specialty tools, machinist dye, torque wrench

servicing procedures include: adjust backlash, adjust tooth contact pattern, replace gears and joints, adjust bearing preload

F-19.03 Diagnoses final drive belt and pulleys

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
F-19.03.01P	determine defects, faults and wear	drive belts and pulleys are inspected for defects, faults and wear by performing ***sensory inspections*** and test ride
F-19.03.02P	evaluate drive belts and pulleys	drive belts and pulleys are evaluated for ***conditions*** using ***tools*** according to manufacturers' specifications and procedures
F-19.03.03P	determine ***causes of failure***	***causes of failure*** of drive belts and pulleys are determined according to interpretation of diagnostic results
F-19.03.04P	determine ***servicing procedures***	***servicing procedures*** are determined according to manufacturers' specifications and procedures

RANGE OF VARIABLES

sensory inspections include: listening for noises, feeling for vibrations, observing for wear or damage, incorrect tension

conditions include: cracking, wear, loose or broken fasteners, damaged pulleys, contaminated belt

tools include: belt deflection gauges, vernier caliper, tape measure, torque wrench, sonic tension meter

causes of failure include: incorrect tension, misalignment, wear, debris damage, contamination

servicing procedures are: adjust or replace components

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
F-19.03.01L	demonstrate knowledge of final drive belts and pulleys, and their characteristics, applications and operation	identify final drive belts and pulleys, and describe their characteristics and applications
		describe final drive belt and pulley operation
F-19.03.02L	demonstrate knowledge of procedures to diagnose final drive belts and pulleys	identify ***tools*** used to diagnose final drive belts and pulleys, and describe their procedures for use
		describe procedures to inspect final drive belts and pulleys
		describe procedures to diagnose final drive belts and pulleys
		describe manufacturers' ***servicing procedures*** for final drive belts and pulleys
		describe workplace practices and procedures

RANGE OF VARIABLES

tools include: belt deflection gauges, vernier caliper, tape measure, torque wrench, sonic tension meter

servicing procedures are: adjust or replace components

TASK F-20 Services final drive

TASK DESCRIPTOR

Motorcycle technicians are required to maintain and replace chains, belts and sprockets on a regular basis.

F-20.01 Services final drive chain and sprockets

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
F-20.01.01P	adjust chain	chain is adjusted according to manufacturers' specifications and procedures using ***tools and equipment***
F-20.01.02P	remove and install chain	chain is removed and installed according to manufacturers' specifications and procedures using ***tools and equipment***
F-20.01.03P	remove and install sprockets	sprockets are removed and installed according to manufacturers' specifications and procedures using ***tools and equipment***
F-20.01.04P	align chain and wheel	chain and wheel is aligned according to manufacturers' specifications and procedures using wheel alignment tools
F-20.01.05P	adjust chain	chain is adjusted according to manufacturers' specifications and procedures

RANGE OF VARIABLES

tools and equipment include: vernier caliper, tape measures, grinders, chain breaking tools, riveting tools, pliers, torque wrenches, ruler

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
F-20.01.01L	demonstrate knowledge of final drive chain and sprockets and their characteristics, applications and operation	identify final drive chain and sprockets, and describe their characteristics, sizes and applications
		identify ***types of final drive chains***, and describe their characteristics and applications

		describe final drive chain and sprocket operation
		explain final drive ratio
F-20.01.02L	demonstrate knowledge of procedures to service final drive chains and sprockets	identify ***tools and equipment*** used to service final drive chains and sprockets, and describe their procedures for use
		describe manufacturers' ***servicing procedures*** for final drive chains and sprockets
		describe workplace practices and procedures

RANGE OF VARIABLES

types of final drive chains include: O-ring, non O-ring
tools and equipment include: vernier caliper, tape measures, grinders, chain breaking tools, riveting tools, pliers, torque wrenches, ruler
servicing procedures are: adjust or replace components

F-20.02 Services final drive shaft and gears

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
F-20.02.01P	remove and replace shaft drive fluid	shaft drive fluid is removed and replaced according to manufacturers' specifications and procedures using ***tools***
F-20.02.02P	remove and replace ***final drive shaft and gear components***	***final drive shaft and gear components*** are removed and replaced according to manufacturers' specifications and procedures using ***tools***
F-20.02.03P	replace and adjust gears	gears are replaced and adjusted according to manufacturers' specifications using ***tools***

RANGE OF VARIABLES

tools include: micrometers, dial gauges, vernier caliper, manufacturers' specialty tools, machinist dye, torque wrench
final drive shaft and gear components include: shafts, universal joints, bearings, seals, gears, shims

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
F-20.02.01L	demonstrate knowledge of final drive shaft and gears, and their ***components***, characteristics, applications and operation	identify final drive shaft and gears, and describe their characteristics and applications
		identify ***final drive shaft and gear components***, and describe their characteristics and applications
		describe operation of final drive shaft and gears
F-20.02.02L	demonstrate knowledge of procedures to service final drive shaft and gears	identify ***tools*** used to service final drive shaft and gears, and describe their procedures for use
		describe manufacturers' ***servicing procedures*** for final drive shaft and gears
		describe workplace practices and procedures

RANGE OF VARIABLES

final drive shaft and gear components include: shafts, universal joints, bearings, seals, gears, shims

tools include: micrometers, dial gauges, vernier caliper, manufacturers' specialty tools, machinist dye, torque wrench

servicing procedures include: adjust backlash, adjust tooth contact pattern, replace gears and joints, adjust bearing preload

F-20.03 Services final drive belt and pulleys

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
F-20.03.01P	adjust belt	belt is adjusted according to manufacturers' specifications and procedures using ***tools***
F-20.03.02P	remove and install belt	belt is removed and installed according to manufacturers' specifications and procedures using ***tools***
F-20.03.03P	remove and install pulleys	pulleys are removed and installed according to manufacturers' specifications and procedures using ***tools***

F-20.03.04P	align belt and wheel	belt and wheel are aligned according to manufacturers' specifications and procedures using ***tools***
F-20.03.05P	adjust belt tension	belt tension is adjusted according to manufacturers' specifications and procedures using ***tools***

RANGE OF VARIABLES

tools include: belt deflection gauges, vernier caliper, tape measure, torque wrench, sonic tension meter, hand tools

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
F-20.03.01L	demonstrate knowledge of final drive belt and pulleys and their characteristics, applications and operation	identify final drive belt and pulleys, and describe their characteristics and applications
		describe final drive belt and pulley operation
F-20.03.02L	demonstrate knowledge of procedures to service final drive belt and pulleys	identify ***tools*** used to service final drive belt and pulleys, and describe their procedures for use
		describe manufacturers' ***servicing procedures*** for final drive belt and pulleys
		describe procedure for removal of rear swing arm systems
		describe workplace practices and procedures

RANGE OF VARIABLES

tools include: belt deflection gauges, vernier caliper, tape measure, torque wrench, sonic tension meter, hand tools

servicing procedures are: adjust, replace, clean

MAJOR WORK ACTIVITY G

Maintains electrical systems

TASK G-21 Diagnoses electrical systems

TASK DESCRIPTOR

Electrical systems communicate with all electrical controls and commands that are part of motorcycle operations. Motorcycle technicians are required to have advanced knowledge of electrical systems to efficiently diagnose a variety of electrical problems.

G-21.01 Diagnoses battery and charging system

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
G-21.01.01P	inspect for ***faults*** related to battery and charging system	battery and charging systems are inspected for ***faults*** by performing ***sensory inspections*** and using ***diagnostic tools***
G-21.01.02P	perform ***measurements*** using ***diagnostic tools***	***measurements*** are performed using ***diagnostic tools*** according to manufacturers' specifications
G-21.01.03P	determine ***causes of failure*** of battery and charging system	***causes of failure*** of battery and charging system are determined according to interpretation of diagnostic results
G-21.01.04P	determine ***servicing procedures***	***servicing procedures*** are determined according to manufacturers' specifications

RANGE OF VARIABLES

faults include: dim lights, high or low battery voltage, corrosion, melted connectors, burnt windings, battery plate sulphating

sensory inspections include: listening for abnormal noises, smelling for abnormal odours, observing lights

diagnostic tools include: multimeter, hydrometer, battery analyser, diagnostic software

measurements include: resistance/voltage drop, load testing, voltage output

causes of failure include: loose terminals, plate distortion, shorted or open wires, improper installation

servicing procedures include: repair or replace components

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
G-21.01.01L	demonstrate knowledge of battery and charging systems, their ***components***, characteristics, applications and operation	identify ***types of batteries***, and describe their characteristics and applications
		identify ***types of charging systems***, and describe their characteristics and applications
		identify ***charging system components***, and describe their characteristics and applications
		describe charging system operation
		describe safe handling and disposal of batteries
G-21.01.02L	demonstrate knowledge of procedures to diagnose battery and charging systems	identify ***diagnostic tools*** used to diagnose battery and charging systems, and describe their procedures for use
		describe procedures to inspect battery and charging systems
		describe procedures to diagnose battery and charging systems
		describe manufacturers' ***servicing procedures*** for battery and charging systems
		describe workplace practices and procedures

RANGE OF VARIABLES

types of batteries include: absorbed glass mat (AGM), lead acid, gel cell, lithium ion

types of charging systems include: alternator, generator

charging system components include: rotor, stator, regulator/rectifier, battery cables

diagnostic tools include: multimeter, hydrometer, battery analyser, diagnostic software

servicing procedures include: repair or replace components

G-21.02 Diagnoses electrical ancillary and accessory components

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
G-21.02.01P	inspect for ***faults***	electrical ***ancillary*** and ***accessory components*** are inspected for ***faults*** by performing ***sensory inspections*** and using ***diagnostic tools***
G-21.02.02P	determine ***causes of failure***	***causes of failure*** of ***ancillary*** and ***accessory components*** are determined according to interpretation of diagnostic results
G-21.02.03P	determine ***servicing procedure***	***servicing procedures*** are determined according to manufacturers' specifications, and workplace practices and procedures

RANGE OF VARIABLES

faults include: failure or intermittent functioning, corrosion, short or open circuit, damaged wiring and connectors

ancillary components include: lights, horns, signal systems

accessory components include: audio system, cruise control, security systems, heated hand grips, heated and inflatable seats, powered windshields, Global Positioning System (GPS)

sensory inspections include: listening for abnormal noises, smelling for burnt odours, observing for loose or broken accessories, observing lights for brightness

diagnostic tools include: multimeter, diagnostic software

causes of failure include: corrosion, broken wires, defective controls, improper installation

servicing procedures include: repair or replace components

KNOWLEDGE

	Learning Outcomes	Learning Objectives
G-21.02.01L	demonstrate knowledge of ***ancillary*** and ***accessory components***, and their characteristics, applications and operation	identify ***ancillary components***, and describe their characteristics and applications
		identify ***accessory components***, and describe their characteristics and applications
		describe operation of ***ancillary*** and ***accessory components***
G-21.02.02L	demonstrate knowledge of procedures to diagnose ***ancillary*** and ***accessory components***	identify ***diagnostic tools*** used to diagnose ***ancillary*** and ***accessory components***, and describe their procedures for use

	describe procedures to inspect ***ancillary*** and ***accessory components***
	describe procedures to diagnose ***ancillary*** and ***accessory components***
	describe manufacturers' ***servicing procedures*** for ***ancillary*** and ***accessory components***
	describe workplace practices and procedures

RANGE OF VARIABLES

ancillary components include: lights, horns, signal systems

accessory components include: audio system, cruise control, security systems, heated hand grips, heated and inflatable seats, powered windshields, Global Positioning System (GPS)

diagnostic tools include: multimeter, diagnostic software

servicing procedures include: repair or replace components

G-21.03 Diagnoses wiring harness systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
G-21.03.01P	inspect for ***faults***	wiring harness systems are inspected for ***faults*** by performing ***sensory inspections*** and using ***diagnostic tools***
G-21.03.02P	determine ***causes of failure***	***causes of failure*** of wiring harness systems are determined according to interpretation of diagnostic results
G-21.03.03P	determine ***servicing procedure***	***servicing procedures*** are determined according to manufacturers' specifications, and workplace practices and procedures

RANGE OF VARIABLES

faults include: pinched, cut, broken, corroded, melted and rubbed through wires, loose connectors, short circuits, open circuits

sensory inspections include: smelling for burnt odours, observing for burnt wires, observing for loose or broken connections

diagnostic tools include: multimeter, diagnostic software

causes of failure include: broken wires, loose connectors, incorrect routing, accident damage

servicing procedures include: repair or replace components

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
G-21.03.01L	demonstrate knowledge of wiring harness systems and their ***components***, characteristics and applications	identify wiring harness systems, and describe their characteristics and applications
		identify ***components*** of wiring harness systems, and describe their characteristics and applications
G-21.03.02L	demonstrate knowledge of ***procedures to diagnose*** wiring harness systems	identify diagnostic tools used to diagnose wiring harness systems, and describe their procedures for use
		describe procedures to inspect wiring harness systems
		describe ***procedures to diagnose*** wiring harness systems
		describe manufacturers' ***servicing procedures*** for wiring harness systems
		describe workplace practices and procedures

RANGE OF VARIABLES

components include: wires, diodes, resistors, terminals, connectors, insulators
procedures to diagnose include: checking voltage drop, current draw, open and shorted circuits
servicing procedures include: repair or replace components

G-21.04 Diagnoses ignition system

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
G-21.04.01P	inspect for ***faults***	ignition system is inspected for ***faults*** by performing ***sensory inspections*** and using ***diagnostic tools***
G-21.04.02P	perform ***checks and measurements***	***checks and measurements*** are performed according to manufacturers' specifications
G-21.04.03P	determine ***causes of failure***	***causes of failure*** of ignition system are determined according to interpretation of diagnostic results
G-21.04.04P	determine ***servicing procedure***	***servicing procedures*** are determined according to manufacturers' specifications

RANGE OF VARIABLES

faults include: loss of spark, intermittent spark, failure to advance

sensory inspections include: listening for arcing, checking for spark

diagnostic tools include: peak voltage meters, multimeters, spark checker, diagnostic software, timing light

checks and measurements include: coil resistance, source coil, pulse coil output voltage

causes of failure include: open and shorted circuits, corrosion, defective components

servicing procedures include: adjust, repair or replace components

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
G-21.04.01L	demonstrate knowledge of ignition systems and their ***components***, characteristics, applications and operation	identify ***types of ignition systems***, and describe their characteristics and applications
		identify ***ignition system components***, and describe their characteristics and applications
		describe ignition system operation
G-21.04.02L	demonstrate knowledge of procedures to diagnose ignition systems	identify ***diagnostic tools*** used to diagnose ignition systems, and describe their procedures for use
		describe procedures to inspect ignition systems
		describe procedures to diagnose ignition systems
		describe manufacturers' ***servicing procedures*** for ignition systems
		describe workplace practices and procedures

RANGE OF VARIABLES

ignition system components include: source, pulse and ignition coils, capacitor discharge ignition (CDI) units, transistor control ignition (TCI) units, ECU, spark plugs

types of ignition systems include: digital, CDI, alternating current (AC), direct current (DC), TCI

diagnostic tools include: peak voltage meters, multimeters, spark checker, diagnostic software, timing light

servicing procedures include: adjust, repair or replace components

G-21.05 Diagnoses electric starting system

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
G-21.05.01P	inspect for ***faults***	starting system is inspected for ***faults*** by performing ***sensory inspections*** and using ***diagnostic tools***
G-21.05.02P	perform ***checks and measurements***	***checks and measurements*** are performed according to manufacturers' specifications
G-21.05.03P	determine ***causes of failure***	***causes of failure*** of electric starting system are determined according to interpretation of diagnostic results
G-21.05.04P	determine ***servicing procedure***	***servicing procedures*** are determined according to manufacturers' specifications

RANGE OF VARIABLES

faults include: slow or excessive starter motor revolution, excessive current draw, no function

sensory inspections include: listening for abnormal sounds, smelling for abnormal odours, observing for loose connections

diagnostic tools include: multimeter, test light

checks and measurements include: wire resistance, cold cranking amperage, voltage drop

causes of failure include: open circuits, short circuits, corrosion, excessive draw, pinion misalignment, contamination due to leaking seals

servicing procedures include: repair or replace components

KNOWLEDGE

	Learning Outcomes	Learning Objectives
G-21.05.01L	demonstrate knowledge of electric starting systems and their ***components***, characteristics, applications and operation	identify ***electric starting system components***, and describe their characteristics and applications
		describe electric starting system operation
G-21.05.02L	demonstrate knowledge of procedures to diagnose electric starting systems and ***components***	identify ***diagnostic tools*** used to diagnose electric starting systems, and describe their procedures for use
		describe procedures to inspect electric starting systems
		describe procedures to diagnose electric starting systems

	describe manufacturers' ***servicing procedures*** for electric starting systems
	describe workplace practices and procedures

RANGE OF VARIABLES

electric starting system components include: armature, solenoids, brushes, bearings, starter gears, sprag clutch, decompressors, battery cables, fasteners

diagnostic tools include: multimeter, test light

servicing procedures include: repair or replace components

TASK G-22 Services electrical systems

TASK DESCRIPTOR

Electrical systems communicate all electrical controls and commands that are part of motorcycle operations. Motorcycle technicians require advanced knowledge of electrical systems to efficiently service and repair a variety of electrical problems.

G-22.01 Services battery and charging system

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
G-22.01.01P	replace battery and ***charging system components***	battery and ***charging system components*** are replaced according to manufacturers' specifications and customer preference
G-22.01.02P	clean posts, top up electrolyte	posts are cleaned and electrolyte topped-up according to battery type
G-22.01.03P	charge batteries	batteries are charged according to battery type and manufacturers' specifications
G-22.01.04P	recondition components	components are reconditioned by following ***procedures*** according to manufacturers' specifications
G-22.01.05P	reassemble ***charging system components***	***charging system components*** are reassembled according to manufacturers' specifications

RANGE OF VARIABLES

charging system components include: rotor, stator, regulator/rectifier, battery, cables
procedures (reconditioning) include: dressing armatures, lubricating bushings, cleaning brushes

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
G-22.01.01L	demonstrate knowledge of battery and charging systems and their ***components***, characteristics, applications and operation	identify ***types of batteries***, and describe their characteristics and applications
		identify ***types of charging systems***, and describe their characteristics and applications
		identify ***charging system components***, and describe their characteristics and applications
		describe charging system operation
		describe methods for safe handling and disposal of batteries
G-22.01.02L	demonstrate knowledge of procedures to service battery and charging systems	identify tools and equipment used to service battery and charging systems, and describe their procedures for use
		describe manufacturers' ***servicing procedures*** for battery and charging systems
		describe workplace practices and procedures

RANGE OF VARIABLES

charging system components include: rotor, stator, regulator/rectifier, battery, cables
types of batteries include: AGM, lead acid, gel cell, lithium ion
types of charging systems include: alternator, generator
servicing procedures include: repair, recondition and replace components, charge batteries

G-22.02 Services electrical ancillary and accessory components

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
G-22.02.01P	remove and replace electrical ***ancillary*** and ***accessory components***	electrical ***ancillary*** and ***accessory components*** are removed and replaced according to manufacturers' specifications
G-22.02.02P	recondition electrical ***ancillary*** and ***accessory components***	electrical ***ancillary*** and ***accessory components*** are reconditioned by cleaning, sealing, insulating according to workplace practices and procedures
G-22.02.03P	adjust electrical ***ancillary*** and ***accessory components***	electrical ***ancillary*** and ***accessory components*** are adjusted according to manufacturers' specifications
G-22.02.04P	set up and configure electrical ***ancillary*** and ***accessory components***	electrical ***ancillary*** and ***accessory components*** are set up and configured according to manufacturers' specifications

RANGE OF VARIABLES

ancillary components include: lights, horns, signal systems

accessory components include: audio system, cruise control, security systems, heated hand grips, heated and inflatable seats, powered windshields, GPS

KNOWLEDGE

	Learning Outcomes	Learning Objectives
G-22.02.01L	demonstrate knowledge of ***ancillary*** and ***accessory components***, and their characteristics, applications and operation	identify ***ancillary components***, and describe their characteristics and applications
		identify ***accessory components***, and describe their characteristics and applications
		describe operation of ***ancillary*** and ***accessory components***
G-22.02.02L	demonstrate knowledge of procedures to service ***ancillary*** and ***accessory components***	identify ***tools and equipment*** used to service ***ancillary*** and ***accessory components***, and describe their procedures for use

	describe manufacturers' ***servicing procedures*** for ***ancillary*** and ***accessory components***
	describe workplace practices and procedures

RANGE OF VARIABLES

ancillary components include: lights, horns, signal systems

accessory components include: audio system, cruise control, security systems, heated hand grips, heated and inflatable seats, powered windshields, GPS

tools and equipment include: multimeter, scan tool, hand tools

servicing procedures include: recondition, adjust, configure, replace components

G-22.03 Services wiring harness systems

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
G-22.03.01P	repair wiring harness systems	wiring harness is repaired by soldering, crimping, splicing and insulating according to workplace practices and procedures
G-22.03.02P	replace ***wiring harness system components***	***wiring harness system components*** are replaced according to workplace practices and procedures, and manufacturers' specifications
G-22.03.03P	resolve ***causes of failure***	***causes of failure*** are resolved by rerouting, sealing and insulating harness according to manufacturers' specifications

RANGE OF VARIABLES

wiring harness system components include: wires, diodes, resistors, terminals, connectors, insulators, fuses

causes of failure include: broken wires, loose connectors, incorrect routing, accident damage

KNOWLEDGE

	Learning Outcomes	Learning Objectives
G-22.03.01L	demonstrate knowledge of wiring harness systems and their ***components***, characteristics and applications	identify wiring harness systems, and describe their characteristics and applications
		identify ***wiring harness system components***, and describe their characteristics and applications

G-22.03.02L	demonstrate knowledge of procedures to service wiring harness systems	identify tools and equipment used to service wiring harness systems, and describe their procedures for use
		describe manufacturers' ***servicing procedures*** for wiring harness systems
		describe workplace practices and procedures

RANGE OF VARIABLES

wiring harness system components include: wires, diodes, resistors, terminals, connectors, insulators, fuses

servicing procedures include: repair, replace, seal, crimp, insulate, solder

G-22.04 Services ignition system

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
G-22.04.01P	replace ***ignition system components***	***ignition system components*** are replaced according to manufacturers' specifications
G-22.04.02P	perform ***adjustments***	***adjustments*** are performed according to manufacturers' specifications and while monitoring results from scan tool
G-22.04.03P	correct ***causes of failure***	***causes of failure*** are corrected according to manufacturers' specifications
G-22.04.04P	verify repair	repair is verified by monitoring results from scan tool

RANGE OF VARIABLES

ignition system components include: source, pulse and ignition coils, CDI units, TCI units, ECU, spark plugs

adjustments include: spark plugs gap, pulse coil air gap, throttle position sensor (TPS)

causes of failure include: open or shorted circuits, corrosion, defective components

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
G-22.04.01L	demonstrate knowledge of ignition systems and their ***components***, characteristics and applications	identify ***types of ignition systems***, and describe their characteristics and applications
		identify ***ignition system components***, and describe their characteristics and applications
G-22.04.02L	demonstrate knowledge of procedures to service ignition systems	identify ***tools and equipment*** used to service ignition systems, and describe their procedures for use
		describe manufacturers' ***servicing procedures*** for ignition systems
		describe workplace practices and procedures

RANGE OF VARIABLES

ignition system components include: source, pulse and ignition coils, CDI units, TCI units, ECU, spark plugs
types of ignition systems include: digital, CDI, AC, DC, TCI
tools and equipment include: multimeter, scan tool
servicing procedures include: adjust, repair or replace components

G-22.05 Services electric starting system

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
G-22.05.01P	remove and replace ***electric starting system components***	***electric starting system components*** are removed and replaced according to manufacturers' specifications
G-22.05.02P	recondition components	components are reconditioned by following ***procedures***
G-22.05.03P	perform ***measurements***	***measurements*** are performed using a multimeter according to workplace practices and procedures
G-22.05.04P	resolve ***causes of failure***	***causes of failure*** is resolved according to manufacturers' specifications, and workplace practices and procedures

RANGE OF VARIABLES

electric starting system components include: armature, solenoids, brushes, bearings, starter gears, sprag clutch, decompressors, battery cables, fasteners

procedures (reconditioning) include: dressing armature, lubricating bushings, cleaning and replacing brushes

measurements include: current draw, resistance

causes of failure include: excessive draw, pinion misalignment, contamination due to leaking seals

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
G-22.05.01L	demonstrate knowledge of electric starting systems and their ***components***, characteristics, applications and operation	identify ***electric starting system components***, and describe their characteristics and applications
		describe electric starting system operation
G-22.05.02L	demonstrate knowledge of procedures to service electric starting systems	identify ***tools and equipment*** used to service electric starting systems, and describe their procedures for use
		describe manufacturers' ***servicing procedures*** for electric starting systems
		describe workplace practices and procedures

RANGE OF VARIABLES

electric starting system components include: armature, solenoids, brushes, bearings, starter gears, sprag clutch, decompressors, battery cables, fasteners

tools and equipment include: multimeter, hand tools

servicing procedures include: repair, recondition and replace components

MAJOR WORK ACTIVITY H

Maintains vehicle management systems

TASK H-23 Diagnoses vehicle management systems

TASK DESCRIPTOR

Vehicle management systems use several ECUs to control the integration of many functions in the operation of the motorcycle such as fuel injection, ignition control, meter displays, anti-theft management, traction control and ABS. These ECUs communicate with each other through a Controller Area Network (CAN) bus system. Motorcycle technicians use special tools such as multimeters, diagnostic software and computers to diagnose and identify faults within the systems.

H-23.01 Reads fault codes

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
H-23.01.01P	check malfunction indicator light (MIL)	MIL status (current or historic) is checked
H-23.01.02P	check for ***fault codes***	***fault codes*** are checked using diagnostic software according to manufacturers' procedures
H-23.01.03P	determine meaning of ***fault codes***	meaning of ***fault codes*** is determined according to manufacturers' specifications
H-23.01.04P	record ***fault code*** history	***fault code*** history is recorded to keep track of faults to be repaired according to workplace practices
H-23.01.05P	clear ***fault codes***	***fault codes*** are cleared according to manufacturers' procedures

RANGE OF VARIABLES

fault codes include: engine, braking systems, traction control systems, displays, suspension

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
H-23.01.01L	demonstrate knowledge of ***fault codes*** and ***vehicle management systems***	identify ***fault codes*** (universal and proprietary)
		identify ***types of vehicle management systems***, and describe their characteristics and applications
		describe vehicle management systems operation
		explain interrelationships among vehicle management systems (via CAN bus system)
		identify ***types of vehicle management system components***, and describe their characteristics and applications
		explain relationship between ECU and ***emissions system components***
		explain relationship between fault indicator codes
		identify operating voltages of system
H-23.01.02L	demonstrate knowledge of procedures to read ***fault codes***	identify tools and equipment used to diagnose ***fault codes***
		describe manufacturers' procedures for using diagnostic software
		describe procedures to retrieve and identify ***fault codes***
		describe workplace practices and procedures

RANGE OF VARIABLES

fault codes include: engine, braking systems, traction control systems, displays, suspension

types of vehicle management systems include: fuel injection, suspension, meter displays, ignition control, anti-theft management, shift control, traction control, ABS

types of vehicle management system components include: O_2 sensors, crank position sensors, immobilizer units, wheel speed sensors, ABS brake pressure sensors, inertial management unit (IMU), stability control module, CAN bus

emissions system components include: air injection system (AIS), O_2 sensors

H-23.02 Interprets fault code results

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
H-23.02.01P	determine which ***fault codes*** to investigate first	***fault codes*** to investigate first are determined according to relationship among fault indicator codes
H-23.02.02P	confirm electrical system and vehicle management system repairs	electrical system and vehicle management system repairs are confirmed by comparing ***fault codes*** that occur after repair with fault code history
H-23.02.03P	determine most likely areas of failure	most likely areas of failure are determined according to ***fault codes***

RANGE OF VARIABLES

fault codes include: engine, braking systems, traction control systems, displays, suspension

KNOWLEDGE

	Learning Outcomes	Learning Objectives
H-23.02.01L	demonstrate knowledge of ***fault codes*** and vehicle management systems	identify ***fault codes*** (universal and proprietary)
		identify ***types of vehicle management systems***, and describe their characteristics and applications
		describe vehicle management systems operation
		explain interrelationships among vehicle management systems (via CAN bus system)
		identify ***types of vehicle management system components***, and describe their characteristics and applications
		explain relationship between ECU and ***emissions system components***
		explain relationship between fault indicator codes
		identify operating voltages of system
H-23.02.02L	demonstrate knowledge of procedures to interpret fault code results	identify tools and equipment used to interpret fault code results, and describe their procedures for use

	describe procedures to interpret fault code results
	describe workplace practices and procedures

RANGE OF VARIABLES

fault codes include: engine, braking systems, traction control systems, displays, suspension

types of vehicle management systems include: fuel injection, suspension, meter displays, ignition control, anti-theft management, shift control, traction control, ABS

types of vehicle management system components include: O_2 sensors, crank position sensors, immobilizer units, wheel speed sensors, ABS brake pressure sensors, IMU, stability control module, CAN bus

emissions system components include: AIS, O_2 sensors

H-23.03 Tests system circuitry and components

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
H-23.03.01P	locate, identify and investigate ***vehicle management system components*** and circuits indicated by fault code	***vehicle management system components*** and circuits indicated by fault code are located, identified and investigated according to manufacturers' specifications
H-23.03.02P	test sensors and circuitry (individual and networked)	sensors and circuitry's functions, continuity, voltage drop and resistance are tested against specifications using ***diagnostic tools***

RANGE OF VARIABLES

vehicle management system components include: O_2 sensors, crank position sensors, immobilizer units, wheel speed sensors, ABS brake pressure sensors, IMU, stability control module, CAN bus

diagnostic tools include: multimeters, diagnostic software, breakout boxes

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
H-23.03.01L	demonstrate knowledge of system circuitry and ***vehicle management system components***, and their characteristics and applications	identify system circuitry and ***vehicle management system components***, and describe their characteristics and applications
		identify ***types of vehicle management systems***, and describe their characteristics and applications
		describe vehicle management systems operation
		explain interrelationships among vehicle management systems
		explain relationship between ECU and ***emissions system components***
		explain relationship between fault indicator codes
		identify operating voltages of system
H-23.03.02L	demonstrate knowledge of procedures to test system circuitry and ***vehicle management system components***	identify ***diagnostic tools*** used to test system circuitry and ***vehicle management system components***, and describe their procedures for use
		describe testing procedures for system circuitry and components
		describe workplace practices and procedures

RANGE OF VARIABLES

vehicle management system components include: O_2 sensors, crank position sensors, immobilizer units, wheel speed sensors, ABS brake pressure sensors, IMU, stability control module, CAN bus

types of vehicle management systems include: fuel injection, suspension, meter displays, ignition control, anti-theft management, shift control, traction control, ABS

emissions system components include: AIS, O_2 sensors

diagnostic tools include: multimeters, diagnostic software, breakout boxes

TASK H-24 Services vehicle management systems

TASK DESCRIPTOR

Modern motorcycles' advanced vehicle management systems require up-to-date software to optimize their functioning. Motorcycle technicians need to update this software as part of their service work on these systems. They also perform maintenance and repairs to system circuitry and components in these systems.

H-24.01 Updates software

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
H-24.01.01P	verify most recent version of software	most recent version of software is identified according to manufacturers' online specifications
H-24.01.02P	identify scan tool	scan tool applicable to vehicle data port is used
H-24.01.03P	program and configure individual modules	individual modules are programmed and configured using manufacturers' information and data
H-24.01.04P	verify operation of updated modules	operation of updated modules is verified by matching software code to manufacturers' online specifications

KNOWLEDGE

	Learning Outcomes	Learning Objectives
H-24.01.01L	demonstrate knowledge of software updates and reprogramming software	identify software versions
		identify methods used to access, transfer and reprogram software
H-24.01.02L	demonstrate knowledge of vehicle management systems	identify ***types of vehicle management systems***, and describe their characteristics and applications
		describe vehicle management systems operation
		describe workplace practices and procedures

RANGE OF VARIABLES

types of vehicle management systems include: fuel injection, suspension, meter displays, ignition control, anti-theft management, shift control, traction control, ABS

H-24.02 Services system circuitry and components

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
H-24.02.01P	service wiring	wiring is serviced by crimping, soldering or replacing using ***tools***
H-24.02.02P	seal connectors	connectors are sealed with ***sealing materials*** according to workplace practices and procedures
H-24.02.03P	insulate repaired wiring	repaired wiring is insulated using ***insulating materials*** according to workplace practices and procedures
H-24.02.04P	adjust TPS	TPS is adjusted according to manufacturers' specifications using ***tools***
H-24.02.05P	clear ***fault codes***	***fault codes*** are cleared according to manufacturers' procedures

RANGE OF VARIABLES

tools (to service wire) include: soldering guns, crimping tools, connector release tools
sealing materials include: dielectric grease, O-rings, heat shrink tubing
insulating materials include: electrical tape, conduit, heat shrink tubing
tools (to adjust TPS) include: multimeters, diagnostic software, hand tools
fault codes include: engine, braking systems, traction control systems, displays, suspension

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
H-24.02.01L	demonstrate knowledge of system circuitry and components, and their characteristics and applications	identify system circuitry and components, and describe their characteristics and applications
		identify ***types of vehicle management systems***, and describe their characteristics and applications
		describe vehicle management systems operation

		explain interrelationships among vehicle management systems (via CAN bus system)
		identify ***types of vehicle management system components***, and describe their characteristics and applications
		explain relationship between ECU and ***emissions system components***
		explain relationship between fault indicator codes
		identify operating voltages of system
H-24.02.02L	demonstrate knowledge of procedures to service system circuitry and components	identify ***tools and equipment*** used to service system circuitry and components, and describe their procedures for use
		describe servicing procedures for system circuitry and components
		describe manufacturers' procedures
		describe workplace practices and procedures

RANGE OF VARIABLES

types of vehicle management systems include: fuel injection, suspension, meter displays, ignition control, anti-theft management, shift control, traction control, ABS

types of vehicle management system components include: O_2 sensors, crank position sensors, ECU, immobilizer units, wheel speed sensors, ABS brake pressure sensors, IMU, stability control module, CAN bus

emissions system components include: AIS, O_2 sensors

tools and equipment (for servicing system circuitry) include: soldering guns, crimping tools, connector release tools, multimeters, diagnostic software

MAJOR WORK ACTIVITY I

Maintains fuel and exhaust systems

TASK I-25 Diagnoses fuel and exhaust systems

TASK DESCRIPTOR

Motorcycle technicians diagnose fuel and exhaust systems malfunctions. Diagnosing includes the use of special tools and equipment, and the interpretation of diagnostic results.

I-25.01 Diagnoses fuel tanks and components

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
I-25.01.01P	verify ***failure conditions***	fuel tanks and components are inspected to determine ***failure conditions*** by performing ***sensory inspections*** and using measuring tools
I-25.01.02P	perform ***checks and measurements***	***checks and measurements*** are performed on ***fuel tank components*** according to manufacturers' specifications
I-25.01.03P	determine causes of failure of ***fuel tanks*** and ***components***	causes of failure of ***fuel tanks*** and ***components*** are determined according to interpretation of diagnostic results
I-25.01.04P	determine servicing procedure	servicing procedures are determined according to manufacturers' specifications

RANGE OF VARIABLES

failure conditions include: rust in tank, clogged filters, leaks

sensory inspections include: detecting fuel pump malfunction, fuel leaks, fuel condition

checks and measurements include: pressure, volume, sending unit operation, vacuum operation

fuel tank components include: petcocks, pumps, valves, sending units, filler caps, fuel evaporative system (EVAP)

fuel tanks include: steel, aluminum, composite

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
I-25.01.01L	demonstrate knowledge of ***fuel tanks*** and their ***components***, characteristics, applications and operation	identify ***fuel tanks***, and describe their characteristics and applications
		identify ***fuel tank components***, and describe their characteristics and applications
		describe ***fuel tank*** operation
		describe ***fuel tank components*** operation
I-25.01.02L	demonstrate knowledge of procedures to diagnose ***fuel tanks*** and ***components***	identify tools and equipment used to diagnose ***fuel tanks*** and ***components***, and describe their procedures for use
		describe procedures to inspect ***fuel tanks*** and ***components***
		describe procedures to diagnose ***fuel tanks*** and ***components***
		describe manufacturers' servicing procedures for ***fuel tanks*** and ***components***
		describe workplace practices and procedures

RANGE OF VARIABLES

fuel tanks include: steel, aluminum, composite
fuel tank components include: petcocks, pumps, valves, sending units, filler caps, EVAP

I-25.02 Diagnoses air delivery system

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
I-25.02.01P	verify operation of system and detect ***problems***	operation of system is verified and ***problems*** detected by performing sensory inspection
I-25.02.02P	perform ***checks and measurements***	***checks and measurements*** are performed according to manufacturers' specifications

I-25.02.03P	evaluate ***failure conditions***	***failure conditions*** are evaluated by disassembling components
I-25.02.04P	determine ***servicing procedures***	***servicing procedures*** are determined according to manufacturers' specifications

RANGE OF VARIABLES

problems include: vacuum leaks, pressure leaks, bearing wear, cracks in fittings, incorrect fitting of components

checks and measurements include: induction air leak test, pressure tests, air flow tests, clearances, tolerances

failure conditions include: deterioration due to contamination, warped surfaces, restrictions, scored surfaces

servicing procedures include: replace, repair and adjust components

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
I-25.02.01L	demonstrate knowledge of ***air delivery systems*** and their ***components***, characteristics, applications and operation	identify ***air delivery systems***, and describe their characteristics and applications
		identify ***air delivery system components***, and describe their characteristics and applications
		describe ***air delivery system*** operation
I-25.02.02L	demonstrate knowledge of procedures to diagnose ***air delivery systems***	identify tools and equipment used to diagnose ***air delivery systems***, and describe their procedures for use
		describe procedures to inspect ***air delivery systems***
		describe procedures to diagnose ***air delivery systems***
		describe manufacturers' ***servicing procedures*** for air delivery systems
		describe workplace practices and procedures

RANGE OF VARIABLES

air delivery systems include: forced air induction, naturally aspirated, variable intake runners

air delivery system components include: air filter, air box, air sensors, ducting, intercoolers

servicing procedures include: replace, repair and adjust components

I-25.03 Diagnoses carburetor system

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
I-25.03.01P	determine ***failure conditions***	***failure conditions*** are determined by performing sensory inspection
I-25.03.02P	evaluate ***failure conditions***	***failure conditions*** are evaluated by test driving and inspecting components
I-25.03.03P	perform ***checks and measurements***	***checks and measurements*** are performed according to manufacturers' specifications
I-25.03.04P	determine ***servicing procedures***	***servicing procedures*** are determined according to manufacturers' procedures

RANGE OF VARIABLES

failure conditions include: vacuum leaks, fuel leaks, fuel restrictions, broken linkages, stuck throttle, fuel condition, damaged diaphragms, incorrect assembly, component wear

checks and measurements include: calibration, synchronization, float height

servicing procedures include: replace, repair and adjust components

KNOWLEDGE

	Learning Outcomes	Learning Objectives
I-25.03.01L	demonstrate knowledge of carburetor systems and their ***components***, characteristics, applications and operation	identify ***carburetors***, and describe their characteristics and applications
		identify ***carburetor components***, and describe their characteristics and applications
		describe ***carburetor*** operation
I-25.03.02L	demonstrate knowledge of procedures to diagnose carburetor systems	identify ***tools and equipment*** used to diagnose carburetor systems, and describe their procedures for use
		describe procedures to inspect carburetor systems
		describe procedures to diagnose carburetor systems
		describe manufacturers' ***servicing procedures*** for carburetor systems
		describe workplace practices and procedures

RANGE OF VARIABLES

carburetors include: butterfly, constant velocity, mechanical slide
carburetor components include: float, needle, seat, venturi, jets, slides, diaphragms
tools and equipment include: float level gauge, jet gauges, exhaust gas analyzer, manometers
servicing procedures include: replace, repair and adjust components

I-25.04 Diagnoses fuel injection system

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
I-25.04.01P	determine ***failure conditions***	***failure conditions*** are determined by performing sensory inspection
I-25.04.02P	evaluate ***failure conditions***	***failure conditions*** are evaluated by test driving and inspecting components
I-25.04.03P	perform ***checks and measurements***	***checks and measurements*** are performed according to manufacturers' specifications
I-25.04.04P	determine ***servicing procedures***	***servicing procedures*** are determined according to manufacturers' procedures
I-25.04.05P	perform electrical tests on injectors using ***tools***	injectors are tested using ***tools*** according to manufacturers' procedures

RANGE OF VARIABLES

failure conditions include: clogged injectors, damaged seals, worn linkages, component malfunctions, fuel condition
checks and measurements include: pressure tests, volume tests, injector function
servicing procedures include: replace, repair and adjust components
tools include: multimeter, fuel injector tester

KNOWLEDGE

	Learning Outcomes	Learning Objectives
I-25.04.01L	demonstrate knowledge of ***fuel injection systems*** and their ***components***, characteristics, applications and operation	identify ***fuel injection systems***, and describe their characteristics and applications
		identify ***fuel injection system components***, and describe their characteristics and applications
		describe ***fuel injection system*** operation

I-25.04.02L	demonstrate knowledge of procedures to diagnose ***fuel injection systems***	identify ***tools*** and equipment used to diagnose ***fuel injection systems***, and describe their procedures for use
		describe procedures to inspect ***fuel injection systems***
		describe procedures to diagnose ***fuel injection systems***
		describe ***servicing procedures*** for ***fuel injection systems***
		describe manufacturers' specifications and procedures
I-25.04.03L	demonstrate knowledge of procedures for electrical testing on injectors	describe procedures to test injectors
		describe workplace practices and procedures

RANGE OF VARIABLES

fuel injection systems include: sequential, multi-port, direct
fuel injection system components include: injectors, fuel rail, regulators, throttle body, fuel lines
tools include: multimeter, fuel injector tester
servicing procedures include: replace, repair and adjust components

I-25.05 Diagnoses exhaust system

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
I-25.05.01P	determine ***failure conditions***	***failure conditions*** are determined by performing sensory inspection
I-25.05.02P	evaluate ***failure conditions***	***failure conditions*** are evaluated by test driving and inspecting components
I-25.05.03P	perform ***checks and measurements***	***checks and measurements*** are performed according to manufacturers' specifications
I-25.05.04P	determine ***servicing procedures***	***servicing procedures*** are determined according to manufacturers' procedures

RANGE OF VARIABLES

failure conditions include: exhaust leaks, broken studs, cracks, damaged seals, restrictions, cracked components and gaskets

checks and measurements include: exhaust gas analysis, exhaust control valve check and sound test

servicing procedures include: replace, repair, weld and adjust components

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
I-25.05.01L	demonstrate knowledge of exhaust systems and their ***components***, characteristics, applications and operation	identify exhaust systems, and describe their characteristics and applications
		identify ***exhaust system components***, and describe their characteristics, applications and operation
		describe exhaust system operation
I-25.05.02L	demonstrate knowledge of air injection systems, their characteristics and applications	describe air injection systems operation
I-25.05.03L	demonstrate knowledge of turbo-charged induction system and **components**, their characteristics and applications	identify turbo-charged induction system and **components**, and describe their characteristics and applications
I-25.05.04L	demonstrate knowledge of procedures to diagnose exhaust systems	identify tools and equipment used to diagnose exhaust systems, and describe their procedures for use
		describe procedures to inspect exhaust systems
		describe procedures to diagnose exhaust systems
		describe manufacturers' ***servicing procedures*** for exhaust systems
		describe workplace practices and procedures

RANGE OF VARIABLES

exhaust system components include: muffler, spark arrestor, header pipe, expansion chambers, variable exhaust valves, catalytic converters, O_2 sensors, power valves

turbo-charged induction system components include: wastegates, impellers, seals, bushings, turbo, ducting

servicing procedures include: replace, repair, weld and adjust components

TASK I-26 Services fuel and exhaust systems

TASK DESCRIPTOR

Motorcycle technicians service fuel and exhaust systems to provide optimum engine efficiency and performance. Servicing includes replacing non-serviceable components, reconditioning parts and adjusting settings for maximum efficiency.

I-26.01 Services fuel tanks and components

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
I-26.01.01P	replace ***fuel tank components***	***fuel tank components*** are replaced according to manufacturers' specifications and safe handling procedures
I-26.01.02P	adjust fuel sender	fuel sender is adjusted according to manufacturers' specifications
I-26.01.03P	adjust and replace tank mounting components	tank mounting components are adjusted and replaced according to manufacturers' procedures

RANGE OF VARIABLES

fuel tank components include: petcocks, pumps, valves, sending units, filler caps, EVAP

KNOWLEDGE

	Learning Outcomes	Learning Objectives
I-26.01.01L	demonstrate knowledge of ***fuel tanks*** and their ***components***, characteristics, applications and operation	identify ***fuel tanks***, and describe their characteristics and applications
		identify ***fuel tank components***, and describe their characteristics and applications
		describe ***fuel tank*** operation
I-26.01.02L	demonstrate knowledge of procedures to service ***fuel tanks*** and ***components***	identify ***tools and equipment*** used to service ***fuel tanks*** and ***components***, and describe their procedures for use
		describe ***servicing procedures*** for fuel tanks and components
		describe manufacturers' specifications and procedures

		describe workplace practices and procedures
I-26.01.03L	demonstrate knowledge of safe handling procedures	describe safe handling procedures of fuel and ***fuel tank*** and ***components*** according to jurisdictional requirements

RANGE OF VARIABLES

fuel tanks include: steel, aluminum, plastic

fuel tank components include: petcocks, pumps, valves, sending units, filler caps, EVAP

tools and equipment include: multimeter, pressure gauge, graduated cylinder, stopwatch, apple watch, smart phone

servicing procedures include: replace and repair components

I-26.02 Services air delivery system

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
I-26.02.01P	replace ***faulty components***	***faulty components*** are replaced according to manufacturers' specifications
I-26.02.02P	recondition components	components are reconditioned to service by following ***procedures***
I-26.02.03P	adjust ***settings***	***settings*** are adjusted according to manufacturers' specifications

RANGE OF VARIABLES

faulty components include: worn bearings, cracked fittings, clogged filters, collapsed hoses, leaking seals and gaskets

procedures include: service air filters, clean screens, replace, repair and adjust components

settings include: wastegate valve pressure and belt tension

KNOWLEDGE

	Learning Outcomes	Learning Objectives
I-26.02.01L	demonstrate knowledge of ***air delivery systems*** and their ***components***, characteristics, applications and operation	identify ***air delivery systems***, and describe their characteristics and applications
		identify ***air delivery system components***, and describe their characteristics and applications
		describe ***air delivery system*** operation

I-26.02.02L	demonstrate knowledge of procedures to service ***air delivery systems***	identify tools and equipment used to service ***air delivery systems***, and describe their procedures for use
		describe manufacturers' ***servicing procedures*** for ***air delivery systems***
		describe workplace practices and procedures

RANGE OF VARIABLES

air delivery systems include: forced air induction, naturally aspirated, variable intake runners
air delivery system components include: air filter, air box, air sensors, ducting, intercoolers
servicing procedures include: service air filters, clean screens, replace, repair and adjust components

I-26.03 Services carburetor system

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
I-26.03.01P	replace faulty ***components***	faulty ***components*** are replaced according to extent of deterioration or wear
I-26.03.02P	clean and recondition ***components***	***components*** are cleaned and reconditioned by following ***servicing procedures*** and ***cleaning methods***
I-26.03.03P	adjust ***settings***	***settings*** are adjusted according to manufacturers' specifications

RANGE OF VARIABLES

components include: inlet fuel valves, floats, seals, gaskets, carburetor body, slides, jets, jet needles, venturi, emulsion tubes
servicing procedures include: replace, repair and adjust components
cleaning methods include: chemical, ultrasonic, mechanical
settings include: fuel levels, air/fuel mixtures screws, needle clip position, throttle plate synchronization

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
I-26.03.01L	demonstrate knowledge of carburetor systems and their ***components***, characteristics, applications and operation	identify ***carburetors***, and describe their characteristics and applications
		identify ***carburetor components***, and describe their characteristics and applications
		describe carburetor operation
I-26.03.02L	demonstrate knowledge of procedures to service carburetor systems	identify ***tools and equipment*** used to service carburetor systems, and describe their procedures for use
		describe manufacturers' ***servicing procedures*** for carburetor systems
		describe ***cleaning methods***
		describe workplace practices and procedures

RANGE OF VARIABLES

carburetor components include: inlet fuel valves, floats, seals, gaskets, carburetor body, slides, jets, jet needles, venturi, emulsion tubes

carburetors include: butterfly, constant velocity, mechanical slide

tools and equipment include: float level gauge, jet gauges, exhaust gas analyzer, manometers

servicing procedures include: replace, repair and adjust components

cleaning methods include: chemical, ultrasonic, mechanical

I-26.04 Services fuel injection system

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

	SKILLS	
	Performance Criteria	**Evidence of Attainment**
I-26.04.01P	replace ***components***	***components*** are replaced according to manufacturers' specifications
I-26.04.02P	recondition ***components***	***components*** are reconditioned by following ***procedures***
I-26.04.03P	adjust ***settings***	***settings*** are adjusted according to manufacturers' specifications

RANGE OF VARIABLES

components include: hoses, seals, filters, injectors, throttle bodies

procedures include: clean injectors, clean idle air control passages, decarbonize throttle bodies, clean filters

settings include: throttle plate, air bypass synchronization, idle speed

	KNOWLEDGE	
	Learning Outcomes	**Learning Objectives**
I-26.04.01L	demonstrate knowledge of ***fuel injection systems*** and their ***components***, characteristics, applications and operation	identify ***fuel injection systems***, and describe their characteristics and applications
		identify ***fuel injection system components***, and describe their characteristics and applications
		describe ***fuel injection system*** operation
I-26.04.02L	demonstrate knowledge of procedures to service ***fuel injection systems***	identify ***tools and equipment*** used to service ***fuel injection systems***, and describe their procedures for use
		describe manufacturers' ***servicing procedures*** for ***fuel injection systems***
		describe ***cleaning methods***
		describe workplace practices and procedures

RANGE OF VARIABLES

fuel injection systems include: sequential, multi-port, direct

fuel injection system components include: injectors, fuel rail, regulators, throttle body

tools and equipment include: multimeter, fuel injector cleaner, fuel pressure gauge and tester

servicing procedures include: replace, repair and adjust components

cleaning methods include: chemical, ultrasonic, mechanical

I-26.05 Services exhaust system

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
NV	yes	yes	NV	ND	yes	ND	ND	NV	yes	ND	ND	ND

SKILLS

	Performance Criteria	Evidence of Attainment
I-26.05.01P	replace ***exhaust system components***	***exhaust system components*** are replaced according to manufacturers' procedures
I-26.05.02P	recondition ***exhaust system components***	***exhaust system components*** are reconditioned by following ***procedures***
I-26.05.03P	adjust ***settings***	***settings*** are adjusted according to manufacturers' specifications

RANGE OF VARIABLES

exhaust system components include: muffler, spark arrestor, header pipe, expansion chambers, variable exhaust valves, catalytic converters, O_2 sensors, seals, gaskets

procedures include: decarbonize valves and baffles, recoat surfaces, repack baffles

settings include: adjusting cable free play on power valves, adding/removing baffle plates

KNOWLEDGE

	Learning Outcomes	Learning Objectives
I-26.05.01L	demonstrate knowledge of exhaust systems and their ***components***, characteristics, applications and operation	identify exhaust systems, and describe their characteristics and applications
		identify ***exhaust system components***, and describe their characteristics and applications
		describe exhaust system operation
I-26.05.02L	demonstrate knowledge of air injection systems and their characteristics, applications and operation	describe air injection system characteristics, applications and operation
I-26.05.03L	demonstrate knowledge of turbo-charged induction systems and their ***components***, characteristics, applications and operation	identify turbo-charged induction systems, and describe their characteristics and applications
		identify ***turbo-charged induction system components***, and describe their characteristics and applications
		describe forced induction system operation
I-26.05.04L	demonstrate knowledge of procedures to service exhaust systems	identify tools and equipment used to service exhaust systems, and describe their procedures for use

	describe manufacturers' ***servicing procedures*** for exhaust systems
	describe workplace practices and procedures

RANGE OF VARIABLES

exhaust system components include: muffler, spark arrestor, header pipe, expansion chambers, variable exhaust valves, catalytic converters, O_2 sensors, seals, gaskets

turbo-charged induction system components include: wastegates, impellers, seals, bushings, turbo, ducting

servicing procedures include: replace, repair and adjust components

APPENDIX A
ACRONYMS

ABS	anti-lock braking system
AC	alternating current
AGM	absorbed glass mat
AHJ	authorities having jurisdiction
AIS	air injection system
CAN	Controller Area Network
CDI	capacitor discharge ignition
CO	carbon monoxide
CVT	continuously variable transmission
DC	direct current
ECU	electronic control unit
EV	Electric Vehicle
GPS	Global Positioning System
IMU	inertial management unit
MIL	malfunction indicator light
OH&S	Occupational Health and Safety
PDI	pre-delivery inspection
PPE	personal protective equipment
RPM	revolutions per minute
SDS	safety data sheet
TCI	transistor control ignition
TPS	throttle position sensor
WHMIS	Workplace Hazardous Materials Information System

APPENDIX B

TOOLS AND EQUIPMENT / OUTILS ET ÉQUIPEMENT

Hand Tools/Outils à main

cylinder hone	pierre à finir pour cylindre
valve seat cutter	rodoir de siège de soupape
bearing driver	chassoir de paliers
bearing puller	extracteur de paliers
bolt cutter	coupe-boulon
brass mallet	maillet d’alignement de vilebrequin
bushing and seal driver	chassoir de coussinets
circlip pliers	pince à circlips
combination wrench set	ensemble de clé mixte
crimping tool	sertisseuse
dead-blow hammer	marteau à inertie
drill	perceuse
file	lime
hex wrenches	clés hexagonales
pin/hook wrench	clé à pointe hexalobée
pliers	pinces
punch	poinçon
reamers	alésoirs
riveting tool	dérive-chaîne
rubber mallet	maillet en caoutchouc
scrapers	grattoirs
screwdriver	tournevis
slide hammer	marteau à ressort
snap ring pliers	pinces à circlips
socket	douille
spoke wrench	clé à rayon
threaded insert repair	trousse de réparation de filet rapporté
tire iron	démonte-pneu
torx wrench	clé à ergot
wire brush	brosse métallique
wire stripping tool	outil à dénuder

Cutting/Heating Tools and Equipment

grinder	broyeur
heat gun	pistolet thermique
oxyacetylene cutting equipment	matériel de coupage et de soudage oxyacétylénique
propane torch	chalumeau au propane
soldering equipment	matériel de soudage

Pneumatic and Electric Power Tools

air impact tool	outil à impact pneumatique
compressed air gun	pistolet à air comprimé
grinder	rectifieuse
impact driver	clé à impact
riveting equipment	matériel de rivetage

Measuring Devices / Instruments de mesure

air pressure gauge	jauge de pression d’air
alignment tools	outils d’alignement
caliper	pied à coulisse
carburetor float level gauge	jauge de niveau pour flotteur de carburateur
coolant tester	testeur du liquide de refroidissement
cylinder bore gauge	jauge d’alésage de cylindre
degree wheel	comparateur à cadran étalonné en degrés
dial indicator	comparateur à cadran
engine tachometer	tachymètre
feeler gauge	jauge d’épaisseur
height depth gauge	calibre de profondeur
hydrometer	densimètre
inclinometer (angle finder)	inclinomètre (recherche d’angle)
inside/outside calipers	pied à coulisse intérieur/ extérieur
inside/outside micrometers	micromètre d’intérieur/ d’extérieu
micrometer	micromètre
multimeter oil pressure gauge	manomètre d’huile
oil pressure gauge	manomètre de pression d`huile
plastigage	jauge plastique
pounds pull gauge	dynanomètre étalonné en livres
protractor (magnetic)	rapporteur (magnétique)
refractometer	réfractomètre
sag gauge	jauge d’affaissement
small hole (ball) gauge	petits trou jauge (balle)
steel ruler	règle en acier

straightedge	règle
tape measure	ruban à mesurer
telescopic gauge	jauge télescopique
temperature gauge	jauge de température
tension gauge	jauge de pression d’air
thickness gauge	jauge d’épaisseur
tire pressure gauge	dynanomètre de traction
torque wrench	clé dynamométrique
tread depth gauge	jauge à filets
vacuum gauges	vacuomètre
vernier caliper	pied à coulisse à vernier
vibration meter	vibromètre
volume measuring vessels (graduated cylinders, burettes)	récipient de mesure des volumes (cylinder gradué, burettes)

Diagnostic and Testing Tools

alignment tools	outils d’alignement
borescope	endoscope
breakout boxes	boîtiers d`éclatement
coil tester	testeur de bobine
compression tester	testeur de compression
crankcase pressure test equipment	matériel d’essai de pression du carter moteur
fuel/oil pressure tester	appareil d’essai de pression du carburant ou de l’huile
hydrometer	densimètre
infrared thermometer	thermomètre infrarouge
leak-down tester	testeur de fuites
load tester	testeur de charge
multimeter/DVOM	multimètre/ DVOM
peak voltage adapter (PVA)	adaptateur de tension de crête
radiator pressure tester	appareil d’essai de pression du radiateur
sonic tension meter	tensiomètre sonique
stethoscope	stéthoscope
test light	lampe d’essai
timing light	lampe stroboscopique
vacuum gauge	vacuomètre
vacuum pump	pompe à vide

Shop Tools and Equipment

air compressor	compresseur d'air
alignment bars	barres d’alignement
ball hone	balle aiguiser
battery charger	chargeur de batterie
bearing installation tool	outil de pose de paliers
bench grinder and wire wheel brush	ouret et brosse métallique à touret
bleeding equipment	matériel de purge
boost leak tester	testeur de fuite boost
brake cylinder hone	pierre à polir de cylindre de frein
cable luber	lubrifiant à câble
chain breaker	dérive-chaîne
clutch holder	porte-embrayage
computer diagnostic equipment	équipement de diagnostic numérique
crank aligning jig crank jig	gabarit d’alignement de manivelles
crank installer	outil de pose de vilebrequin
crankcase separator	séparateur de carter moteur
crankshaft puller	extracteur de vilebrequin
cylinder hone	pierre à polir les cylindres
damper rod holder	porte-tige d’amortissement
electric arc welding equipment	équipement de soudage à arc électrique
electronic diagnostic equipment	équipement de diagnostic électronique
frame jig	gabarit de cadre
funnel	entonnoir
gasket scraper	grattoir de joint
glass bead blaster	sableuse par projection de particules de verre
grinder	rectifieuse
guide installation pilot	pilote de montage de guide
hand pump	pompe à main
headlight aiming equipment	matériel d’alignement des projecteurs
honing stone	pierre à polir
hydraulic jack	vérin hydraulique
hydraulic press	presse hydraulique
magnetic base	base magnétique
metal lathe	tour à métal
nitrogen recharging unit	bloc de recharge d’azote
piston pin puller	extracteur d’axe de piston
pneumatic/hydraulic/electric/manual lift table	table élévatrice pneumatique, hydraulique, électrique ou manuelle
ring compressor	compresseur de segments
scraper	racloir

seal driver	chassoir de joints
seal installer	outil de pose de joints
seal remover	extracteur de joints
shock spring compressor	compresseur à resorts de choc
solvent tank	réservoir à solvant
surface plate	plaque de surface
tire balancing equipment	matériel d’équilibrage des pneus
tire mounting equipment	matériel de pose de pneus
torque plates	plaques de couple
truing stand	vérin d’alignement
ultrasonic tank	cuve à ultrasons
valve resurfacing tool	rectifieuse de soupapes
valve seat cutter	coupeur de siège de soupape
valve spring compressor	compresseur de ressort de valve
V-block	bloc fendu
vice	étau
water bath	bac de lavage
wheel truing jig	centreur de roue

APPENDIX C
GLOSSARY / GLOSSAIRE

accessory	an item added to a complete motorcycle, to enhance the visual or riding enjoyment of the motorcycle such as an audio system or a carrying rack	**composant accessoire**	composant supplémentaire ajouté à une motocyclette à des fins esthétiques ou pour le plaisir de conduire la motocyclette, comme une chaîne stéréophonique ou un support
ancillary	an item fitted to the motorcycle that is required for the motorcycle to be compliant to safe road operation	**composant auxiliaire**	un dispositif monté sur la motocyclette qui est nécessaire pour que celle-ci soit conforme à la sécurité routière
brake pad	a stamped section of steel with friction material bonded to it, which is pressed against the brake disc when the brake is applied	**plaquettes de frein**	une section d'acier emboutie à laquelle est collé un matériau de friction, qui est pressée contre le disque de frein lorsque le frein est actionné
brake shoe	a cast aluminum, half-circular shoe that holds a bonded brake lining material; when brake is applied, shoe forces lining into brake drum	**sabot de frein**	pièce semi-circulaire moulée en aluminium sur laquelle est collé le matériau de la garniture de frein; lorsque le frein est serré, le segment pousse la garniture contre le tambour de frein
chain drive	use of a chain and sprockets to connect gearbox output shaft to rear wheel	**transmission par chaîne**	utilisation d'une chaîne et de pignons pour relier l'arbre de sortie de la boîte de vitesses à la roue arrière
chamfer	to bevel an edge of an object; e.g. chamfer edges of port openings in a two-stroke cylinder to prevent piston ring breakage	**chanfrein**	biseau de l'arête d'un objet ou des arêtes d'une lumière dans un cylindre de moteur à deux temps pour empêcher le bris des segments de piston
chassis	the base frame and components connected directly to it, excluding those parts which provide power, but may include wheels and suspension to become a "rolling chassis"	**châssis**	le cadre de base et les composants qui y sont directement reliés, sans compter les pièces qui alimentent en énergie, mais peut inclure les roues et la suspension pour ainsi devenir un « châssis roulant »

crankcase	castings that support and contain the crankshaft flywheel assembly, and may also include primary drive and gearbox	**carter-moteur**	pièce moulée qui supporte et renferme le volant du vilebrequin, la transmission primaire et la boîte de vitesses
cylinder head	casting that seals top of cylinder and provides a mounting place for spark plug. In four-stroke engine, cylinder head also incorporates intake and exhaust ports. Both two- and four-stroke engines also have combustion chamber built into cylinder head	**culasse**	pièce moulée qui assure l'étanchéité à la partie supérieure des cylindres et sur laquelle on monte les bougies d'allumage; dans un moteur à quatre temps, la culasse renferme également les lumières d'admission et d'échappement; la chambre à combustion des moteurs à deux et à quatre temps est partiellement formée à même la culasse
damper	device which uses oil metered through orifices to control abrupt suspension movement during extension and compression	**amortisseur**	dispositif qui utilise de l'huile traversant des orifices calibrés pour absorber les brusques mouvements de la suspension pendant l'extension et la compression
damper rod	tube secured to bottom of each fork slider to hold slider onto fork leg. Damper rod controls movement of suspension by metering hydraulic fluid through orifices in rod	**tige d'amortisseur**	tube fixé au fond de chaque cylindre de fourche pour retenir le cylindre sur le tube de fourche; la tige d'amortisseur absorbe les mouvements de la suspension avant en faisant passer du liquide hydraulique à travers des orifices calibrés
damping	controlling oil metered through orifices to control abrupt suspension movement during extension and compression	**amortissement**	réglementer l'huile traversant des orifices calibrés pour absorber les brusques mouvements de la suspension pendant l'extension et la compression
decarbonize	to remove carbon build-up on piston, combustion chamber, and other parts	**décalaminer**	enlever l'accumulation de calamine sur un piston, la chambre à combustion et d'autres pièces
diagnostic software	automatic computer program sequence that determines the operational status within the software, hardware or any combination thereof in a component, a system, or a network of systems	**logiciel de diagnostic**	séquence automatique de programme informatique qui détermine l'état de fonctionnement du logiciel, du matériel ou de toute combinaison de ceux-ci dans un composant, un système ou un réseau de systèmes

dry sump	in this system, oil is gravity fed to supply side of oil pump from a remote oil tank. After oil has been pumped through four-stroke engine, it is returned to oil tank by return oil pump	**carter sec**	type de circuit de lubrification dans lequel l'huile est fournie par gravité au côté alimentation de la pompe à huile à partir d'un réservoir séparé; une fois que l'huile a circulé dans un moteur à quatre temps, elle revient dans le réservoir d'huile par le côté retour de la pompe à huile
final drive	chains, sprockets, belts, pulleys, shafts and gears used to connect the gearbox output shaft to rear wheel	**transmission secondaire**	les chaînes, pignons, courroies, poulies, arbres et engrenages utilisés pour relier l'arbre de sortie de la boîte de vitesses à la roue arrière
friction plate	a plate that has friction material bonded to its surface. When clutch is engaged, friction plate transfers power to steel plate	**plateau menant**	plateau d'embrayage fixé à la cloche d'embrayage (moyeu extérieur) par des languettes et dont la surface est recouverte d'un matériau de friction; lorsque l'embrayage est en prise, le plateau menant transmet la puissance au plateau mené
friction shoe	a cast aluminum, half-circular shoe that holds a bonded friction lining material; it is used to transfer power in a centrifugal clutch	**sabot de friction**	un sabot demi-circulaire en aluminium moulé qui contient un matériau de garniture de friction collé; il est utilisé pour transférer la puissance dans un embrayage centrifuge
gearbox	a series of shafts and gears which varies ratio of engine to rear wheel speed. Motorcycle gearboxes use two or more speeds or ratios	**boîte de vitesse**	ensemble d'arbres et de roues dentées qui fait varier le rapport entre le régime du moteur et la vitesse de rotation de la roue arrière; les boîtes de vitesses des motocyclettes utilisent de deux à sept rapports ou vitesses
hydraulic brake	a braking system using hydraulic fluid, piston and cylinders to provide extremely high pressure for brake application	**frein hydraulique**	type de frein se servant de liquide hydraulique, d'un piston et de cylindres pour fournir une pression très élevée pour le serrage des freins

induction air leak test	commonly referred to as a “vacuum leak test”. An air induction leak test is used to identify unmetered air entering the intake downstream of the throttle plate	**test de fuite du système d’induction d’air**	communément appelé « test de fuite de vide ». Un test d’étanchéité de l’admission d’air est utilisé pour identifier l’air non dosé entrant dans l’admission en aval du papillon des gaz
lateral run-out	side-to-side movement (wobble) of a wheel rim; also known as axial run-out	**voilage**	mouvement oscillatoire latéral d’une jante de roue; aussi appelé battement axial
manometer	an instrument used to measure positive or negative pressures	**manomètre**	instrument utilisé pour mesurer les pressions positives ou négatives
master cylinder	components in hydraulic systems that produce hydraulic pressure for systems	**maître-cylindre**	les composants des freins qui fournissent l’énergie hydraulique à un circuit de freinage
mechanical brake	a braking system which uses a mechanical advantage by way of levers and cables or rods to apply brakes. A braking system not using hydraulic fluids or hydraulics	**frein mécanique**	frein qui a recours au gain mécanique grâce à des leviers, à des câbles ou à des tiges pour serrer les freins; frein qui n’est pas hydraulique
O-ring	used to provide a positive seal. It usually fits into a groove slightly shallower than O-ring, and mated against a flat surface to provide a seal for oil, fuel, coolant or air	**joint torique**	utilisé pour assurer l’étanchéité; il s’adapte habituellement dans une rainure légèrement moins profonde que son épaisseur et s’appuie contre une surface plate pour assurer l’étanchéité à l’huile, au carburant, au liquide de refroidissement et à l’air
primary drive	use of chain, gear, or belt drive (belts and pulleys) to connect crankshaft to clutch and gearbox into shaft	**transmission primaire**	transmission se servant d’une chaîne, d’un pignon ou d’une courroie (courroies et poulies) pour relier le vilebrequin à l’embrayage et la boîte de vitesses à l’arbre de transmission
recondition	to rebuild a component or return to within factory specifications	**remettre en état**	reconstruire un composant ou le refaire pour qu’il redevienne conforme aux spécifications des fabricants

shift fork	a flat forked gearbox component which engages with a slot in a sliding gear or dog. Shift forks slide back and forth on lateral shafts. Rotation of shift drum causes shift fork to move its sliding gear or dog to engage with another gear, locking both gears to shaft	**fourchette de changement de vitesse**	composant de boîte de vitesses en forme de fourchette plate qui s'adapte à une fente dans un baladeur ou un doigt; la fourchette se déplace d'avant en arrière sur les arbres intermédiaires; la rotation du barillet de changement de vitesse ou du plateau à came amène la fourchette à déplacer son baladeur ou son doigt pour engrener une autre roue dentée, ce qui verrouille l'engrenage sur l'arbre
shift drum	a drum shaped gearbox component with slots around its outside diameter. It engages with shift mechanism and shift forks. As drum is rotated, drum slots cause shift forks to move sliding gears or dogs causing engagement and disengagement of various gearbox ratios	**barillet de changement de vitesse**	composant de boîte de vitesses en forme de tambour dont le pourtour est pourvu de fentes; il s'adapte au mécanisme de changement de vitesse et aux fourchettes; à mesure que le barillet tourne, les fentes de ce dernier amènent les fourchettes à déplacer des baladeurs ou des doigts, ce qui permet de choisir divers rapports de boîte de vitesses
sintered	the complex compounds used in brake and clutch friction materials	**métal fritté**	décrit les composés complexes utilisés dans les matériaux de friction de freins et d'embrayage
spoked wheel	a wheel consisting of a rim, spokes, nipples and hub. Spokes are laced between hub and rim, and are attached to rim.	**roue à rayons**	roue composée d'une jante, de rayons, d'écrous de rayon et du moyeu; les rayons sont montés entre le moyeu et la jante, et fixés à cette dernière par des écrous
sprocket/pulley	a sprocket consists of a wheel with teeth to engage a chain or toothed belt and provide a positive (non-slip) drive. In the case of a belt final drive, often the toothed sprockets are referred to as "pulleys"	**roue dentée et poulie**	une roue dentée est une roue avec des dents qui engrène une chaîne ou une courroie crantée et procure un démarreur à pied à pignon poussé (non glissant); lorsqu'il s'agit de la transmission secondaire, on appelle souvent les roues dentées des « poulies »

stamped frame	a frame stamped from pieces of sheet metal which are welded together to provide support for engine and suspension	**cadre embouti**	cadre formé par emboutissage de pièces de tôle soudées ensemble pour supporter le moteur et la suspension
stamped wheel	a wheel assembly using stamped sheet metal spokes in place of small wire type spokes. A stamped wheel resembles a cast alloy wheel in appearance	**roue emboutie**	roue dont les rayons sont remplacés par des montants emboutis en tôle; une roue emboutie ressemble à une roue en alliage
steel plate	a steel plate is indexed onto clutch inner hub by tabs or splines around its inside diameter. Steel plate is usually a plain plate (no friction material) and drives gearbox input shaft through clutch inner hub	**plateau mené**	plateau d'embrayage fixé au moyeu intérieur de l'embrayage au moyen de languettes ou de cannelures sur le pourtour de son diamètre intérieur; le plateau mené est habituellement un plateau ordinaire (sans matériau de friction) qui entraîne l'arbre d'entrée de la boîte de vitesses par l'intermédiaire du moyeu intérieur de l'embrayage
steering head	forward part of frame providing a mounting place for bearings which locate and support steering spindle and fork assembly	**colonne de direction**	partie avant du cadre dans laquelle se trouvent les paliers et roulements qui positionnent et supportent la colonne de direction et la fourche
suspension	components which absorb road surface irregularities to smooth motorcycle ride. It is designed to permit controlled wheel movement over irregular surfaces. Basic parts include forks, swing arm and shock absorbers.	**suspension**	composants qui absorbent les irrégularités de la route pour offrir un confort de conduite en motocyclette; conçue pour permettre à la roue de se déplacer de façon contrôlée sur les irrégularités de la route; les composants de base sont la fourche, le bras oscillant et les amortisseurs
swing arm	main member of rear suspension that provides a mounting place for rear wheel and one end of shock absorbers	**bras oscillant**	composant principal d'une suspension arrière sur lequel sont montées la roue arrière et une extrémité des amortisseurs

triple clamps	a pair of sturdy brackets that provide a mounting place for fork legs and steering spindle. Triple clamps attach forks to frame through spindle, steering head and steering head bearings	**triple bride**	paire de supports robustes sur lesquels sont montés les tubes de fourche et la colonne de direction; la triple bride unit la fourche au cadre par l'intermédiaire de la colonne de direction, le tube de direction et les paliers de direction
valve train	all components which directly influence valve operation (cam, cam chain, cam followers, valves, valve springs, valve collars, and keepers) in four-stroke engines.	**culbuterie**	ensemble de tous les composants qui influencent directement le fonctionnement des soupapes (cames, chaîne à cames, galets de cames, soupapes, ressorts de soupapes, mains de soupapes et clavettes dans un moteur à arbre à cames en tête) dans un moteur à quatre temps
variable exhaust valve	the exhaust control valve operates by opening and closing thereby varying the exhaust pressure	**soupape d'échappement variable**	la soupape d'échappement de contrôle s'ouvre et se ferme, ce qui fait varier la pression des gaz d'échappement