education
Department: Education
GAUTENG PROVINCE

MECHANICAL TECHNOLOGY

AUTOMOTIVE

GRADE 10

PRACTICAL ASSESSMENT TASKS

2025

This document consists of 39 pages

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SECTION A: EDUCATOR GUIDELINES FOR PAT GRADE 10

1. INTRODUCTION / BACKGROUND

The 18 Curriculum and Assessment Policy Statements subjects which contain a practical component all include a practical assessment task (PAT). These subjects are:

- AGRICULTURE: Agricultural Management Practices, Agricultural Technology
- ARTS: Dance Studies, Design, Dramatic Arts, Music, Visual Arts
- SCIENCES: Computer Applications Technology, Information Technology, Technical Sciences.
- SERVICES: Consumer Studies, Hospitality Studies, Tourism
- TECHNOLOGY: **MECHANICALTECHNOLOGY**, Civil Technology, Electrical Technology, and Engineering Graphics and Design.
- MATHEMATICS: Technical Mathematics.

A practical assessment task (PAT) mark is a compulsory component of the final promotion mark for all candidates offering subjects that have a practical component and counts 25% (100 marks) of the end-of-year examination mark. The PAT is implemented across the first three terms of the school year. This is broken down into different phases or a series of smaller activities that make up the PAT. The PAT allows for candidate to be assessed on a regular basis during the school year and it also allows for the assessment of skills that cannot be assessed in a written format, e.g., test or examination. It is therefore important that schools ensure that all candidates complete the practical assessment tasks within the stipulated period to ensure that candidate resulted at the end of the school year. The planning and execution of the PAT differs from subject to subject.

The PAT allows the teacher to directly and systematically observe applied competence. The PAT comprises the application/performance of the knowledge, skills and values particular to that subject and counts 25% of the total promotion/certification mark out of 400 for the subject.

The PAT is implemented across the first three terms of the school year.

Any profession requires of its members a thorough grounding in both theory and practice and mechanical technology is no exception. It is emphasized that the goal of the practical assessment task is to produce a skilled candidate in each specialisation field. A nation's true wealth is in its manpower and education that should aim to develop the talents of a candidate so that he/she can contribute to the well-being of the society by using and developing scientific and technological resources.

To prepare a candidate in mechanical technology specialisation fields, one must focus on the following:

- An attitude where the candidate can selectively use ideas, gather evidence and facts, to drawing logical conclusions to put them to good use creatively and with imagination;

- A capability to express ideas and information clearly by speech, writing, drawing and manufacturing and
- A willingness and capability to accept and exercise responsibility, to make decisions, and to learn by experience.

Attributes such as these cannot all be achieved in a classroom. A sound knowledge of engineering sciences is essential to equip the mechanical technology candidate with the necessary practical capabilities for the required processes. Practical training is the application of acquiring essential skills to bridge the gap between trade theory and practice.

Practical application in the workshop must therefore be made an interesting and challenging experience to develop the candidate's both physically and mentally. The candidates must show his/her initiative, curiosity and persistence in learning. In order to stimulate and develop self-confidence the granting of some degree of responsibility during the practical application is very important.

2. TEACHER GUIDELINES

2.1 Administration of the PAT

Teachers are requested to make copies of the different specialisation PAT documents. These documents need to be handed out to the candidates at the beginning of the year. The Practical Assessment Task for Grade 12 is externally set, internally assessed and externally moderated.

Teachers must attach due dates for the different facets of the PAT (refer to the CAPS document). In this manner, candidates can easily assess their progress. Instances where formal assessments take place, it is the responsibility of the teacher to administer assessment.

The PAT should be completed within the first three terms. The PAT should be completed under controlled conditions (refer to Mechanical Technology SPECIALISATION: CAPS Grade 10 –12).

Educators MUST build a prototype of the Phase 1 task to be able to demonstrate to the candidates how the final product will look like. It will guide the candidates with visual presentation. It provides the educator with insight into possible challenges regarding machines, equipment or material and what possible manufacturing procedures he/she need to follow in the workshop to complete the PAT.

For simulation tasks, learners must have access to specification sheets during the tasks. Teachers must perform all the tasks prior to assessing candidates so that the teacher can identify possible challenges and the final results. It provides the teacher with insight into possible challenges regarding equipment or tools and what possible procedures he/she needs to follow in the workshop to complete the PAT.

NOTE: The learner must complete the procedures practically. The teacher must record reasons, readings, specifications, etc. provided by the candidate onto the worksheet (Procedure sheet).

2.2 Assessment of PAT

Frequent and developmental feedback is needed to ensure necessary guidance and support to the candidates.

Both formal and informal assessment should be conducted to ensure that the embedded skills are developed. Informal assessment can be conducted only to monitor progress of the candidates. Formal assessment should always be conducted and recorded by the candidates.

On completion of each phase in each term, the marks for the completed phase need to be recorded onto the school administration system.

2.3 Moderation of PAT

The tasks, projects, assessment criteria as well as the mark sheets must be presented to the moderator during moderation of the PAT.

The moderator should be able to call on a candidate to explain and demonstrate the functions, principles and skills during the moderation purposes.

On completion the moderator will, if necessary, adjust the marks of the group upwards or downwards depending on the decision reached because of moderation.

Task must be clearly marked with the correct initials and surname of each candidate.

Internal moderation MUST take place at school level and reports must be available for the Subject Advisor or Provincial moderator as evidence.

2.4 Consequences of absence / non-submission of tasks.

If a learner's practical assessment task is incomplete or unavailable for a valid reason, the learner will be given three weeks before the commencement of the final end-of-year examinations to submit the outstanding task. Should a learner fail to fulfil the outstanding PAT requirement such a learner will be awarded a zero (0) for that PAT component.

A learner's results are regarded as incomplete if he/she does not offer any component of the PAT task. He/she will be given another opportunity based on the decision of the Head of the Assessment Body.

Should the learner fail to fulfil the outstanding PAT requirement, the marks for these components will be omitted and the final mark for Mechanical Technology will be adjusted for promotion purposes in terms of the completed tasks.

3. ADMINISTRATION OF THE PAT

The PAT (all phases) should be **completed in the first three terms**. The PAT must be completed under controlled conditions.

Educators must attach their own due dates for the different phases of the PAT (Refer: Mechanical Technology CAPS Gr10 – 12 Document.

In this manner, Learners can easily assess their progress. Instances where formal assessments take place, it is the responsibility of the Educator to administer the assessment.

Educators are requested to make copies of **Section B** and distribute to Learners at the beginning of the year. Learners should receive the assessment criteria of the PAT at the beginning of the year when the PAT is handed out and this must be mediated with the Learners.

STRUCTURE OF THE PAT

PROCESS OF THE PAT		**TOPIC**	**MARKS**
TERM 1	Phase 1 Task	Terminology / *Manufacturing*	**50**
TERM 2	Phase 2 Task	Terminology / *Engine specific*	**50**
TERM 3	Phase 3 Task	Terminology / *Maintenance*	**50**
	Phase 4 Task	Terminology / *Engine specific / Maintenance*	**100**
		TOTAL MARKS	**250 Convert to 100**

Educators must attend to the following in their preparation:

The planning process;
The knowledge and skills to be achieved;
The safety and environmental aspects to be considered;
The applicable calculations, sketches and/ or diagrams;
The starting time and ending time – how long it took to complete from start to finish;
Bill of materials;
List of tools needed; and
Any other information that is relevant to the project.

4. Assessment and moderation of the Practical Assessment Task

To ensure national standardization the PAT for Grade 12 are externally set and moderated, but internally assessed. The PAT for Grades 10 and 11 have to follow a similar standardization process but this is done provincially and thus are set by allocated people and moderated by the Subject Advisers for Mechanical Technology.

4.1 Assessment

Frequent developmental feedback by the Educator is needed to guide and give support to the Learner to ensure that the Learner is progressing as envisaged.

Both *formal and informal assessment* should be conducted on the different phases that constitute the PAT. Informal assessment can be conducted by the learners themselves, by a peer group of learners, or by the educator. Formal assessment should always be conducted by the Educator and must be recorded on the working mark sheets distributed by the Subject Advisers, these also constitute the final mark sheet for the subject and must always be available in printed format in the educators file. These mark sheets must be updated and printed after each formal assessment. Note that the School and District structures may require results to be transferred to other documents/ systems like SASAMS, in this instance ALL results must correspond on all systems. Any differences must be brought to the attention of the Subject Advisor so that the error can be rectified.

4.2 Moderation

During moderation of the PAT, the project/ skills tasks will be presented to the moderator with the assessment criteria and marks obtained on the **facets mark sheet** and the **combined Excel working** mark sheet.

Where required, the moderator should be able to call on the learner to explain the function, principles of operation and request the learner to exhibit the skills acquired through the capability tasks for moderation purposes. **Internal moderation MUST take place at school level** for all phases and evidence must be presented to the Subject Advisor during district/provincial moderation or verification of completion.

4.3 Time planning:

Phase 1: Complete at the end of first term – **March.**

Phase 2: Complete at the end of second term – **June.**

Phase 3: Complete during third term - End of **September/Term 3.**

Phase 4: Plan and start task during the first term and complete at the end of **September/Term 3.**

MARKING RUBRICS FOR AUTOMOTIVE

DRILLING AND TAPPING

NOTE:
Use the Rubric A below for assessment for all holes to be drilled.

RUBRIC A - DRILLING OF HOLES	
Assessment facet	**Mark**
Drilling of correct diameter of hole	1
Depth correctly drilled	1
Hole clean and without burrs	1
Hole perpendicular to workpiece	1
Hole drilled to correct position on workpiece	1
Sub-total:	**5**

NOTE:
Use the Rubric B below for assessment for all internal and external screw threads to be tapped.

RUBRIC B – TAPPING OF SCREW THREADS	
Assessment facet	**Mark**
Cut correct screw thread	1
Screw thread perpendicular to workpiece	1
Screw thread has no burs on outside	1
Depth/length to be tapped correctly	1
No defects (e.g., Cross thread)	1
Sub-total:	**5**

TOLERANCE RANGES

LENGTH AND DIAMETERS

NOTE:
On all the lengths and diameters candidates will lose 1 mark for every 0,1 mm deviation from the basic size. In the event of a candidate exceeding both length and diameter as per given rubric, then the candidate should be allocated 1 mark for process completed CORRECTLY.
Use rubric C for assessment on all lengths and diameters.

RUBRIC C - LENGTHS AND DIAMETERS	
DEVIATION	**MARK DEDUCTIONS**
0–0,1	-0
0,1–0,2	-1
0,2–0,3	-2
0,3–0,4	-3
0,4–0,5	-4
0,5 and more	-5

Safety (5)

1) Less 1 mark: Repetitive disregard for the use of PPE while working in the workshop.
2) Less 1 mark: Another negative mark for continuing to have a disregard for the use of PPE while working in the workshop.
3) Less 1 mark: Quality versus Time – “rush” job vs inefficient time to complete a good job
4) Less 1 mark: Not cleaning machine after work session.
5) Less 5 marks: Dangerous and fooling around in workshop, machines and equipment.

Finishing (5)

1) Less 1 mark for vice (jaw) damage - clamping marks for overtightening or loose slip.
2) Less 1 mark for lack of overall manufacturing competency in finishing / “look” of completed task related to surface finish and edges.
3) Less 1 mark for lack of overall manufacturing competency in square-ness of project.
4) Less 1 mark for lack of overall manufacturing competency in centrality, etc.

SECTION B: THE PRACTICAL ASSESSMENT TASK GRADE 10

AUTOMOTIVE

The Practical Assessment Task (PAT) consists of FOUR Phases, one per term over term 1 to 3, with the **Phase 4 Task** that can be started in the **First Term** and **completed in the Third Term** – Thus spanning all three terms. Term 4 is reserved for the final theoretical content and revision.

PHASE ONE: TASK: Basic Hand skills

Resources Required:

- Mild steel flat bar 120 x 60 x 5mm (the school may opt to use between 5-6mm) (if flat plate is used, ensure that two sides are parallel to each other).
- Appropriate metal hand files.
- Vernier and other measuring equipment (callipers, steel rule etc).
- Marking medium (Engineers blue, Koki pen, chalk etc.)
- Marking off instruments (Square, combination square, scriber etc.)
- Centre punch.
- Hammer- ball pene /cross pene
- Hacksaw.
- Files, smooth- bastard flat- square- triangle- round and half round
- Stocks and dies
- *Appropriately sized* Twist Drill bits to enable M6
- Cut the radii with a hacksaw and then smoothen with hand file
- Press drilling machine.

Instructions:

1) Apply marking blue or any other medium onto the workpiece and mark out the dimensions according to the drawing
2) Use a steel rule to check / ensure that the material can be cut / filed to 140 mm in length i.e., if pre-cut pieces are used the starting length should be about 120 mm.
3) Use engineers square on either of the 140 mm ends of the material to plan a square line.
4) Use a scriber to scribe this straight square line about 5 mm from the rough edge.
5) Use the square and scriber on the opposite end of the material to scribe a straight, square line so that the material between the lines is 140 mm in length (ensure lines are parallel).
6) ***Request an informal assessment on the marked lines before proceeding.***
7) Cut with a hacksaw about 1-2 mm on the waste side of the above lines (Do NOT cut on the line).
8) ***Request a formal assessment on your ability to cut straight before proceeding.***
9) First use a rough-cut bastard file to file both ends, use the engineers square regularly to check for squareness.

10) Request a formal assessment on your ability to file all sides square and to size, before proceeding.

11) Then using a smooth double cut file, complete the filing process.

12) Request formal assessment on ability to file square to tolerance.

13) Use the centre punch to mark the holes for drilling.

14) Request informal assessment on your ability to mark and punch this centre point, before proceeding (5).

15) Measure and mark a point 15 mm from each end on the 140 mm length.

16) Scribe a line across the width of the material at the 15 mm marks, parallel to the middle line scribed earlier.

17) Along one 15 mm line, measure and mark from both sides 15 mm inwards and centre punch these TWO marks in preparation for drilling.

18) Use this punch mark to scribe the two 15 mm radii on the two corners

19) Along the other 15 mm line, measure and mark from each side 15 mm inwards and centre punch these TWO marks in preparation for drilling.

20) Cut 1-2 mm away from the line using a hacksaw, then use a smooth finish to complete a neat curve.

21) Request <u>formal</u> assessment on your ability to mark and punch these centre points accurately and the grinding of the radii, before proceeding.

22) Use a press drill machine to drill two 4 mm holes. (Ensure the hole is perpendicular, using large engineers square if hand drill is used!)

23) Request an informal assessment / guidance on attempt and required skill to drill the other holes perpendicular to the surface, before proceeding.

24) Use a press drill machine to drill two holes on the centre punched holes positioned on the on the plate, suitable to cut a M6 thread. (Ensure holes are perpendicular, use large engineers square if hand drill is used!)

25) Hand task in for formal assessment on your ability to drill perpendicular holes.

26) Use the taps in the correct order to 2 x M6 thread. (Taper, tap, second tap and plug tap)

27) Cut a 40 mm x Ø6 mm round bar for the key hook.

28) Taper one end to ensure an easy start for cutting the external M6 thread.

29) Secure the rod in the vice and cut the threads for a length of 5 mm.

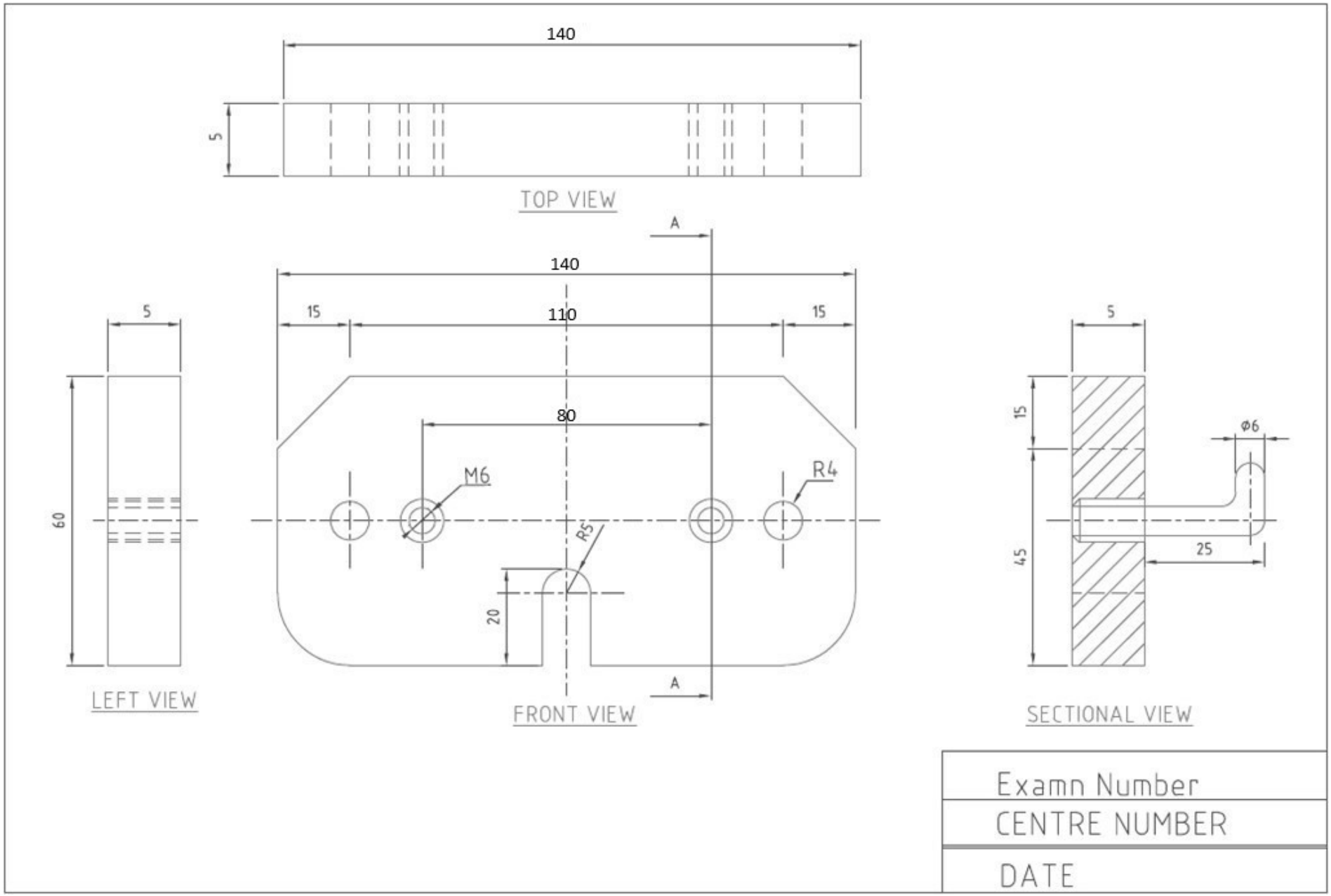
30) Secure the rod in the bench vice to form a hook (approximately 8-10 mm) The hook can be at 90° or greater than as an option.

31) Screw the hook onto the backing plate.

32) Hand the task in for formal assessment on your ability to cut square / perpendicular thread in different sized holes.

33) Clean any burs, roughness and dirt caused by the drilling, cutting and manufacturing process.

34) Hand the task in for **formal final assessment** on your **ability to clean your project.**


140
5
TOP VIEW
A
140
15
110
15
80
M6
R4
R5
20
A
FRONT VIEW
5
60
LEFT VIEW
5
15
45
Φ6
25
SECTIONAL VIEW
Examn Number
CENTRE NUMBER
DATE

MARKING RUBRIC

GRADE: 10	YEAR: 2025	SCHOOL:	
DATE STARTED:		DATE COMPLETED:	
SUBJECT: Mechanical Technology – Automotive		EDUCATOR:	
PROJECT: **TERM ONE - PHASE ONE**		NUMBER OF LEARNERS:	
PAGE ___ of ___		Tools: Hand skills Task	

	ASSESSMENT	FACETS	Measuring and marking	Cutting with the hacksaw	Squareness of ALL sides	Filing of angles	Cutting the recess.	Filing the radii	Drilling of 4 x 10mm holes.	Thread cutting x 2(M6)	Finishing	SUB-TOTAL	
			10	**10**	**5**	**10**	**10**	**10**	**20**	**20**	**5**	**100**	**50**
1	Learner – Self-Assessment												
	Date of self-assessment:												
2	Teacher Assessment												
	Comment:												
3	Internal Moderation												
	Comment:												
4	Provincial Moderation												
	Comment:												
5	External Moderation												
	Comment:												

General Feedback:

SIGNATURE EDUCATOR	
SIGNATURE HEAD OF DEPARTMENT	
SIGNATURE SUBJECT ADVISOR	
SIGNATURE PRINCIPAL	

TERM TWO: PHASE TWO

Grade 10 Automotive

ENGINES (SPECIFIC): Identification and installation Task

Procedure:

The outcome of this task is to assess the learner's skills and ability to understand the relationship between the different hand tools in the workshop and how to convert this knowledge into useful skills by dismantling an internal combustion engine, identifying the parts and assembling the engine or parts thereof, back to original condition / status. The understanding of Engineering Graphic and Design will relate to this task as the learner must be able to refer to, two dimensional drawings of components and relate this to the identification process in the workshop.

READ ALL THE INSTRUCTIONS FIRST THEN PROCEED

FOLLOW ASSESSMENT INSTRUCTIONS AS INDICATED

Resources Required:

- FOUR and TWO stroke Internal Combustion Engines and / or parts that can be assembled as units.
- Parts may be separate items but such that Learners can experience the complete unit.
- Appropriate tools and equipment to dismantle and assemble specified parts.
- Appropriate Personal Protection Equipment (PPE).

Instructions for Phase Two task

- Teacher to do a practical lesson whereby engine components are shown and discussed with learners. Explain the following by using actual components of engines:
    a. Name of component.
    b. Material used to manufacture component. Reasons/advantages for specific material to be used.
    c. Explain the function of each component.
    d. Engine block and cylinder head must be explained thoroughly with all components removed.
    e. On engine block give specific attention to water jackets and oil channels. Explain reasons for different size water jackets between front and rear cylinders.

f. Identify main oil channel and all other oil channels running in engine block to various components for lubrication. It is important that this is discussed properly with learners as you will refer back to it when discussing the maintenance chapter.

- After you have discussed above with the learners give them a chance to experience / investigate on their own. Learners must know the TWO and FOUR stroke internal combustion engines.
- Ensure you know the functions / use of the different parts in Internal Combustion Engines.
- Experience / investigate these parts practically and individually.
- After the investigation and practice you should know all the components of the 2 and 4 stroke internal combustion engines and be able to explain how the different parts are fitted to the various engines.
- Each learner must know the function of each component and the material it is made of.
- Learners must be able to point out components cast into the engine block and cylinder head for example: water jackets, oil channels, oil return to sump, placement of oil pump and water pump etc.
- After learners have been given a chance to investigate and experience on their own a practical exam must be set up by the teacher where each learner is given the chance to identify a certain number of components.
- Teacher to ask for 1 or 2 days during a test or exam cycle to be included into the time table where learners will come to you individually and being tested on actual engine components.
- Each component must only be marked with a number and learner must answer on a worksheet prepared by the teacher. Take note this is a PAT task and must be treated as a practical examination. Proof must be kept for moderation.

  Marks awarded to learners identifying components on pictures or theoretically will not be accepted. Only where a learner has identified actual components from an engine that you have numbered exactly as on the work sheet will be accepted. Learners only receive and complete the work sheet on the day of the practical exam.

  Each teacher to test learners during exam time under exam conditions.
- **NB! Worksheets MUST be available in learner's portfolio and marks captured on Composite mark sheet**.

WORKSHEET 2.1

LEARNER NAME:	

PRACTICAL APPLICATION – ENGINE PARTS			
Action		**Marks**	
Disassembling engine	Remove cylinder head bolts and cylinder head	4	
	Remove fuel tank	2	
	Remove flywheel casing	2	
	Remove flywheel	4	
	Drain oil	2	
	Remove head gasket	2	
	Remove camshaft and valve lifters	4	
	Sub-total:	**[20]**	

Action		**Marks**	
Creating new gasket	Cut out with ballpoint pen hammer gasket shape	2	
	Cut out inside	2	
	Punching holes	4	
	Fitting of gasket	2	
	Sub-total:	**[10]**	

Action		**Marks**	
Assembling engine	Replace camshaft and valve lifters	4	
	Match timing marks	2	
	Replace gasket	2	
	Replace cylinder head bolts and cylinder head	4	
	Torque cylinder head bolts	4	
	Replace crankcase	2	
	Replace flywheel	4	
	Replace flywheel casing	2	
	Replace fuel tank	2	
	Insert new oil	2	
	Start engine	2	

Sub-total:	**[30]**	

WORKSHEET 2.2

LEARNER NAME:		

CONDITION REPORT BY LEARNER – ENGINE PARTS			
Parts	**Part Condition Report**	**Marks**	
• Cylinder head		2	
• Flywheel		2	
• Head gasket		2	
• Camshaft		2	
• Valves		2	
	Sub-total:	**[10]**	

PHASE 2 MARK SHEET – ENGINE PARTS		
Work sheet 1 – Disassembling engine	20	
Work sheet 1 – Creating new gasket	10	
Work sheet 1 – Assembling engine	30	
Work sheet 2 – Part Condition Report	10	
Sub-Total:	**70**	
Total:	**50**	

TERM THREE: PHASE THREE

Grade 10 Automotive

MAINTENANCE (SPECIFIC): Vehicle Service Task

Procedure:

The outcome of this task is to assess the learner's skills and ability to understand the relationship between the vehicle and the maintenance thereof. This task aims at a general maintenance of a petrol vehicle and replacing of service parts. In order to save money, learners can remove parts, and then replace as if they were new parts. This PAT aims on the skills to conduct a general maintenance on vehicle.

Resources Required:

- FOUR stroke Internal Combustion engine on a stand in working condition or a motor vehicle if available.
- Service parts may be separate items but such that Learners can experience the complete unit.
- Appropriate tools and equipment to dismantle and assemble specified service parts.
- Appropriate Personal Protection Equipment (PPE).

Instructions for Phase Three task

A vehicle must be serviced, and the following parts need to be removed, assessed (condition report on parts) and be replaced.

1) Oil change
2) Air filter change
3) Spark plugs changed
4) Oil filter change
5) Sump plug replacement
6) Fan belt replacement (belt that drives alternator / water pump).
5) Worksheet 3.1 must be completed by educator on observation of service.
6) Learners to complete a condition report on parts removed.
7) Engine needs to start after service.

WORKSHEET 3.1

LEARNER NAME:	

PRACTICAL APPLICATION – ENGINE SERVICE			
Action		**Marks**	
Remove service parts	Prepare engine for service – make vehicle safe and place oil drain pan under sump.	4	
	Remove high tension leads from plugs.	4	
	Open air cleaner and remove air filter.	2	
	Clean around spark plugs.	4	
	Remove spark plugs.	4	
	Remove dip stick and oil filler cap.	2	
	Remove oil sump plug.	2	
	Drain oil.	2	
	Remove oil filter.	2	
	Release tension on V-belt driving alternator / water pump	2	
	Remove V-belt driving alternator / water pump	2	
	Safe and correct use of tools	5	
	Sub-total:	**[35]**	

Action		Marks	
Replace service parts	Replace oil sump plug.	2	
	Replace oil filter correctly.	2	
	Replace plugs.	4	
	Replace high tension leads to plugs.	4	
	Replace air filter.	2	
	Close air cleaner cover.	2	
	Replace V-belt driving alternator / water pump.	2	
	Correct the tension on the V-belt.	2	
	Insert new oil.	2	
	Replace oil dip stick and filler cap	4	
	Check oil if correct.	2	
	Start engine.	2	
	Safe and correct use of tools.	5	
	Sub-total:	**[35]**	

WORKSHEET 3.2

LEARNER NAME:		

CONDITION REPORT BY LEARNER – ENGINE SERVICE			
Parts	**Part Condition Report**	**Marks**	
Air filter		3	
Spark plugs		4	
V-belt		3	
Sump plug		2	
Oil filter		3	
	Sub-total:	**[15]**	

PHASE 3 MARK SHEET – ENGINE SERVICE		
Work sheet 1 – Remove service parts	30	
Work sheet 1 – Replace service parts	35	
Work sheet 2 – Engine Service Part Condition Report	15	
Sub-Total:	**80**	
Total:	**50**	

TERM THREE: PHASE FOUR

Grade 10 Automotive

MAINTENANCE (SPECIFIC): Vehicle Service Task – Brake disc and pad replacement

Procedure:

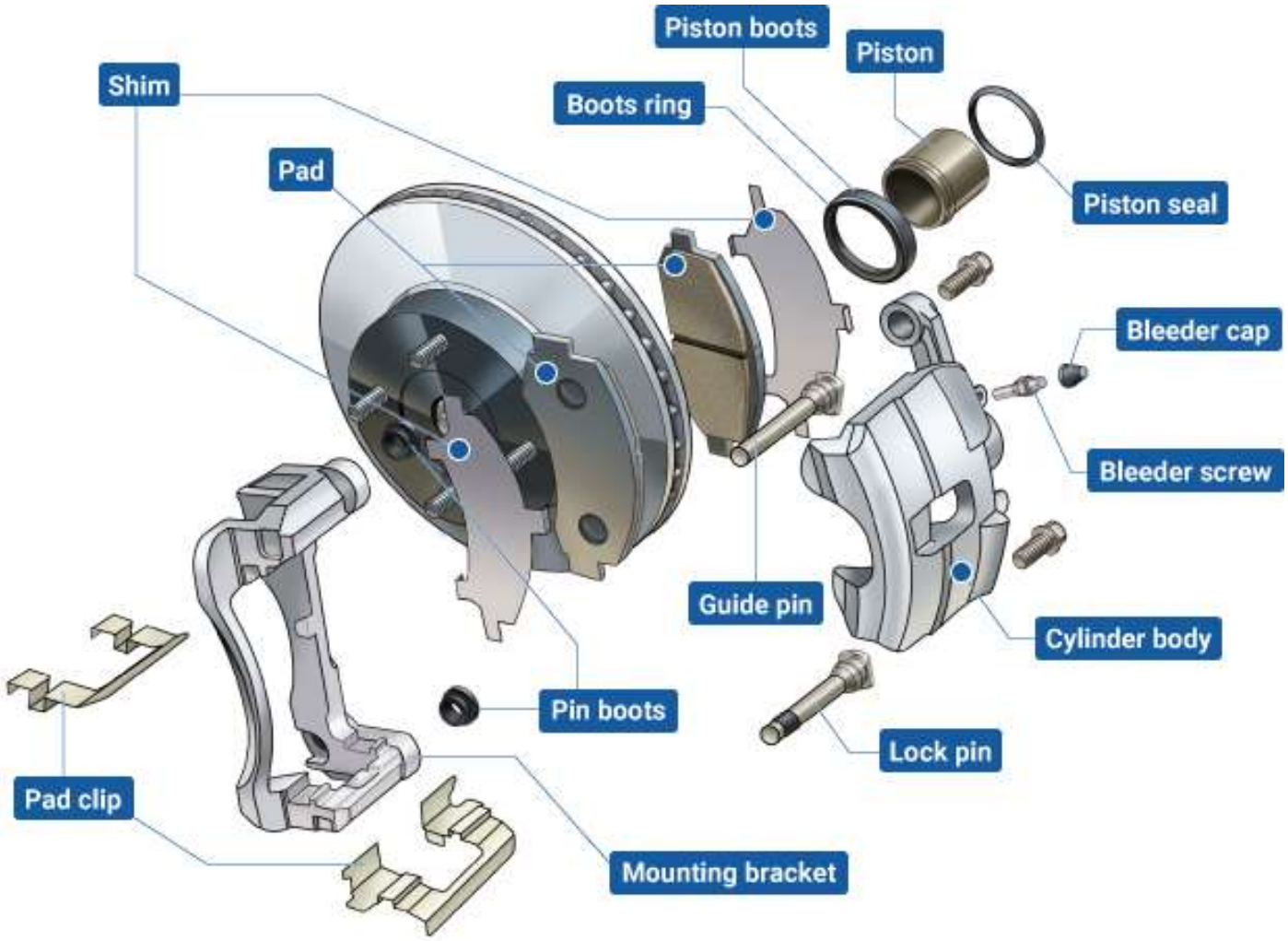
The outcome of this task is to assess the learner's skills and ability to understand the relationship between the vehicle and the maintenance thereof. This task aims at a general maintenance of a petrol vehicle and replacing of a brake pad and brake shoe service kit. In order to save money, learners can remove parts, and then replace as if they were new parts. This PAT aims on the skills to conduct a general maintenance on vehicle.

Resources Required:

- Vehicle with front brake discs and brake pads.
- Brake Service parts may be separate items, but such that Learners can experience the complete unit.
- Appropriate tools and equipment to dismantle and assemble specified service parts.
- Appropriate Personal Protection Equipment (PPE).

Example of a break discs and pads

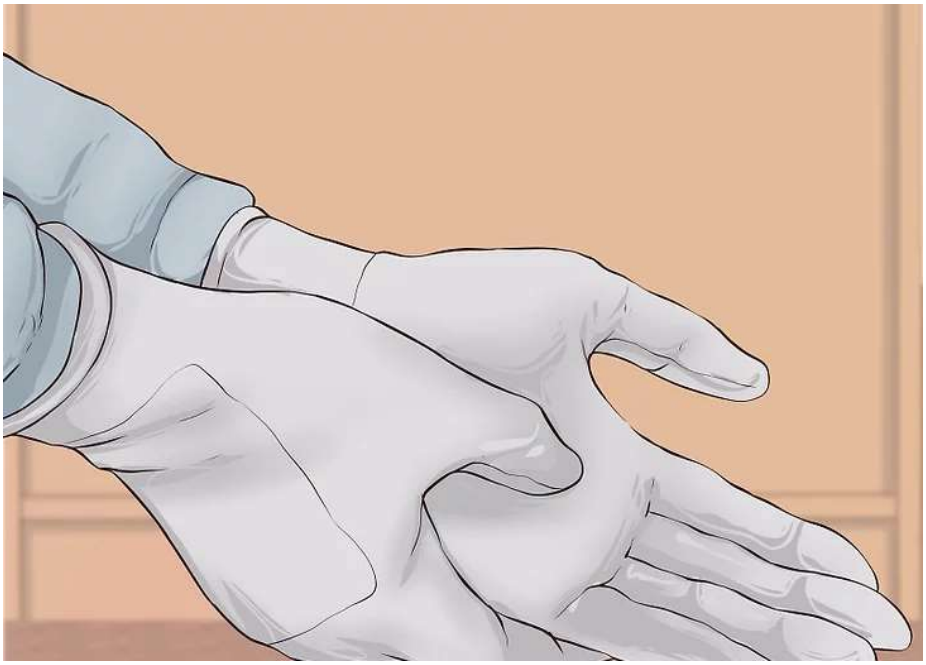
Instructions for Phase Four task.



Exploded view of Brake system

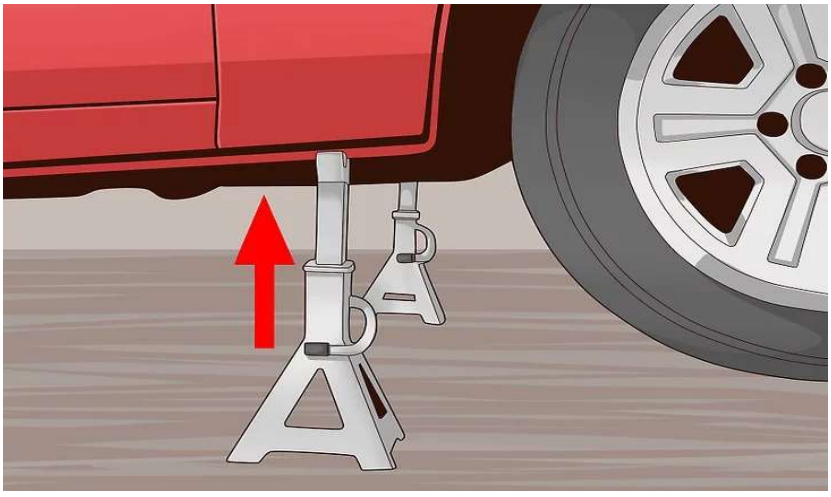
Removing of the old disc:

1. **Put on protective gloves.**



Before performing any work on your vehicle, as you're gathering all the tools you'll need, it's a wise idea to find a pair of sturdy work gloves. Vehicle maintenance can be a messy job, so you'll want to protect your hands from grease and grime before working on the vehicle. These gloves can also protect your hands in the event of an accident.

2. **Raise the vehicle with a lift or jack on solid level ground.**

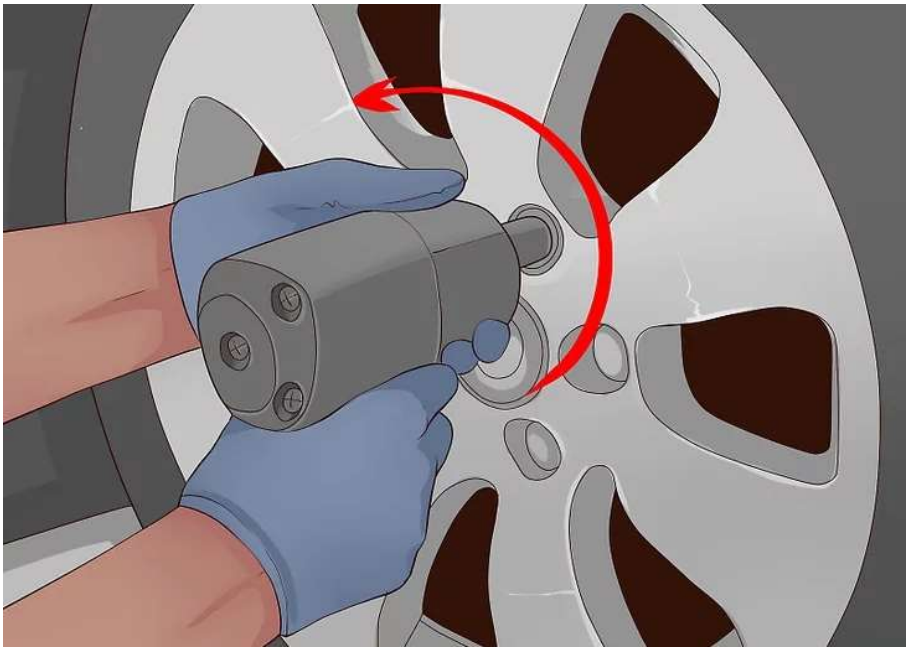


Loosen the lug nuts a little before lifting a wheel, *if using a jack* (the ground holds the wheels from turning while using your lug wrench). Block the other wheels to prevent the vehicle from rolling when lifting only one wheel, or only one end of the car, at a time. You may need to release the parking brake for the wheels you are servicing. Using hand tools and a hand-operated jack(s) works fine but using a power impact wrench and/or a hydraulic car lift such as professionals use is easier. Jack only against a thick and sturdy metal part of the vehicle's undercarriage (if the jack presses into thin metal or a plastic moulding, it could punch through, warp/bend or crack such surfaces).

- **Caution:** Support the vehicle on heavy duty jack stands after lifted in case a jack was to slip (a hydraulic bottle jack or floor jack might lose pressure and lower unexpectedly). A scissor/ accordion jack might bend or break under stress.

  Danger: A jack or jack stand can amazingly easily be leaned over by pushing (including by hand) on the vehicle, and it can easily fall. You could move a car sideways on purpose by jacking up on side of the car with bottle jacks and pushing until the jacks lean and fall over.

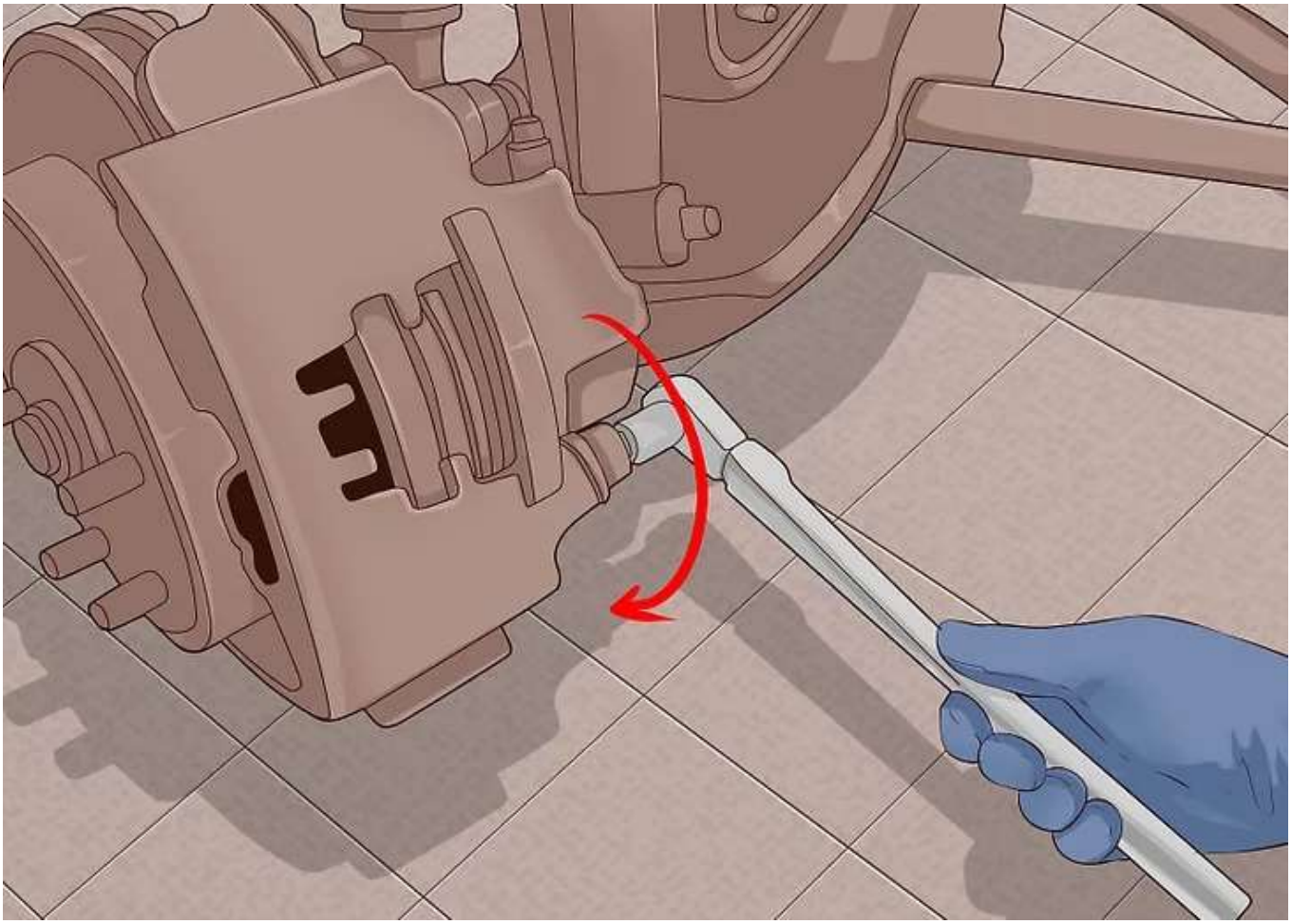
3. Remove the vehicle's wheel.



The components of the brake, including the disc, are mounted behind the wheel itself, so, to access them, the wheel must be removed. To do so, simply unscrew the lug nuts and pull/lift the wheel off, exposing the hub, disc, and callipers.

- To keep track of the lug nuts (and later, other important nuts and bolts), many mechanics like to remove the vehicle's wheel cover/hub cap and use it as a sort of "dish" to contain these small parts. But be careful not to damage the hub cap on the ground.

4. Remove the callipers.

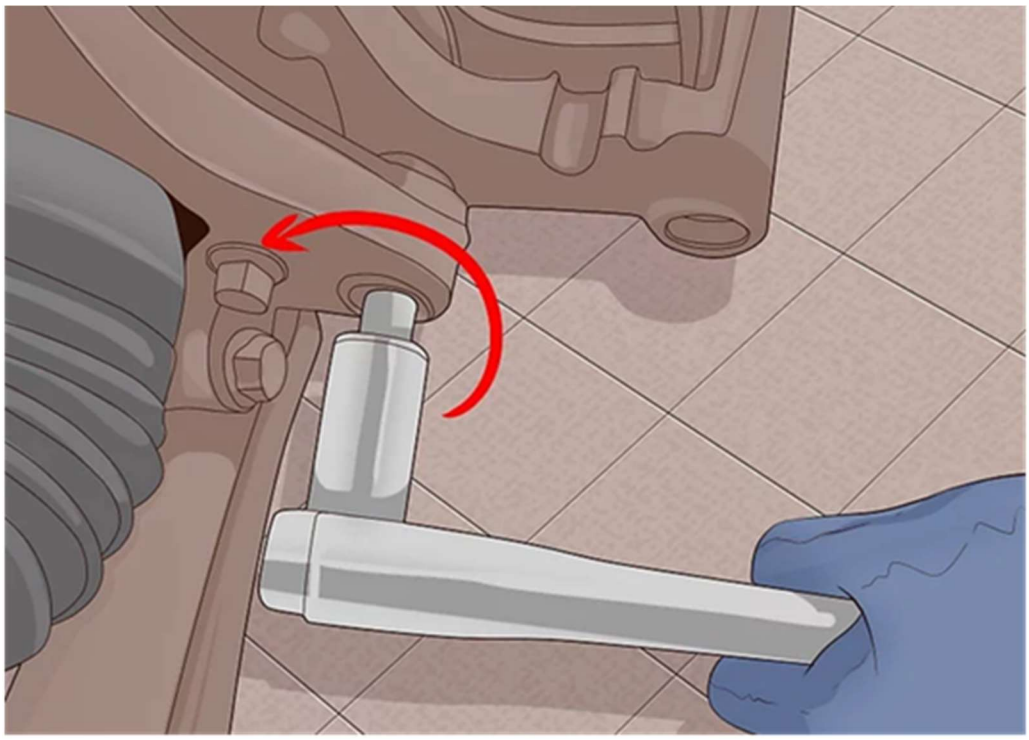


The brake callipers are usually held in place by one or two bolts that are threaded in from the rear of the calliper. To reach these bolts, you'll probably need a ratchet with an extension. The bolts may have standard hex heads, or they may be Allen-head/hex-key type bolts.

After the bolts and any spring clips holding the calliper in place have been removed, take the calliper off and hang it out of your way with cord or wire, taking care not to put tension on the brake hose. You may need to wedge and pry with a screwdriver or tap with a wood block and hammer to dislodge and remove the calliper from the disc and calliper bracket.

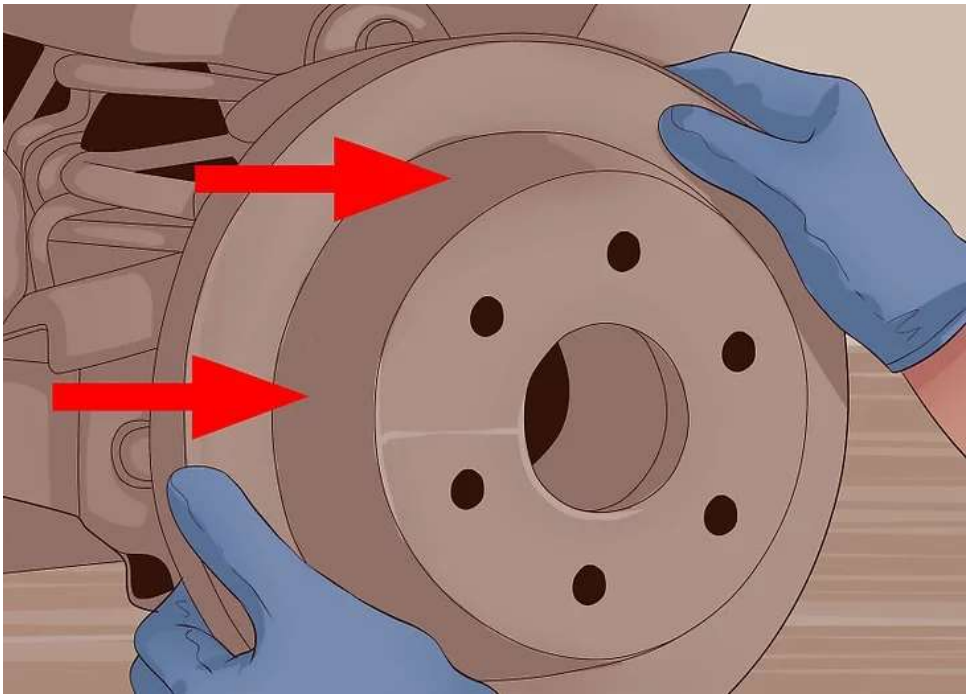
Note that if you remove the calliper from the brake line, the brakes will begin to leak fluid out and get air in the lines and will need to be bled after the repairs to remove the air.

5. If necessary, loosen and remove the calliper mounting bracket bolts.



In some vehicles, the brackets that the caliper was secured to can prevent removal of the disc. If so, use a wrench or ratchet to unscrew this bracket's bolts and remove them. Then, remove the bracket itself. These bolts may have a thread lock cement on them and come out hard.

6. Remove the brake disc.

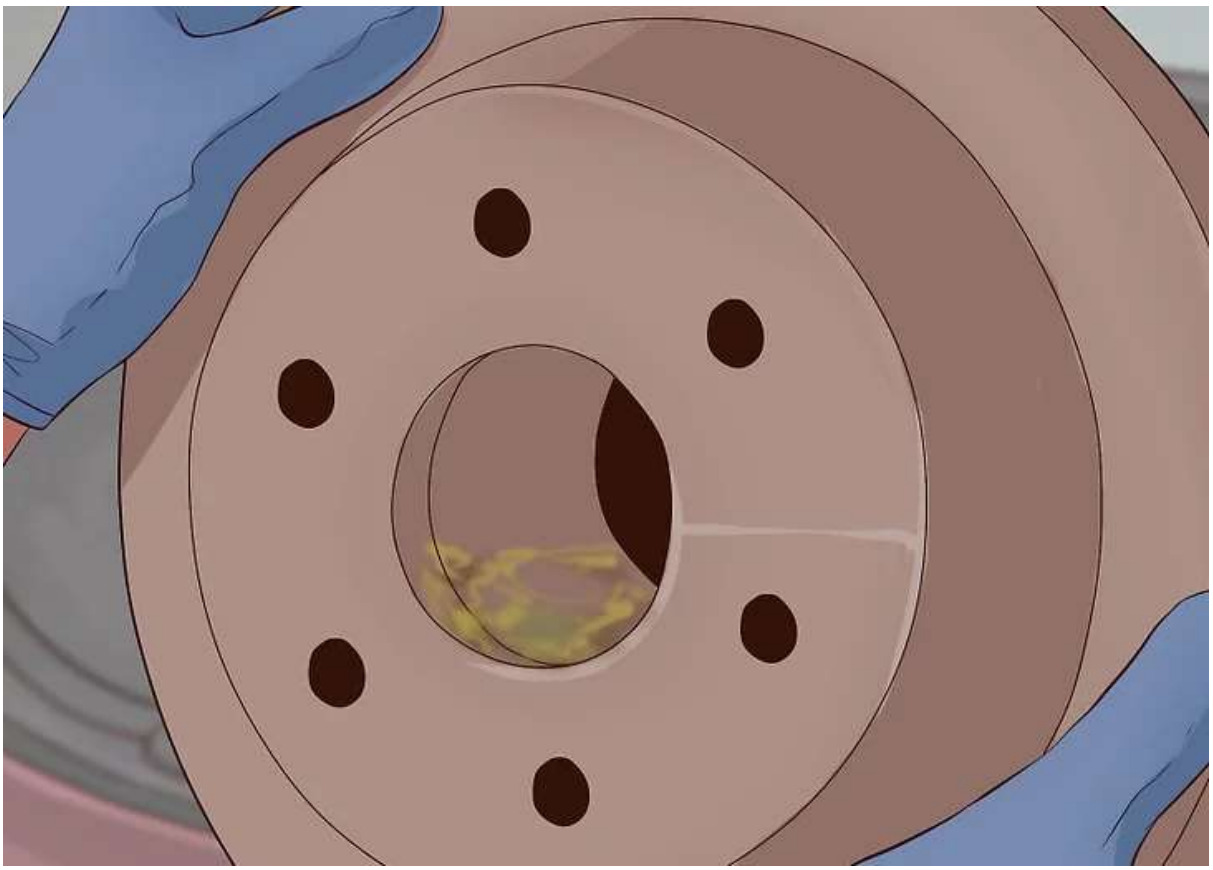


Sometimes, this can be as simple as merely pulling it off. However, if the disc hasn't been replaced in a long time, it may be stuck by corrosion, dirt and rust to the wheel hub and be difficult to remove. You may need to tap it with a hammer and a wooden block to loosen it. Holding a block of wood against the disc and hitting the wood, do not strike the disc directly. Penetrating oil is helpful for loosening the corrosion and rust

Also, some wheels will have disc and hub assemblies where the axle bearing retains nuts and grease-packed bearings must be removed. These are in the center of the hub or knuckle on the axle or spindle. You may, for example, need to remove a metal dust cap, cotter pin or un-clinch a keyed flange and/or castle nut, and bearing to allow the disc to be removed. Be careful not to get dirt in the bearing.

After the disc is removed, clean the hub surface of any corrosion or debris so the new disc can sit flush on the hub surface.

7. Inspect grease seals and bearings.



Inspect grease seals and bearings, if your vehicle has a disc with a grease packed bearing in the hub assembly, since removing the hub will likely damage the grease seal, and replacing the wheel bearings including bearing races can be insurance against a potential failure later.

8. Replacing brake pads.

You need to open the caliper to access the brake pads. On some vehicles the caliper will rest in an open position on its own. However, on this vehicle it wanted to fall back closed, so I had to hold it open by hand. If you don't have a helper, you might hold the caliper up using a small bungee cord.

Remove the bolt and the caliper. You may need to use a second wrench on the caliper bolt bushing to keep it from spinning. If it rotates with the bolt, then you are not loosening the bolt yet. Some brake pads have small rivets on the back that might catch on the edge of the piston.

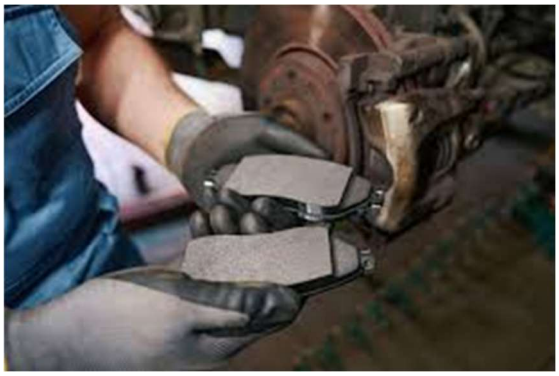
If this happens and you cannot rotate the caliper, you may need to use a wrench, screwdriver, c-clamp, etc. to try to compress the piston enough to clear the rivets. To avoid risk of damaging hydraulic components, open the bleeder screw on the back of the caliper before compressing the piston.

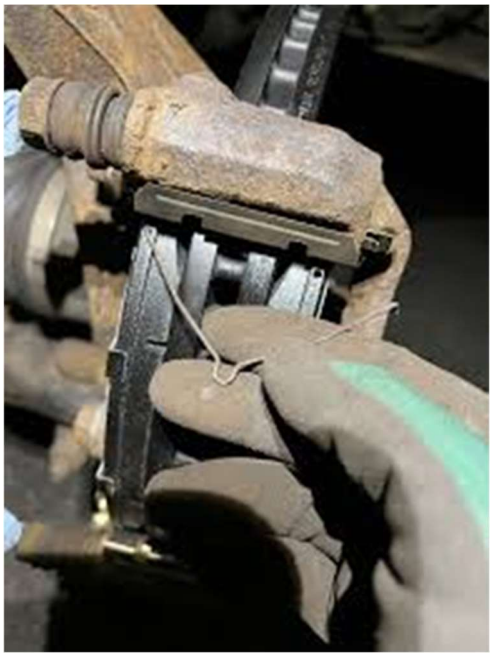
With the caliper open, you can pull the old pads away from the disc and remove them from the brake assembly. Pay attention to any differences between the inside and outside brake pads to facilitate the installation of the new pads later. As the pads wear, the piston continues to rest in a more "closed" position. In fact, it would not fit over the larger thickness of your new pads.

First open the brake fluid reservoir before any piston should be moved backwards. Also check the fluid level and do not top up before new pads have been installed.

You can use a C-clamp to compress the piston back to the fully open position. This process forces some of the brake fluid in the hydraulic system back into the master cylinder. You can use alternative tools to compress the piston, but I found the c-clamp works well.

Insert the pads into the brake calliper taking care of the direction you removed them. Ensure that it is the right model to compare the pads with old pads.





Ensure if the pads are being held in place with wire springs or plate spring, to replace them as well. Normally in a new kit you will get a new set with the pads. Some pads have already springs built into them.

Replace the caliper by sliding it back into place over the pads. Ensure the piston is pushed back as far as possible so the caliper is not forced over the pads.

Tighten the screws again and ensure it is torqued according to specifications (normally 43 N/m).

Repeat the installation process for the other side well.

After installation, press the brake pedal until it is stiff. Check the fluid again and only after replacing both sides. If top-up is needed, use the correct DOT number of fluid for the vehicle.

LEARNER WORKSHEET 4.1

LEARNER NAME:	

The Component/Part	INSTRUCTIONS	ANSWERS	Marks Punte	
 FIGURE 4.1	1. Identify the component in FIGURE 4.1.		1	
	2. Explain the purpose of the hole at no 1.		2	
	3. What is the purpose of the smooth surface on no 2?		1	

 FIGURE 4.2	1. Identify the component in FIGURE 4.2.		1	
	2. Explain the function of the component in FIGURE 4.2		1	
	3. What is the purpose of the surface indicated as A?		2	

 FIGURE 4.3	1. Identify the component in FIGURE 4.3.		1	
	2. Explain the function of component on FIGURE 4.3.		2	
	3. What is the purpose of the fins in FIGURE 4.3?		1	
 FIGURE 4.4	1. Identify the component in FIGURE 4.4.		1	
	2. Explain the function of component in FIGURE 4.4.		2	
		Sub-Total:	**[15]**	

EDUCATOR WORKSHEET 4.2

LEARNER NAME:	

PRACTICAL APPLICATION – BRAKE DISC and PAD REPLACEMENT			
Action		**Marks**	
Making vehicle safe	Place wheel locks behind wheels	3	
	Ensure jack is placed in right position as not damage vehicle body	2	
	Lift vehicle to remove parts	2	
Remove parts	Open fluid reservoir cap.	2	
	Inspect brake fluid level.	2	
	Loosen wheel nuts.	4	
	Remove wheel.	2	
	Inspect wheel for damage on rim.	2	
	Loosen brake calliper bolts.	2	
	Remove wire/spring clips form pads.	2	
	Remove brake calliper.	2	
	Remove brake pads.	4	
	Place brake calliper by hanging safe without to damage brake line pipe.	2	
	Press cylinder safely back with appropriate tool.	2	
	Loosen holding screws on disc	3	
	Remove disc	2	
	Inspect wheel bearing hub for damage/enough grease	2	
	Sub-total:	**[40]**	

EDUCATOR WORKSHEET 4.3

LEARNER NAME:	

PRACTICAL APPLICATION – BRAKE DISC and PAD REPLACEMENT			
Action		**Marks**	
Replace parts	Replace disc	3	
	Ensure new disc is clean from any rust prevention oil	2	
	Check brake pads match with new ones	2	
	Replace brake pads	4	
	Replace calliper	4	
	Tighten and torque nuts to correct specification	4	
	Replace wire/tension springs	4	
	Replace wheel	2	
	Insert wheel nuts and tighten	4	
	Lower vehicle safely	2	
	Torgue wheel nuts to specification	4	
	Press brake pedal until stiff	2	
	Check brake fluid level	2	
	Replace brake fluid reservoir cap	1	
	Sub-total:	**[40]**	

LEARNER WORKSHEET 4.4

LEARNER NAME:		

CONDITION REPORT – BRAKE DISC and PAD REPLACEMENT			
Parts	**Part Condition Report**	**Marks**	
Wheel hub/bearing		3	
Condition of brake calliper fluid pipes.		3	
Cylinder condition (rubber and seals outside)		4	
Disc surface		4	
Brake pads condition		4	
Clips/wire springs condition		2	
	Sub-total:	**[20]**	

MARK SHEET – ENGINE SERVICE		
Work sheet 1 – Theory – Identification of parts	15	
Work sheet 2 – Remove parts	40	
Work sheet 3 – Replace parts	40	
Work sheet 4 – Part Condition Report	20	
Sub-Total:	**115**	
Total:	**100**	

GRADE 10

PRACTICAL ASSESSMENT TASKS

PHASES ONE, TWO, THREE and FOUR

ANNEXURE A

DECLARATION OF AUTHENTICITY

NAME OF THE SCHOOL: …….

NAME OF LEARNER: ……...

(FULL NAME(S) AND SURNAME)

EXAMINATION or I.D. NUMBER: …….

NAME OF TEACHER: …….

SCHOOL STAMP

I hereby declare that the project submitted for assessment is my own, original work and has not been previously submitted for moderation.

_____ _____

SIGNATURE OF CANDIDATE **DATE**

As far as I know, the above declaration by the candidate is true and I accept that the work offered is his or her own.

_____ _____

SIGNATURE OF TEACHER **DATE**