

TEACHER'S GUIDE

MECHANICAL TECHNOLOGY

GRADE

8

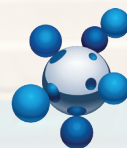


basic education
Department:
Basic Education
REPUBLIC OF SOUTH AFRICA



KAGISO
TRUST
Overcoming poverty

sasol



TEACHER'S GUIDE

MECHANICAL TECHNOLOGY

GRADE

8

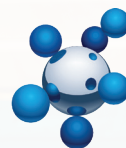


basic education
Department:
Basic Education
REPUBLIC OF SOUTH AFRICA



KAGISO
TRUST
Overcoming poverty

sasol



Mechanical Technology Grade 8 Teacher's Guide

First published in 2023

© 2023. Copyright in the work is vested in the publisher. Copyright in the text remains with the contributors. This project is funded as an ongoing project of the Sasol Foundation and the Kagiso Trust, and has been developed with the participation of ACP Project Management and Publishing Services.

Illustrations and design ACP Project Management and Publishing Services, 2023
Cover design by ACP Project Management and Publishing Services
Cover image 123RF Stock Photos: Zoya Fedorova (Image ID 13654128)
Illustrations by Will Alves, Tina Nel and Shameema Dharsey
Layout and typesetting by Nazley Samsodien in ITC Stone Serif Std 10.5 pt over 13.5 pt
Editing, Proofreading and Project Management by ACP Project Management and Publishing Services

ISBN: 978-1-998982-76-9

Contributors from the DBE

Ms Desiree Letshwiti • Mr Prince Luvuno • Mr Elija Mahlaku • Mr Mfana Nene • Mr Danie Van Der Westhuizen

Your freedom to legally copy this book

This work is published under a Creative Commons Attribution-Non Commercial 4.0 Unported License (CCBY-NC 4.0) <http://creativecommons.org/licenses/by-nc/4.0/>

You are allowed to freely copy this book subject to the following criteria: You can photocopy, print and distribute it as you like.

You may download it onto any electronic device, distribute it via email, and upload it to your website at no charge.

You may adapt the text and illustrations.

Image attribution

123RF Stock Photos: p. 2; p.3; p.5–9; p.11–13; p.17; p.22; p.35; p.37; p.51; p.65–66; p.68; p.79–82; p.91; p.99; p.124–125; p.127; p.133; p.137–141; p.145; p.147; p.153–154; p.157; p.161; p.163; p.170–171; p.181; p.184–186; p.193; p.201–202; p.207; p.215 (right); p.219–221; p.225–226; p.230; p.236; p.244–246; p.248; p.254; p.256–257; p.274; p.278; p.280; p.282–284; p.287; p.291–293; p.295–297; p.300; p.313; p.321; p.323–329; p.331–332; p.340–345; p.346 (second, third and fifth photos); p.347–349; p.377–378; p.383 (bottom); p.384 (second photo); p.387 (first and third photos); p.388; p.408–410; p.414–415; p.240
Dreamstime Image Library: p.149; OSIRIS Team: p.391; NOAA Photo Library: p.397
Gallo images: p.109 and p.124
NASA Images: p.189; p.346 (first and fourth photos); p.379; p.381; p.383 (top); p.384 (first photo); p.386; p.387 (second photo); p.402–405 Tango22: p.323 (seventh photo); John O'Neill: p.375; Mrs Cranfield: p.14

Attribution

When doing any of the above, you should provide clear acknowledgement of the license/copyright holders. This attribution should include the name(s) of the original book(s) and the publisher, as well as acknowledgement of Sasol Inzalo Foundation and the Department of Basic Education of South Africa. You should also provide the Creative Commons web address (<http://creativecommons.org/licenses/by-nc/4.0/>), which explains this type of license. If you have made any changes to the material, you must indicate what changes you made. You may not in any way suggest that the licensor endorses you, or uses any of your materials or your changes to the material.

Restrictions

You may not make copies of this book in part or in full – in printed or electronic or audio or video or whatever form – for a profit seeking purpose.

Rights of other copyright holders

All reasonable efforts have been made to ensure that materials included are not already copyrighted to other entities, or in a small number of cases, to seek permission from and acknowledge copyright holders. In some cases, this may not have been possible. The publishers welcome the opportunity to redress this with any unacknowledged copyright holders.

Table of Contents

INTRODUCTION

Planning	1
Teaching-learning protocols	1
Learner's Book	2
Outcomes	2
Teacher's input	2
What is facilitation?	3
Understanding pedagogy	3
The Facilitator/Teacher	4

OVERVIEW

Overview of topics per term and Annual Teaching Plans (ATPs)	5
Content overview	5
Content outline per term	11
Term 1	11
Term 2	13
Term 3	15
Term 4	17

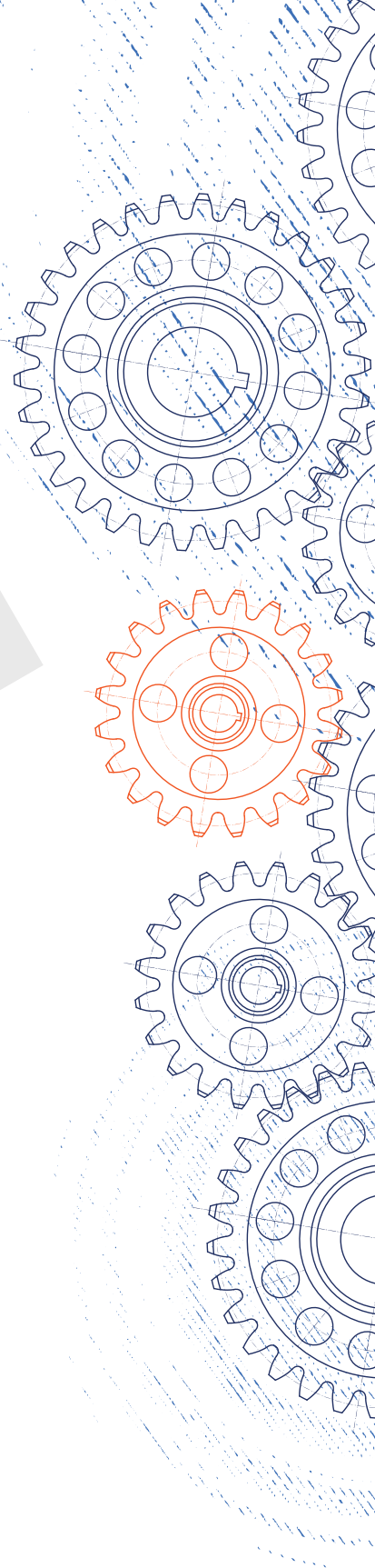
SUGGESTED ANSWERS

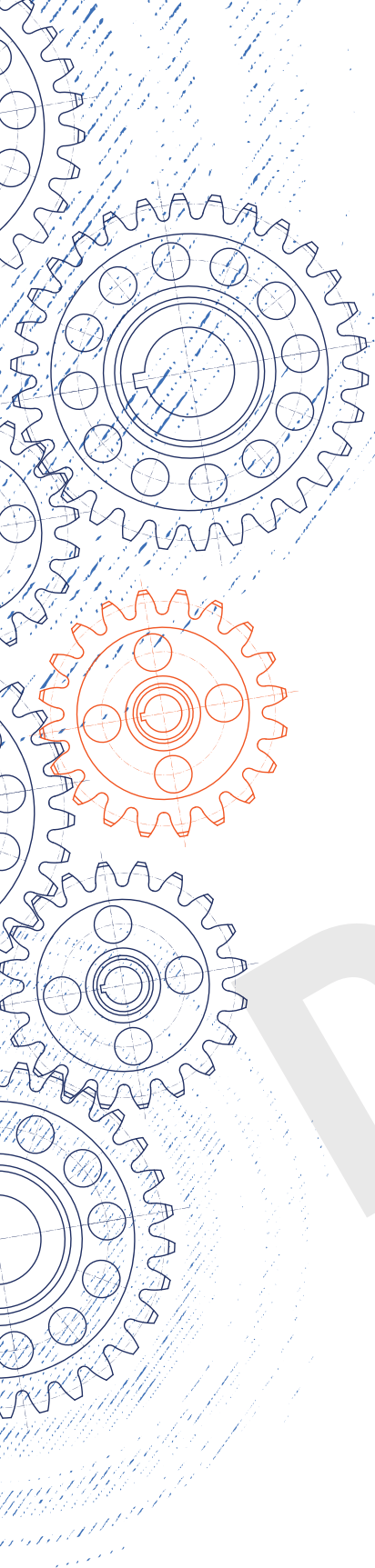
CHAPTER 1 OCCUPATIONAL HEALTH AND SAFETY

Activity 1.1 Occupational health and safety	18
Activity 1.2 Accidents and good housekeeping	20
Activity 1.3 Safety signs and safety requirements	20
Activity 1.4 First aid	23
Practical tasks	24

CHAPTER 2 GRAPHIC COMMUNICATION

Activity 2.1 Types of lines	25
Activity 2.2 Printing using freehand drawing	26
Activity 2.3 Using freehand drawing	27
Activity 2.4 Orthographic projections and isometric drawings	28





CHAPTER 3 TOOLS, INSTRUMENTS AND EQUIPMENT (GENERIC) 31

Activity 3.1 workbenches, clamping tools and spanners	31
Activity 3.2 Pliers, screwdrivers and hammers	32
Activity 3.3 Cutting tools	35
Activity 3.4 Scribes, punches and dividers	37
Activity 3.5 Steel rule, steel tape	37
Activity 3.6 Bench grinder, portable drill machines and lifting equipment	38

CHAPTER 4 ENTREPRENEURSHIP 39

Activity 4.1 Entrepreneurs and entrepreneurship	39
Activity 4.2 Marketing and branding	41

CHAPTER 5 43

Activity 5.1 Materials	43
Activity 5.2 Materials	45
Practical task	47

CHAPTER 6 JOINING METHODS 48

Activity 6.1 Joining methods	48
Activity 6.2 Screws	50

CHAPTER 7 TERMINOLOGY 54

Activity 7.1 Centre lathe	54
Activity 7.2 Milling machine	55
Activity 7.3 Engines	56

CHAPTER 8 MAINTENANCE 59

Activity 8.1 Maintenance	59
Practical maintenance	60

CHAPTER 9 BODY WORKS AND SPRAY PAINTING 61

Activity 9.1	61
Practical Activity	64
Activity 9.2	65
Practical skills activity	65

Introduction

Planning

This involves planning, preparing, and timing the activities following the Annual Teaching Plan (ATP). Planning for the teaching, learning and assessment process includes making the presentations and deciding how to approach the activities.

Once you have planned the broad term schedule for Mechanical Technology, start concentrating on the detailed planning for each topic and class session.

Here you will have to consider the:

- content of activities
- timing of activities
- methods of teaching, learning and assessment
- resources
- facilitating/teaching techniques.

Teaching-learning protocols

- Subject Annual Teaching Plans/Programme
- Attendance and punctuality
- Signing of learner attendance registers
- Monitoring of the adherence to classroom etiquette
- Strategies for how learners will share their inputs, for example, raising a hand to speak

The purpose of these support resources

These support resources aim to guide the teaching, learning and assessment, with the requisite balance in the cognitive levels and subject-specific aims.

It should be read in conjunction with the subject policy to ensure that the process in the subject has integrity and yields high-quality, competent learners, who can be relied on by all stakeholders.

Learner's Book

Introduce the textbook resource to the learners and discuss the teaching-learning programme.

Introduction to the lesson, outcomes and expectations

All target learning styles (differentiation and inclusion)

Activity: learner's expectations of the lesson

Suggested time allocation: 30 min

Resources

- Learner textbook

Method

- Individual, pair, team inputs and discussion

Outcomes

Learners should be given an opportunity to:

- express and discuss their expectations regarding School Based Assessment (SBA)
- check whether the lesson is responsive to their expectations.

Group/Team Learning

Number your learners 1 – 10. Repeat four times (if you have a total of 40 learners). Group all the 1s together at Table 1, Group all the 2s together at Table 2, Group all the 3s together at Table 3; Group all the 4s together at Table 4; Group all the 5s together at Table 5; Group all the 6s together at Table 6; Group all the 7s together at Table 7; Group all the 8s together at Table 8; Group all the 9s together at Table 9; Group all the 10s together at Table 10. (Remember to make table numbers)

(You may find it is useful to change groups/teams every day so that participants get an opportunity to interact with more peers.)

- Learners introduce themselves in the group/team. (3 minutes)
- Make sure all learners are seated in a group/team and your tables are numbered.

Teacher's input

Individual activity

Ask the learners to record their expectations of the lesson in the classwork books.

Group/Team activity

In their groups/teams, ask learners to discuss and record their expectations on their group/team poster.

Presentations and discussion

- Allow time for group/team presentations.
- Take note of common expectations.
- Display posters on the wall.

Consolidation and reflection

- Summarise learners' expectations.
- Highlight those expectations that will be covered in the lesson.
- Ask learners to track which of their expectations (tick off in a red pen) are met as the lesson unfolds.

What is facilitation?

Facilitation means doing something that makes a lesson more effective and productive. Facilitation can also mean all the teacher's behaviours and actions that positively influence the experiences and learning of the learners and the groups/teams.

- Through the facilitation process, learners can develop a product much more quickly in a group/team setting.
- Everyone involved “owns” the product and understands how it came to be.

Effective facilitation ensures group/team success because a facilitator guides learners to interact with one other in a safe and trusting environment.

When you conduct a lesson, you have a group of participating learners, and you want that group to perform at an optimal level where there is maximum participation. You can use a variety of facilitation strategies.

Understanding pedagogy

A pedagogically skilled teacher:

- **Plans** their teaching, learning, and assessment processes to achieve lesson objectives.
- Creatively **prepares** and **develops** lessons.
- Can make a **distinction** between **pedagogy** and **curriculum**.
- Can **deliver lessons effectively** and within the parameters of the curriculum, and **assess** in a way that supports learning and measures learning reliably.
- Can use **open-ended questions** to break points down, critique them, and apply critical thinking to formulate thoughts.
- Sets high expectations for all learners to try their best and attain the envisaged high standards.
- Can use **differentiation and inclusion** to allow each learner to succeed.

Other pedagogical skills

- **Scaffolding:** systematically building on learners' experiences and knowledge as they are learning new skills.
- **Repetition:** teachers need to repeat things to reinforce learning (informal assessment is vital).
- **Inquiry-based teaching:** a form of active learning that starts with the teacher posing questions, problems, or scenarios. Learners get a better understanding from doing and discovering.
- **Classroom layout:** use a conducive setting to experience an increase in academic engagement and a decrease in disruptive behaviour.
- **Trimmed information:** small, manageable amounts of information provide for effective assimilation of knowledge.

We make use of facilitation to:

- ❖ work better, smarter, and faster
- ❖ encourage better participation, interaction, collaboration, and cooperation
- ❖ get better and new ideas
- ❖ foster deeper levels of understanding
- ❖ promote a higher level of ownership of the product

The Facilitator/Teacher

A facilitator/teacher is someone who...

- is knowledgeable and well prepared
- is flexible but firm when necessary
- is friendly and approachable
- is willing to listen and learn
- is tactful but honest
- brings out the full potential of the learners in a group/team
- keeps the training on track
- helps resolve conflict
- draws out participation from all the participants
- organises the work of a group/team and makes sure that the outcomes of the lesson are met
- manages group/team dynamics

A facilitator/teacher is not someone who...

- is unprepared or disorganised and cannot respond satisfactorily to questions from participants
- marginalises a learner
- ignores an idea (looks tired and gets distracted because too many ideas are coming at once)
- becomes emotional and defensive
- solves the problem for the group
- dominates the discussion
- manipulates people and behaviours through their own feedback
- tries to have all the answers
- uses the cell phone all the time
- is unable to integrate the life experiences of learners into the classroom for a more meaningful learning experience

Overview

Overview of topics per term and Annual Teaching Plans (ATPs)

Content overview

TOPIC	GRADE 8	GRADE 9
1. Safety	<ul style="list-style-type: none"> • Definition of an accident • Causes of accidents • Identify and respond to unsafe or potentially unsafe conditions or acts • Personal safety equipment and performing housekeeping duties • Purpose of demarcated areas, emergency stops, first aid stations, safety signs, ventilation, lighting, electricity supply 	<ul style="list-style-type: none"> • Firefighting • Identify and respond to unsafe or potentially unsafe conditions or acts • Explain the rights and responsibilities of workers with HIV/AIDS
2. Graphic Communication	<p>Introduction of Graphic Communication</p> <ul style="list-style-type: none"> • What is Graphic Communication? • The purpose of Graphic Communication • General drawing principles • Safety precautions when using drawing instruments • Correct use and care of drawing instruments • Freehand sketches • Types of lines • Lines (SANS0111 guidelines) • Dimensions, lettering, and border lines. • Freehand drawing • Scale drawing 1:1 and 1:2 • Pictorial drawings (using drawing instruments) <ul style="list-style-type: none"> » Isometric drawings » 1st Angle Orthographic 	<p>Demonstrate and apply all aspects of drawing</p> <ul style="list-style-type: none"> • Revision of Grade 8 work • Free-hand drawings • Geometrical drawings • Isometric drawings • 3rd angle Orthographic drawings

TOPIC	GRADE 8	GRADE 9
3. Tools, instruments and equipment	<ul style="list-style-type: none"> Identify tools, instruments and equipment and their uses (theory and practical application) <ul style="list-style-type: none"> Select and use hand tools Select and use measuring equipment (theory and practical application) Identify different lifting equipment used in the automotive workshop, i.e. hydraulic trolley jack, bottle jack, scissor jack Safety equipment needed when using lifting equipment, i.e. chock block, jacking points on the vehicle, trestles and creepers 	<ul style="list-style-type: none"> Care and maintenance of tools and equipment <ul style="list-style-type: none"> Work safely with due care for self, fellow learners and equipment Care and maintenance of measuring equipment Recognise, and report wear or damage to measuring equipment Power supply and connection to equipment Recognise and report any damage to any power tool Care and maintenance of power tools Discuss operation, functions and components of lifting equipment Carry out precautionary measures before operating the lifting equipment Use lifting equipment to change a wheel of a vehicle
4. Entrepreneurship	<ul style="list-style-type: none"> What is entrepreneurship? Who is an entrepreneur? Types of entrepreneurship Marketing and branding products Advertising on a media platform 	<ul style="list-style-type: none"> What is entrepreneurship? Who is an entrepreneur? Type of entrepreneurship. <ul style="list-style-type: none"> Small Business entrepreneurship Scalable start-up entrepreneurship Large company entrepreneurship Social entrepreneurship Why is entrepreneurship important? What factors affect entrepreneurship? Business Plan

TOPIC	GRADE 8	GRADE 9
5. Materials	<ul style="list-style-type: none"> • Introduction to and classification of material: <ul style="list-style-type: none"> » Ferrous metals » Non-ferrous metals 	<ul style="list-style-type: none"> • Classification and application of materials: <ul style="list-style-type: none"> » Ferrous alloys » Non-ferrous alloys (Sheet metals, cold-rolled sheets, galvanised sheets, expanded sheets) » Plastics
6. Joining methods	<ul style="list-style-type: none"> • Definition of joining methods • Types of joining methods <ul style="list-style-type: none"> » Permanent joining methods (definition only) » Semi-permanent joining methods • Semi-permanent joining methods • Apply procedures of basic semi-permanent joining processes <ul style="list-style-type: none"> » Bolt and nuts (and washers) » Screws 	<ul style="list-style-type: none"> • Demonstrate the processes of joining methods • Apply permanent joining method <ul style="list-style-type: none"> » Soldering » Arc welding • The Teacher demonstrates screw thread-cutting procedures • Screw cutting (Tap and Die ONLY) • ISO metric threads
7. Terminology	<ul style="list-style-type: none"> • Identify the different machines used in the Fitting and Machining Workshop and their uses. <ul style="list-style-type: none"> » Centre Lathe » Milling Machine • Engines <ul style="list-style-type: none"> » Engine components and their functions: crankshaft, connecting rods, cylinder block, combustion chamber, inlet valve, cam, camshaft, spark plug, valve spring, exhaust valve, cylinder head, water jacket, piston and crankcase. • Practical task 1 On Centre Lathe and Milling Machine (cleaning and oil). 	<ul style="list-style-type: none"> • Identify the different components (and their functions) of the machines used in the Fitting and Machining Workshop • Centre Lathe (tailstock, chuck, chuck key, tool post, lead screw, compound slide, cross slide, emergency brake and headstock) • Milling Machine (table, motor, levers, switches, spindle, stand) • Surface grinder (table, base, feed lever, grinding wheel, switches) • Operations that can be done on a milling machine (Boring, Drilling, Indexing, Gear cutting, Keyways, Splines)

TOPIC	GRADE 8	GRADE 9
7. Terminology <i>(continued)</i>	<ul style="list-style-type: none"> ● Practical task 2 Use of an engine for learners to identify and explain the purpose of different engine components. 	<ul style="list-style-type: none"> ● Terminology: <ul style="list-style-type: none"> » Engine designs » Engines » TDC » BDC » Stroke » Bore ● Fundamentals engine technology: <ul style="list-style-type: none"> » FOUR (4) Stroke (Petrol) Engine » Operation » Intake » Compression » Power » Exhaust » Function of engine systems ● FOUR (4) Stroke (Petrol) – 1 cylinder <ul style="list-style-type: none"> » Comparison of the two engines » Inspect parts
8. Maintenance	<ul style="list-style-type: none"> ● Introduction to machine maintenance ● Lubrication <ul style="list-style-type: none"> » Definition » Identify lubricant for different components (engine oil, gear oil, automatic transmission fluid). » Correct handling and storage of lubricants. ● Practical task <ul style="list-style-type: none"> » Plan and prepare to inspect and lubricate machines and equipment 	<ul style="list-style-type: none"> ● Introduction to machine maintenance (Grade 8 revision) ● Lubrication: <ul style="list-style-type: none"> » Definition » The purpose of lubrication » Inspection frequency » Types of maintenance » Inspection and fluid top ups » Inspection of defects on motor vehicle ● Engine maintenance <ul style="list-style-type: none"> » Importance of regular maintenance ● Automotive batteries (lead, acid storage and gel type batteries) <ul style="list-style-type: none"> » Handling and care

TOPIC	GRADE 8	GRADE 9
8. Maintenance <i>(continued)</i>		<ul style="list-style-type: none"> • Practical task 1 <ul style="list-style-type: none"> » Drain, refill or top up fluids and lubricants » Inspect for leaks and defects • Practical task 2 <ul style="list-style-type: none"> » Remove and install battery in vehicle
9. Body Works	<p>PANEL BEATING</p> <p>Repair different coin-sized dents on ferrous body shells while applying safety rules</p> <p>Practical demonstration</p> <ul style="list-style-type: none"> • Repair a coin-sized dent on a body panel. <p>Tools</p> <ul style="list-style-type: none"> • Identify and assess the damage • Select appropriate tools to be used for repairs: <ul style="list-style-type: none"> » Planishing hammer » Cross-pane and finishing hammer » Curved pane and finishing hammer » Pick finishing hammer » General purpose dolly » Heel dolly » Toe dolly » Curved dolly » Beating file » Adjustable body file » Orbital sander » Steel brush <p>Perform surface preparation of a body panel</p> <p>Practical demonstrations</p> <ul style="list-style-type: none"> • Identify and assess the damage on the panel • Clean panels in accordance with the workshop procedures • Apply spot putty (if needed) in accordance with job requirement 	<p>PANEL BEATING</p> <p>Perform surface preparation of a body</p> <p>Panel grind and feather edging operations</p> <ul style="list-style-type: none"> • Identify the type of panel and name the material it is made from • Identify and assess the body panel to be repaired <p>Practical demonstration</p> <ul style="list-style-type: none"> • Wash panels in accordance with the workshop procedures • Grind and feather edging operations <p>Tools</p> <ul style="list-style-type: none"> • Electric disc sander/Air driven disc sander • Orbital sander • Sanding blocks <p>Material/Abrasives</p> <ul style="list-style-type: none"> • P150 Hook it disc • P80 sandpaper • P180 sandpaper • Prep sol • Metal cleaner <p>Practical task</p> <ul style="list-style-type: none"> • Wash panels in accordance with the workshop procedures • Grinding and feather edging operations

TOPIC	GRADE 8	GRADE 9
9. Body Works <i>(continued)</i>	<ul style="list-style-type: none"> • Select the appropriate sandpaper (Wet or Dry) • Demonstrate and perform the sanding operation in accordance with the job requirement. • Clean and store tools, equipment and material in accordance with workshop procedures Practical task <ul style="list-style-type: none"> • Clean body panels using water • Select the appropriate sandpaper (Wet or Dry) • Apply spot putty if needed in accordance with job requirement • Demonstrate and perform the sanding operation in accordance with the job requirement • Assess and inspect the sanding and masking procedures • Clean and store tools, equipment, and material in accordance with workshop procedures 	Tools <ul style="list-style-type: none"> • Electric disc sander/Air driven disc sander • Orbital sander • Sanding blocks Material/Abrasives <ul style="list-style-type: none"> • P150 Hook it disc • P80 sandpaper • P180 sandpaper • Prep sol • Metal cleaner • Body Filler • Spot putty • Rags Identify the various types of primers Practical demonstration <ul style="list-style-type: none"> • Identify and explain the use of the primer • Masking of a panel that needs to be primed • Demonstrate the correct use of primers in accordance with the manufacturer's manuals Practical task <ul style="list-style-type: none"> • Identify and explain the use of the primer • Masking of a panel that needs to be primed • Demonstrate the correct use of primers in accordance with manufactures manuals • Clean and store tools, equipment and material in accordance with workshop procedures

Content outline per term

Grade 8: Content outline for Term 1

TERM 1

WEEKS	TOPIC	CONTENT
3 WEEKS	OCCUPATIONAL HEALTH AND SAFETY	<ul style="list-style-type: none"> • Mechanical Technology Workshop orientation: <ul style="list-style-type: none"> » Workshop layout » Demarcated areas, emergency stops, exits and first aid stations » Introduction to Occupational Health and Safety » Definition of accident » Causes of accidents » Identify unsafe acts and unsafe conditions » Good housekeeping • Personal Protective Equipment <ul style="list-style-type: none"> » Eye and ear protection » Head protection » Safety boots/shoes » Protective clothing • Safety signs – Information signs and prohibition signs • Basic First Aid <ul style="list-style-type: none"> » Define first aid » Basic first aid kit content • Practical Task on Safety <ul style="list-style-type: none"> » Perform an emergency evacuation drill (exercise)
2 WEEKS	GRAPHIC COMMUNICATION	<ul style="list-style-type: none"> • Introduction to Graphic Communication <ul style="list-style-type: none"> » What is Graphic Communication? » The purpose of Graphic Communication » General drawing principles » Safety precautions when using drawing instruments » Correct use and care of drawing instruments » Freehand sketches » Types of lines » Lines (SANS 0111 guidelines) » Dimensions, lettering and borderlines » Scale drawing 1:1 and 1:2 » Pictorial Drawings (using drawing instruments) <ul style="list-style-type: none"> – Isometric drawings – 1st Angle Orthographic

WEEKS	TOPIC	CONTENT
3 WEEKS	TOOLS, INSTRUMENTS AND EQUIPMENT	<p>Identify and explain the use/purpose and care of Tools, Instruments and Equipment:</p> <ul style="list-style-type: none"> • Workbench • Hand tools <ul style="list-style-type: none"> » clamping tools » spanners » pliers » screwdrivers » hammers » cutting tools » wire brush » marking off tools • Measuring instruments <ul style="list-style-type: none"> » measuring tape » steel rule » engineer's square » vernier calliper » outside micrometres • Identify the different lifting equipment used in the Mechanical Technology workshop: <ul style="list-style-type: none"> » trolley jack » bottle jack » scissor jack • Machine Equipment/Power Tools <ul style="list-style-type: none"> » Identify and explain the uses of the different machines used in the Mechanical Technology Workshop: <ul style="list-style-type: none"> – Bench grinder – Portable Drilling Machine
1 WEEK	ENTREPRENEURSHIP	<ul style="list-style-type: none"> • What is entrepreneurship? • Who is an entrepreneur? • Types of entrepreneurship • Marketing and branding products • Advertising on a media platform

WEEKS	TOPIC	CONTENT
1 WEEK	REVISION AND PRACTICALS	
	Formal Assessment	<p>The weeks allocated for formal assessment are integrated across the weeks planned for teaching and learning.</p> <p>The assessment will consist of Practical Task/s with a 60% weighting and a Theory test with a 40% weighting.</p>
Revision and assessment Assignment = 50 marks: 40% Practical = 50 marks: 60% Time: 1 hour Assignment to cover all work done in Term 1		

TERM 2

HOURS	TOPIC	CONTENT
2 WEEKS	MATERIALS	<ul style="list-style-type: none"> • Introduction to and classification of: <ul style="list-style-type: none"> » Ferrous metals » Non-ferrous metals
2 WEEKS	JOINING METHODS	<ul style="list-style-type: none"> • Definition of joining methods • Types of joining methods <ul style="list-style-type: none"> » Permanent joining methods (<u>definition only</u>) » Semi-permanent joining methods • Semi-permanent joining methods <ul style="list-style-type: none"> » Apply procedures of basic semi-permanent joining processes » Bolt and nuts (and washers) » Screws
4 WEEKS	TERMINOLOGY	<ul style="list-style-type: none"> • Introduction to machines <ul style="list-style-type: none"> » Centre Lathe » Milling Machine • Engines <ul style="list-style-type: none"> » Engine components and their functions » Crankshaft » Connecting rods » Cylinder block » Combustion chamber » Inlet valve

HOURS	TOPIC	CONTENT
4 WEEKS (continued)		<ul style="list-style-type: none"> » Cam » Camshaft » Spark plug » Valve spring » Exhaust valve » Cylinder head » Water jacket » Piston » Crankcase • Practical Task 1 On Centre Lathe and Milling Machine (cleaning and oil). • Practical Task 2 Use of an engine for learners to identify and explain the purpose of different engine components
	Formal Assessment	The weeks allocated for formal assessment are integrated across the weeks planned for teaching and learning. The assessment will consist of Practical Task/s with a 60% weighting and a Theory test with a 40% weighting.
2 WEEKS	Activity <ul style="list-style-type: none"> • Theory 40% • Practical 60% PRACTICAL <ul style="list-style-type: none"> • Use marking-off tools to make a product whereby semi-permanent joining methods must be used by using pop-rivets, bolts, and nuts. 	
Revision and Examinations	Exam = 80 marks: 40% Practical = 50 marks: 60% Examination to cover all work done in Term 1 and Term 2 Time: 1 hour 30 minutes	

TERM 3

HOURS	TOPIC	CONTENT
3 WEEKS	MAINTENANCE	<ul style="list-style-type: none"> • Introduction to machine maintenance • Lubrication <ul style="list-style-type: none"> » Definition » Identify lubricant for different components (Engine oil, gear oil, automatic transmission fluid). » Characteristics of a lubricant » Importance of using lubricants » Lubrication of machines and equipment » Correct handling and storage of lubricants. » Inspection frequency » Use and care of appropriate tools and equipment • Practical Task <ul style="list-style-type: none"> » Plan and prepare to inspect and lubricate machines and equipment
4 WEEKS	BODY WORKS (PANEL BEATING)	<p>Repair different coin-sized dents on ferrous body shells while applying safety rules</p> <ul style="list-style-type: none"> • Tools <ul style="list-style-type: none"> » Planishing hammer » Cross-pane and finishing hammer » Curved pane and finishing hammer » Pick finishing hammer » Sledgehammer » Ball peen hammer • General purpose dolly <ul style="list-style-type: none"> » Heel dolly » Toe dolly » Curved dolly » Double-ended dolly • Panel beating files <ul style="list-style-type: none"> » Beating file » Adjustable body file • Panel beating sanders <ul style="list-style-type: none"> » Disc sander » Orbital sander » Sandpaper » Steel brush • Practical demonstration: Repair a coin-sized dent on a body panel. <ul style="list-style-type: none"> » Identify and assess the damage

HOURS	TOPIC	CONTENT
4 WEEKS (continued)		<ul style="list-style-type: none"> » Select appropriate tools to be used for repairs » Perform the repair of a dent on a body panel » Assess the repaired work » Clean the work area and clean and store the tools and equipment
	SURFACE PREPARATION FOR SPRAY PAINTING	<p>Surface preparation for spray painting</p> <ul style="list-style-type: none"> • Tools and equipment <ul style="list-style-type: none"> » Sanding block » Cutting knife » Spreader or celluloid » Blowgun » Air compressor • Material <ul style="list-style-type: none"> » Sandpaper » Rags » Water » Spot putty » Prep Sol/degreaser » Body filler • Practical demonstration: Perform surface preparation on a body panel for spray painting <ul style="list-style-type: none"> » Identify and assess the damage on the panel » Clean panels in accordance with the workshop procedures » Apply spot putty if needed in accordance with job requirement » Select the appropriate sandpaper (Wet or Dry) » Demonstrate and perform the sanding operation in accordance with the job requirement » Clean and store tools, equipment, and material in accordance with workshop procedures
6 HRS	Formal Assessment	The weeks allocated for formal assessment are integrated across the weeks planned for teaching and learning. The assessment will consist of Practical Task/s with a 60% weighting and a Theory test with a 40% weighting.
Revision and assessment		
Test = 50 marks: 40% Practical = 50 marks: 60% Time: 1 hour Test to cover all work done in Term 3		

TERM 4

WEEKS	TOPIC	CONTENT
4 WEEKS	REVISION AND PRACTICALS	
1 WEEK	Formal Assessment – EXAMINATION	

DRAFT



TERM 1

CHAPTER

1

SUGGESTED ANSWERS

Occupational health and safety

Learner's Book page 1

Activity 1.1 Occupational Health and Safety

Learner's Book page 8

1. List any SIX (6) workshop rules.

Model answer

Below are the general workshop safety rules:

- Do not enter or leave the workshop without the teacher's permission.
- A workshop is not a playground, therefore no playing and running around is allowed.
- Know where the emergency stop buttons are located in the workshop.
- Wear Personal Protective Equipment (PPE) all the time when in the workshop.
- Do not use a machine if you have not been shown how to operate it safely.
- Do not use machinery or tools without the required permission.
- Always use a guard when working on a machine.
- Keep your hands away from moving or rotating parts of the machinery.
- Use hand tools carefully, keeping both hands behind the cutting edge.
- Report any damage to machines or equipment as this could cause an accident.
- No eating or drinking in the workshop.
- Tie up long hair.
- Turn the machine off before cleaning it.
- Keep the workshop clean.
- Persons under the influence of any illegal substances are not permitted in a workshop.
- No unauthorised person is allowed in the workshop.
- Report any broken tools or machinery in the workshop.
- Never put sharp tools or instruments in your pocket.
- Return tools to their correct storage place after use.
- Smoking is not allowed in the workshop.

(ANY 6)

2. Provide FIVE (5) examples of unsafe acts.

Model answer

Unsafe acts:

- Fooling or teasing your fellow learner.
 - Failing to secure machinery.
 - Placing objects in unsafe places.
 - Making safety devices inoperative.
 - Working without permission.
 - Working at unsafe speeds.
 - Using equipment carelessly.
 - Lack of or improper use of Personal Protective Equipment (PPE).
 - Bypassing or removal of safety device.
 - Unsafe position or posture.
 - Wearing loose clothing near machines.
 - Failure to put warning signs where they are needed.
 - Entering the workshop without permission.
 - Adjusting of machine while it is in operation.
- (ANY 5)

3. Provide FIVE (5) examples of unsafe conditions.

Model answer

Unsafe conditions:

- Overcrowding in the workshop.
 - Unsafe and poor workshop ventilation.
 - Poor lighting (dull) and unsafe workshop lighting (flashing).
 - Poor housekeeping.
 - Poorly (unsafe) constructed buildings.
 - Working without Personal Protective Equipment (PPE).
 - No machine guards on equipment.
 - Slippery floors.
 - Defective hand tools, equipment, machines, etc.
 - Poor workshop layout or workflow.
- (ANY 5)

4. Explain why workshop floors need to be demarcated.

Model answer

Demarcated areas are used to distinguish or differentiate between walkways that are safe for walking and working areas. In the working areas, it is prohibited for unauthorised people to walk as it is generally where you would find dangerous machines and equipment.

5. What is the purpose of emergency stops on machines?

Model answer

The purpose of emergency stops is to stop the machine in an emergency.

Activity 1.2 Accidents and good housekeeping

Learner's Book page 11

1. Define an accident.

Model answer

An accident is an unplanned and uncontrolled incident caused by unsafe acts and unsafe conditions.

2. List FOUR (4) main reasons for causes of accidents.

Model answer

Causes of accidents:

- Loose clothing.
 - Poor housekeeping.
 - Improper use of tools.
 - Inaccurate setting-up of machinery.
-

3. Define housekeeping and explain why good housekeeping is desirable.

Model answer

Good housekeeping is explained by the phrase "A place for everything and everything in its place". This practice ensures that the workshop is kept clean and tidy, making it a better and safe place to work.

Good housekeeping is important because it:

- saves time.
 - cuts costs.
 - ensures that the workplace is safe.
-

Activity 1.3 Safety signs and safety requirements

Learner's Book page 15

1. Collect FIVE (5) pictures and paste them in your classwork book showing different personal protective equipment (PPE) needed in your workshop.

Model answer

Learners are to conduct research on the internet or magazines. They should print examples of personal protective equipment from the internet or cut pictures from magazines. It can be any of the following examples, but if not listed, teacher must then use own discretion:






Here are 10 different criteria used in PPE. It can include any of the following:

- Clothing such as overalls, high visibility vests, life jackets and padded suits. Each employee must have their own set in the correct size.
- Respiratory protective equipment, including masks.
- Eye and face protection, for example safety glasses and face shields.
- Head protection with safety helmets.
- Hearing protective devices such as earplugs and earmuffs.
- When working at high levels, fall arrest harnesses.
- Skin protection (gloves and fire-resistant clothing).
- Protective footwear (safety boots and rubber boots with steel toe guards).
- Sun and heat protection when working outdoors (hats, sunscreen, shaded rest areas).
- Disposable protective clothing for working with chemicals and biohazards.

2. By referring to safety signs, classify each sign below with its related group.

	Sign	Group
A		
B		
C		
D		
E		

Model answer

	Sign	Group
A		Mandatory (Compulsory) signage
B		Informative signage
C		Prohibition signage
D		Fire prevention signage
E		Danger signage

3. List and briefly explain the four steps for safe evacuation.

Model answer

Follow these building evacuation procedures in the event of an emergency:

1. Safely stop your work.
 - Shut down equipment that could become unstable or present a hazard.
 - Gather your personal belongings such as glasses, prescription medication, and bags.
2. Leave the building through the nearest door with an EXIT sign.
 - Do not use elevators.
 - Go to the nearest safe stairway.
 - Help those who need special assistance, such as persons with a disability.
 - Touch closed doors before opening them. If the surface is hot, do not open it – use another exit route.
 - Close, but do not lock, all doors as you leave.

3. Report to your designated assembly area.
 - Stay in your designated outdoor assembly area for a head count.
 - Report any missing individuals and last known locations to emergency responders.
 - Notify emergency responders about sensitive research, operating equipment, animals left in buildings, etc.
 4. Wait for instructions from teachers or emergency responders.
 - Remain outside at your designated assembly area.
 - Do not re-enter the building until authorised to do so by an appropriate authority (police, fire department, etc.).
-

Activity 1.4 First aid

Learner's Book page 19

1. What is the purpose of first aid?

Model answer

First aid is the assistance (help) given to a sick or injured person in order to save their life and prevent the worsening of the sickness or injury.

2. List at least SEVEN (7) items that must be included in a first-aid kit.

Model answer

Basic first aid kit content:

- adhesive bandages
- adhesive tape
- antibiotic ointment
- antiseptic
- burn treatment
- cold pack
- eye covering (with attachment)
- hand sanitiser
- medical exam gloves
- scissors
- triangular bandage

ANY 7

3. Provide the reason for first-aid stations in the workshop.

Model answer

The reason for first-aid stations is to assist a person in an emergency while waiting for professional help to arrive.

Practical tasks

1. Perform an emergency evacuation drill (exercise).

Model answer

Assist the learners with this task. You could arrange a demonstration of first aid equipment.

Notes to educator

Prepare for the exercises. Practice equipment must be at hand. Divide learners into groups to practice on one another. Role play can be a very good form of teaching.

How to use role play:

Step 1: Identify the situation. To start the process, gather learners together, introduce the problem, and encourage an open discussion to uncover all of the relevant issues.

Step 2: Add details.

Step 3: Assign roles.

Step 4: Act out the scenario.

Step 5: Discuss what they have learnt.

2. Perform an emergency evacuation drill (exercise).

Notes to educator

Consult the evacuation plan of the school. The emergency exits should be clearly marked, and learners must know where the assembly points are.

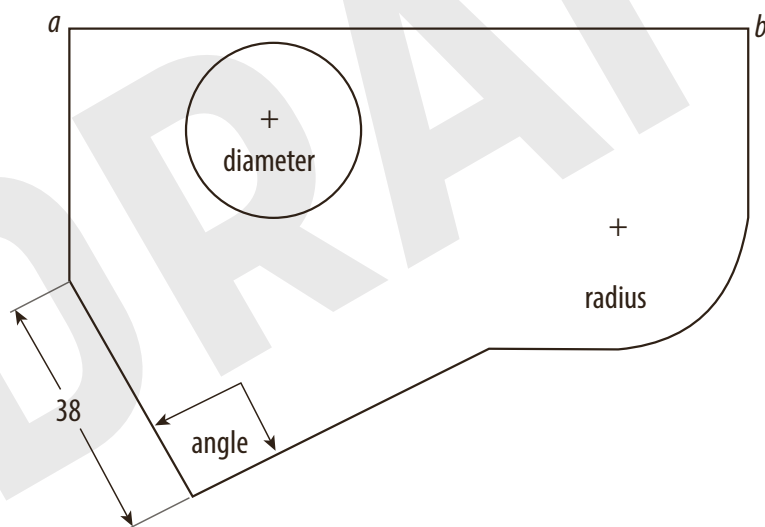
The school evacuation plan and emergency evacuation plan must first be introduced to the learners before the exercise commences.

Activity 2.1 Types of lines

Learner's Book page 26

1. Measure and insert dimensions on:

- a) line ab
- b) the diameter
- c) the radius
- d) the angle

Model answer

Make copies of this figure and instruct the learners to use a pair of dividers to measure line ab , the diameter and the radius. They will then use the protractor to measure the angle.

Measure your own copy to determine the marking guide.

1. Print the given alphabet letters in capitals and print the given numbers.

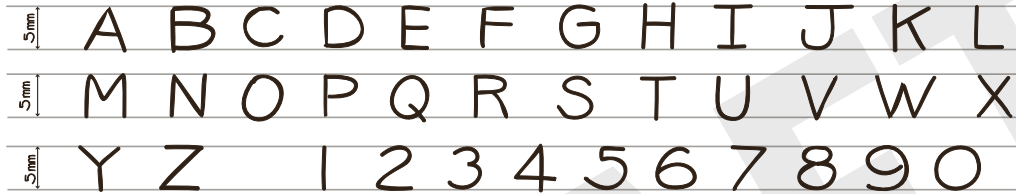
Use very feint **5 mm** guide lines.

A B C D E F G H I J K L M N

O P Q R S T U V W X Y Z

1 2 3 4 5 6 7 8 9 0

Model answer



A B C D E F G H I J K L
M N O P Q R S T U V W X
Y Z 1 2 3 4 5 6 7 8 9 0

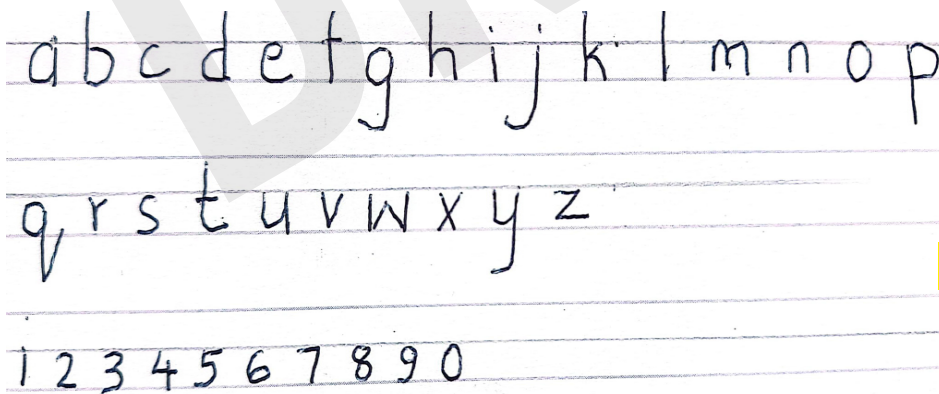
2. Print the given alphabets in small caps/lower case letters and print the given numbers.

Use very feint **3 mm** guide lines.

a b c d e f g h i j k l m n o p q r s t u v w x y z

1 2 3 4 5 6 7 8 9 0

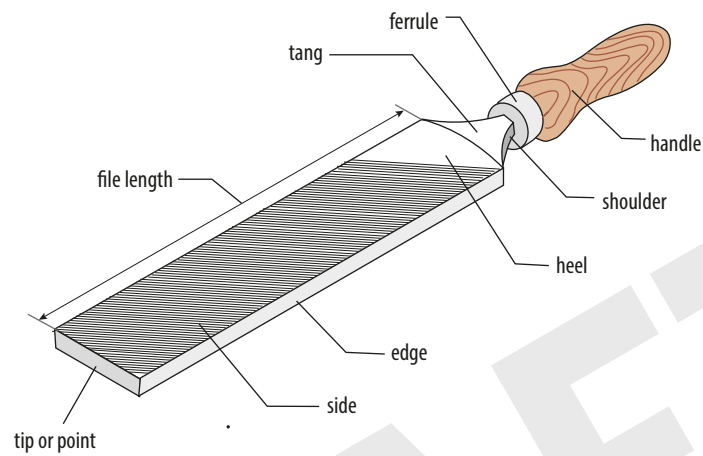
Model answer



a b c d e f g h i j k l m n o p
q r s t u v w x y z
1 2 3 4 5 6 7 8 9 0

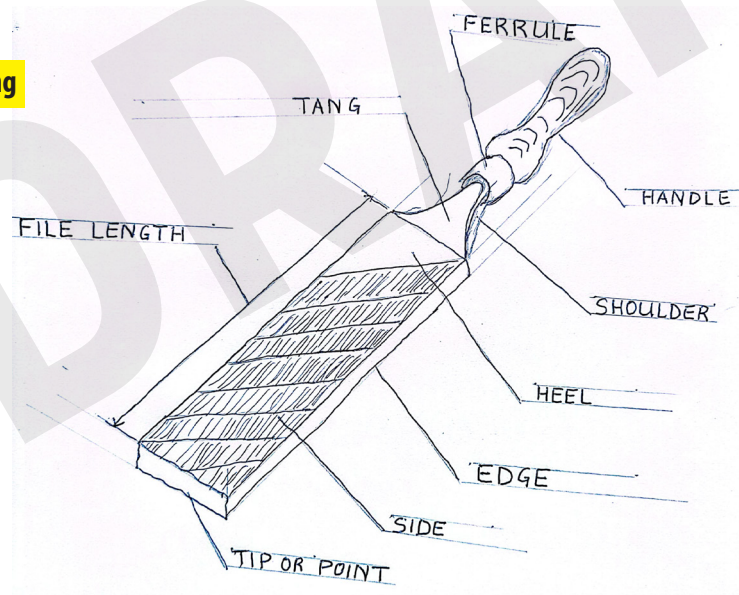
artwork missing

- Using a freehand drawing, redraw the following tool and label it using freehand lettering.

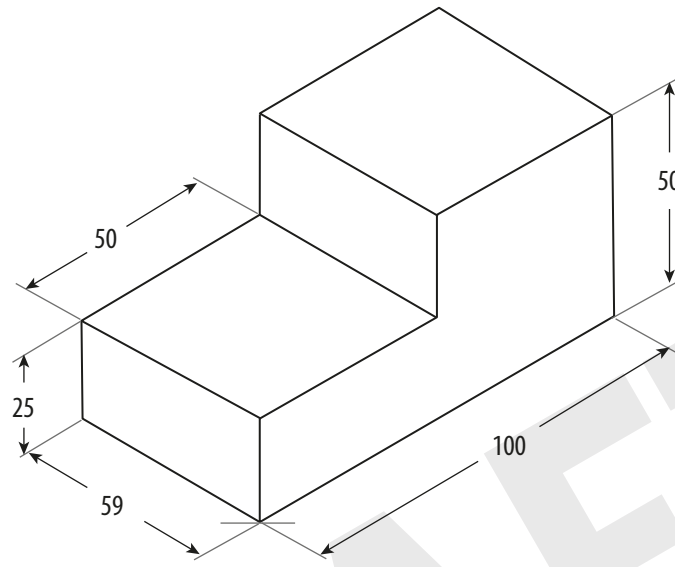


Model answer

artwork missing

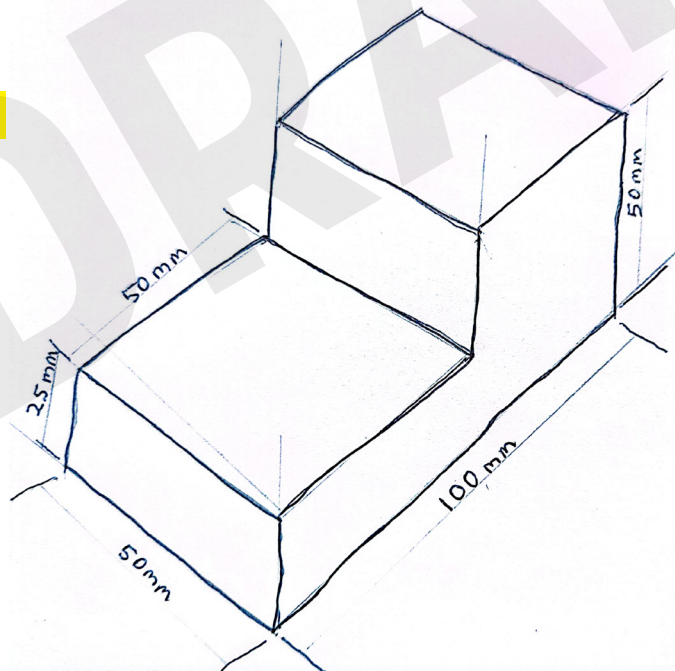


2. Using a freehand drawing, redraw the following figure and insert freehand dimensions.



Model answer

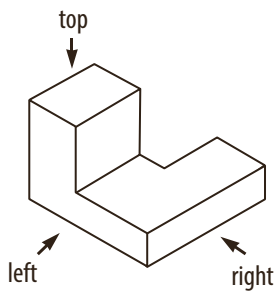
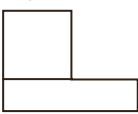
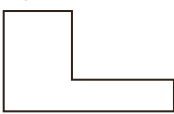
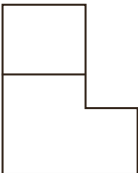
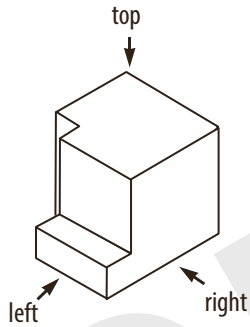


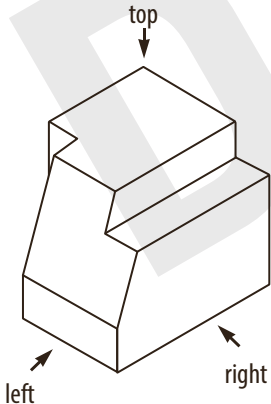
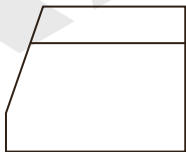
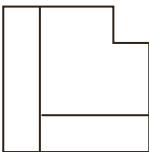
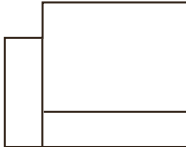
artwork missing



Activity 2.4 Orthographic projections and isometric drawings

Learner's Book page 33

1. Study the drawings in the pictorial view column of the table below.
The column labelled ORTHOGRAPHIC VIEW shows three views of an object.
Each orthographic drawing represents either the Front, Left, Right and Top view.

Pictorial view	Orthographical view								
	<div> View 1  </div> <div> View 2  </div> <div> View 3  </div> <table border="1"> <thead> <tr> <th colspan="2">Identify and name each view</th></tr> </thead> <tbody> <tr> <td>View 1</td><td></td></tr> <tr> <td>View 2</td><td></td></tr> <tr> <td>View 3</td><td></td></tr> </tbody> </table>	Identify and name each view		View 1		View 2		View 3	
Identify and name each view									
View 1									
View 2									
View 3									
	<div> View 1  </div> <div> View 2  </div> <table border="1"> <thead> <tr> <th colspan="2">Identify and name each view</th></tr> </thead> <tbody> <tr> <td>View 1</td><td></td></tr> <tr> <td>View 2</td><td></td></tr> </tbody> </table>	Identify and name each view		View 1		View 2			
Identify and name each view									
View 1									
View 2									
	<div> View 1  </div> <div> View 2  </div> <div> View 3  </div> <table border="1"> <thead> <tr> <th colspan="2">Identify and name each view</th></tr> </thead> <tbody> <tr> <td>View 1</td><td></td></tr> <tr> <td>View 2</td><td></td></tr> <tr> <td>View 3</td><td></td></tr> </tbody> </table>	Identify and name each view		View 1		View 2		View 3	
Identify and name each view									
View 1									
View 2									
View 3									

Identify the views and present your answer in a table as shown.

Write one of the following: Front, Left, Right or Top.

Model answer

a)

Identify and name each view	
View 1	Front
View 2	Left
View 3	Top

b) Identify and name each view

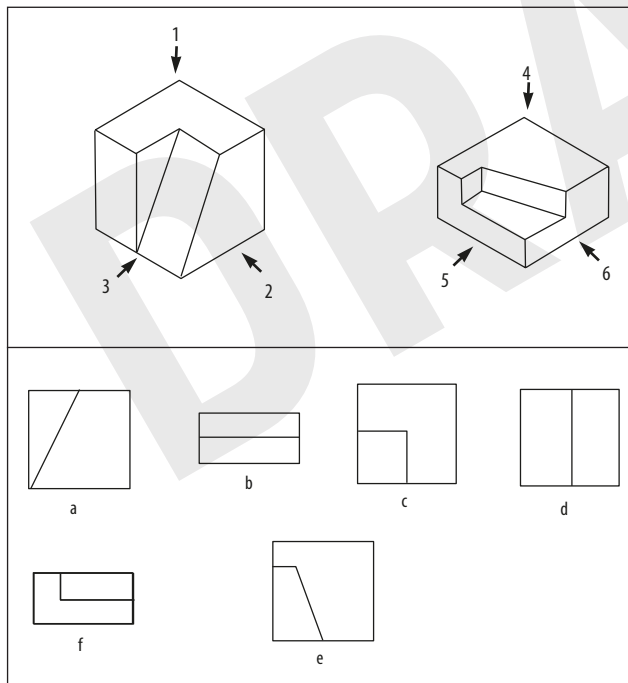
View 1	Front
View 2	Left

c) Identify and name each view

View 1	Right
View 2	Front
View 3	Top

2. Study the isometric drawings in the upper block, below.

- a) The lower block shows letters on orthographic views, which can be linked to the numbers on the isometric drawings.
- b) Match the letters with the corresponding numbered isometric drawing.



Match the numbers with the letters	Front, Left, Right or Top
1	
2	
3	
4	
5	
6	

Model answer

Match the numbers with alphabets	Front, Left, Right or Top
1	c
2	a
3	d
4	e
5	b
6	f

Activity 3.1 Workbenches, clamping tools and spanners

Learner's Book page 40

1. Which three materials could you use to build or make a workbench for your workshop?

Model answer

- steel
- wood
- stone
- composite (plastic)

(ANY 3)

2. Name the tool that is used to hold a workpiece firmly while it is being worked on.

Model answer

Workbench vice

3. Mention the three uses of a workbench vice.

Model answer

- holding work-piece firmly.
- twisting metal (work-piece).
- bending metal (work-piece).

4. A workbench vice has two jaws to make it work, which jaw is the adjustable jaw?

Model answer

The movable jaw

5. There are different types of spanners for different uses. In the table below, Column A indicates the name of the spanner, and Column B explains the use of the spanners. Match the tool name in column A to the correct use in column B.

Column A	Column B
a) Ring spanner	(i) Jaws may stretch and cause the spanner to slip.
b) Open-ended spanner	(ii) Used with various accessories such as a ratchet.
c) Combination spanner	(iii) More teeth come in contact with the head of the nut and bolt.
d) Socket spanner	(iv) It has a ring spanner and an open-ended spanner.

Model answer

Column A	Column B
a) Ring spanner	(iii) More teeth come into contact with the head of nut and bolt.
b) Open-ended spanner	(i) Jaws may stretch and cause the spanner to slip.
c) Combination spanner	(iv) It has a ring spanner and open-ended spanner
d) Socket spanner.	(ii) Used with various accessories such as a ratchet.

6. What flexible component allows the socket spanner to reach different angles?

Model answer

The universal coupling

7. Which component allows the socket spanner to drive in one direction?

Model answer

The ratchet

Activity 3.2 Pliers, screwdrivers and hammers

Learner's Book page 43

1. Name ONE (1) plier that can hold, cut and turn a wire.

Model answer

Combination pliers

2. Which plier can reach in places where fingers cannot reach?





Model answer

Long-nose pliers

3. Identify the pliers below and give ONE (1) use of each.

	Pliers	Name	Use
a)			
b)			
c)			
d)			

Model answer

	Pliers	Name	Use
a)		Diagonal pliers (side cutters)	Diagonal pliers or side cutting pliers are pliers designed for cutting wire.
b)		Water-pump pliers	Water pump pliers hold larger objects, and they are adjustable to fit different sizes of bolts and nuts. They are useful in plumbing.
c)		Vice-grip pliers	Vice-grip pliers are used for gripping and holding parts together.
d)		Circlip pliers	The circlip pliers are designed for fitting and removing inside and outside circlips.

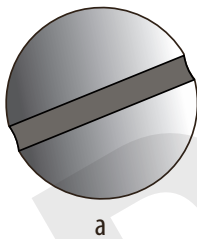
4. Fill in the missing words.

- a) A screwdriver is a hand tool for turning (i) _____ into the material and out of the material. It has a (ii) _____ that fits into the (iii) _____ of a (iv) _____
- b) The (i) _____ screwdriver has a star or cross head to firmly grip on the (ii) _____ and is used for (iii) _____ and (iv) _____ screws.

Model answer

- a) A screwdriver is a hand tool that is used for turning (i) screws into and out of material. It has a (ii) tip that fits into the (iii) head of a (iv) screw.
- b) The (i) Phillips/star screwdriver has a star or cross head to firmly grip the (ii) screws and is used for (iii) tightening and (iv) loosening screws.

5. Identify the type of screwdriver to be used in the following screw heads.



- a) _____
- b) _____

Model answer

- a) flat tip screwdriver
- b) Phillips/star screwdriver

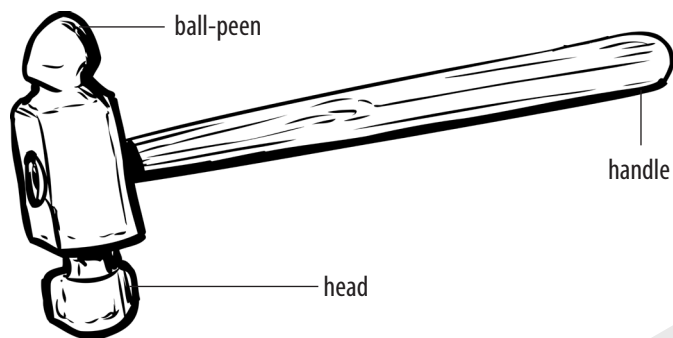
6. Name THREE (3) hammers that are used in the Mechanical Technology workshop.

Model answer

- ball-peen hammer
- cross-peen hammer
- soft-face hammer (mallet)

7. Draw a neat sketch of a ball-peen hammer using a pencil and a ruler and label the handle, the head, and the ball-peen.

Model answer



8. Give TWO (2) uses of the ball peen hammer.

Model answer

It is used for:

- forging
- riveting

9. Why is a soft face hammer (mallet) fitted with a soft face?

Model answer

So that it cannot damage the workpiece that is being worked on.

10. List THREE (3) soft materials used on a face of a mallet.

Model answer

Three soft materials used on a face of a mallet:

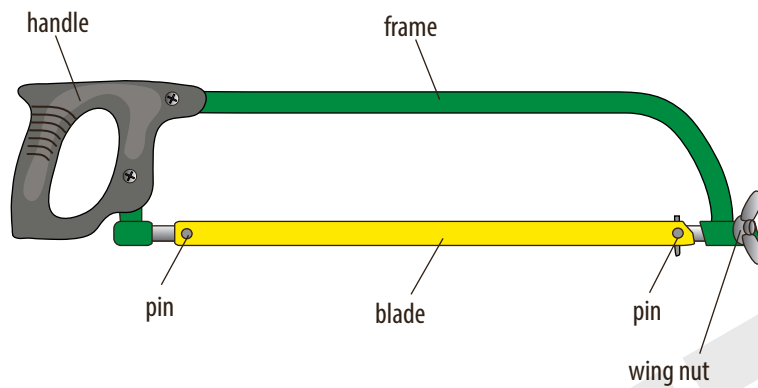
- plastic
- rubber
- copper

Activity 3.3 Cutting tools

Learner's Book page 47

1. A hacksaw is a cutting tool used to cut different materials in the workshop. With the aid of a simple drawing of the hacksaw, show the following parts:
- a) handle
 - b) frame
 - c) blade
 - d) pin
 - e) wing nut

Model answer

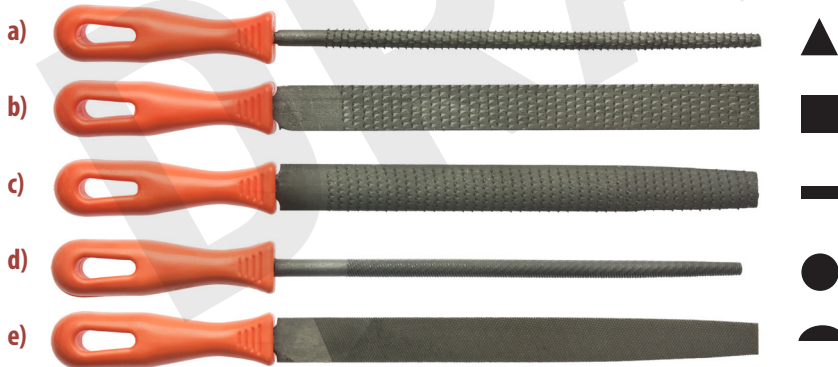


2. Thembi wants to shape the workpiece square in the workshop. Give her advice on which tool she must use.

Model answer

A file

3. Identify the following files by writing the name of each file.



Model answer

Types of files:

- a) triangular file
- b) square file
- c) round file
- d) flat file
- e) half round file

Activity 3.4 Scribes, punches and dividers

Learner's Book page 49

1. Identify the marking tool you will use to carry out the following tasks on a workpiece:
 - a) Marking a straight line on the edge of the workpiece.
 - b) To pop mark the centre where a drill bit must go through.
 - c) To pop mark on a line marked on a workpiece.

Model answer

- a) Scriber
- b) Centre punch
- c) Steel

2. Which divider is used to find the centre of a round workpiece?

Model answer

Hermaphrodite

3. Mention ONE (1) use of the straight divider.

Model answer

It is used to mark (draw) circles, curves for drilling, cutting, and shaping in a material.

ANY 1

Activity 3.5 Steel rule, steel tape

Learner's Book page 52

1. What material is the steel rule made of?

Model answer

Steel

2. State whether the following statements are true or false.
 - a) A steel rule is used to measure distances more than 300mm.
 - b) A steel tape is made from spring steel and the casing is made from plastic.

Model answer

- a) false
- b) true

Activity 3.6 Bench grinder, portable drill machines and lifting equipment

Learner's Book page 55

1. Write down the maximum allowable weight the trolley jack in your workshop can lift.

Model answer

Learner's own answer.

.....

2. Identify the space the scissor jack will fit into under the vehicle.

Model answer

Learner's own answer.

.....

3. Identify the machines that can do the following operations:

- a) sharpen the lathe cutting tool held by hand.
- b) make holes in material up to 13 mm in diameter.

Model answer

- a) Bench grinder
 - b) Portable drilling machine
-

4. Give TWO (2) safety rules that you must observe when working on the bench grinder.

Model answer

- Wear safety goggles.
 - Never force-grind.
-



CHAPTER

4

Entrepreneurship

Learner's Book page 56

Activity 4.1 Entrepreneurs and entrepreneurship

Learner's Book page 60

1. Define what an entrepreneur is.

Model answer

An entrepreneur is a person who starts with an idea, then takes the risk of investing money into that idea in order to start a business. They see a problem in the world and immediately focus on creating a solution. It could be a problem that many people struggle with daily; a way in which to unite people in a unique way; or a way in which to build a revolutionary product that benefits society at large. But being an entrepreneur is not always easy – but entrepreneurs take action to make a positive change in the world. They are leaders that strike out on their own to improve society – whether they are creating jobs or a new product – they constantly take action to ensure world progress.

2. List and explain FIVE (5) reasons why people become entrepreneurs.

Model answer

Here are some of the reasons why people become entrepreneurs:

- **To change the world:** Many entrepreneurs strive to make the world a better place for themselves and future generations. Whether they believe in space exploration, eliminating poverty, or creating a practical but game-changing product, they ultimately build a brand in service of others. Some entrepreneurs use their businesses as a way to raise capital quickly to funnel into their causes. For these social entrepreneurs, building an empire is about creating a better world for everyone.
- **They don't want a boss:** Entrepreneurs often struggle with having a boss. They feel suffocated, restricted, and held back. Some may feel that they have a more effective way of doing things. Others may dislike the lack of creative freedom. Ultimately, they become attracted to entrepreneurship to succeed on their own terms. Being the boss can be more fulfilling than having one!

- **They want flexible working hours:** Entrepreneurship is often popular among those who need flexible working hours. Many people with disabilities often enjoy entrepreneurship because it allows them to work when they are able to. Parents with young children might also prefer entrepreneurship because it allows them to raise young children at home or pick them up from school without having to feel guilty about it.
- **They're risk-takers:** Calculated risk-taking and entrepreneurship go hand in hand. Entrepreneurs don't apply for jobs – they create them. But with that comes risk – whether it's the financial risk of starting your first brand or the risk of not knowing what to expect – business is risky. Entrepreneurs are often taking risks by trying things the average person would not normally do, to do things the average person can't normally do.
- **They can't find a job:** Many stumble into entrepreneurship when they can't find a job. Getting fired or a lack of experience, etc., can prevent a person from getting a job. Instead of being satisfied with their situation, these entrepreneurs create new opportunities for themselves.
- **They don't fit into the corporate environment:** Entrepreneurs don't often thrive in corporate environments because it often restricts their growth. They may dislike the lack of control they have in their role or they may dislike having to deal with every day office politics. These entrepreneurs usually try to gain more control in their roles and they tend to learn about their co-workers' responsibilities to better understand how everything fits together.
- **They're curious:** Entrepreneurs love finding out the answer to the question, 'what will happen if...'. They're experimental and love to learn. They regularly read business and other books to advance their knowledge.
- **They're ambitious:** Those who love reaching difficult goals and milestones are made to be entrepreneurs. There's no limit to how much an entrepreneur can earn, so they can always work to achieve higher levels of greatness. Entrepreneurs constantly grow and achieve more than they ever imagined. (ANY 5)

3. Explain the reasons that entrepreneurs are important for society.

Model answer

Here are some of the reasons why entrepreneurs are important for our economy and society:

- **Entrepreneurs create jobs:** Without entrepreneurs, jobs would not exist. Entrepreneurs take the risk of employing themselves. Their ambition and drive contribute to the growth of the business, which eventually leads to the creation of new jobs. This in turn has a positive effect on the economy in that it reduces unemployment rates while helping people provide for their families.
- **Entrepreneurs create change:** Entrepreneurs dream big... so some of their ideas will make a worldwide change. They might create a new product that solves an urgent problem, or they may take up the challenge of exploring something never explored before. Many entrepreneurs believe in improving the world with their products, ideas, or businesses.

- **Entrepreneurship is the incubator of innovation:** Innovation creates disequilibria. It goes beyond discovery, and implements and commercialises ideas. Innovation, research, and development are constantly being contributed by different entrepreneurs. We can, therefore, say that entrepreneurship provides new ventures, products, technology, markets, and quality of goods to the economy, which in turn increases the Gross Domestic Product (GDP) and people's standard of living.
- **Entrepreneurs give to society:** Entrepreneurs often do more for the greater good than the average person. They make more money and thus pay more in taxes, which helps fund social services. Entrepreneurs are also some of the biggest donors to charities and non-profit organisations (NPOs). (ANY 5)

4. Do some research and find an example of a social entrepreneur that has had a big influence on our current society. Write a paragraph that highlights what this entrepreneur has done, what motivates him/her, and list any innovations that they have come up with that have made positive changes to our society.

Model answer

Learner's own work.

Activity 4.2 Marketing and branding

Learner's Book page 62

1. List and explain (using examples) THREE (3) different types of entrepreneurs.

Model answer

Types of entrepreneurs include:

- **Small business entrepreneurship.** Small business entrepreneurship makes up 99% of all companies. It employs more than half of the non-government workforce. Examples of small business entrepreneurs include plumbers, carpenters, grocers, and pharmacy owners. Some small business entrepreneurs could be quite profitable, while others may be barely profitable.
- **Scalable start-up entrepreneurship.** This type of entrepreneurship usually has the backing of Silicon Valley. Their mission from day one is to find a scalable business model. Not all of them are successful, so investors have to bet big and often make up for the unsuccessful investments. A traditional, growth-minded business's goal is for profits to exceed revenues – even if only slightly. Fortunately in this model, revenues quickly outpace expenses. Revenues are so high that you could say that scaling is about adding revenue at an exponential rate while adding resources at an incremental rate.
- **Large company entrepreneurship.** This type of entrepreneurship happens within huge conglomerates that already have established customer bases and market shares. Over time, consumer tastes change, and products are no longer in vogue. If a large company doesn't innovate then it can slowly become obsolete.

- **Social entrepreneurship.** This is a relatively new type of entrepreneurship. Even though these entrepreneurs still want to make a profit and create a sustainable business, they create products and services that solve social problems. For example, “TOMS Shoes” and their one-for-one campaign.

Social entrepreneurship is an approach by individuals, groups, start-up companies, or entrepreneurs, to developing, funding, and implementing solutions to social, cultural, or environmental issues. This concept may be applied to a wide range of organisations that vary in size, aims, and beliefs. Social entrepreneurs, however, are either non-profits, or they blend for-profit goals with generating a positive ‘return to society’. Social entrepreneurship typically attempts to further broad social, cultural, and environmental goals often associated with the voluntary sector in areas such as poverty alleviation, health care, and community development. (ANY 3)

2. Briefly explain the following:

- product marketing
- product branding
- social media advertising

Model answer

- Product marketing is the process of getting a product to market, promoting it, and selling it to a customer. Product marketing involves understanding the product’s target audience and using strategic positioning and messaging to increase revenue and the demand for the product
- Product branding is a symbol or design that gives your products a proven identity in the marketplace. For example, some major retailers in South Africa have different products that are branded as the retailer’s brand
- Social media advertising is a form of digital marketing where paid advertisements are delivered to users using social media platforms such as Facebook, Twitter, Instagram, TikTok, Pinterest, and LinkedIn.

Social media advertising is a quick way of showcasing an entrepreneur’s most recent products or services, and entrepreneurs can target specific audiences with these ads and marketing campaigns.

3. Search the internet and find one example of an entrepreneur that uses social media to advertise and market their products. Explain what products they sell, who you think their target market is, and whether you think the advertisements are effective.

Model answer

Learner’s own work

Activity 5.1 Materials

Learner's Book page 67

1. Materials are commonly used in our daily lives, mention SIX (6) types of materials that we come across daily.

Model answer

Metal, plastic, wood, glass, paper and ceramic

2. Complete the following table by deciding which material is best suited for each item, describing the property of the material, and the use related to the property of the material:

	Object	Material	Property	Use related to the property of the material
	e.g. teapot	ceramic	rigid, waterproof, resistant to hot liquids	holding hot liquids
a)	eraser			
b)	ruler			
c)	chair			
d)	dustbin			
e)	door			
f)	jug			
g)	sanitizer bottle			
h)	face shield			
i)	bicycle tyre			
j)	tiles			

Model answer

	Object	Material	Property	Use related to the property of the material
	e.g. teapot	ceramic	rigid, waterproof, resistant to hot liquids	holding hot liquids
a)	eraser	rubber	plasticity, elasticity	erasing mistakes
b)	ruler	plastic	stiffness, plasticity, elasticity	shatterproof and used for children who might twist it
c)	chair	metal	hardness, strength	holding the weight of a person
d)	dustbin	plastic	stiffness, plasticity, waterproof	holding different waste materials including some liquids
e)	door	wood	hardness, strength	keep occupants safe and away from harsh weather
f)	jug	plastic	stiffness, plasticity, waterproof	holding different liquids
g)	sanitizer bottle	plastic	stiffness, plasticity, waterproof	holding sanitiser liquid
h)	face shield	plastic	stiffness, plasticity, waterproof	protect from germs or other airborne pathogens
i)	bicycle tyre	rubber	elasticity, plasticity, waterproof	fits over a steel rim and absorbs pressure from various terrains
j)	tiles	ceramic	rigid, toughness, waterproof	able to carry heavy weights of things such as tables, couches, chairs

3. Materials are commonly used to (1) produce parts, components and products, for example, desks, chairs, rulers, tyres, containers, pens, etc.; (2) build infrastructure, buildings and landscapes; and (3) aid processes in farming, manufacturing and logistics.
- a) Choose one use of materials and one item that can be produced.
 - b) Use different sources such as the internet, magazines, or speaking to people. Write a paragraph on the types of materials used for your product, and what processes the material undergoes before it becomes that product.
 - c) List the properties of your product and why the materials used are the best type of material used for the product's intended purposes.

Model answer

- a) Learners choose one material that can be produced.

- b) Learner dependent.
 - c) Learner dependent.
-

Activity 5.2: Materials

Learner's Book page 70

1. Metals have been used by human beings from long time.
 - a) Classify metals according to TWO (2) groups.
 - b) Give THREE (3) examples of each one and describe their uses.

Model answer

- a) Ferrous metals and non-ferrous metals.
- b) Examples of ferrous metals include:
 - cast iron – a hard and wear-resistant metal widely used in cookware, machine tools, engines, manhole covers and water pipes
 - carbon steel (also known as structure steel) – contains high carbon content that creates a hard metal that is used for tools
 - stainless steel – an alloy steel with added chromium, which provides resistance against rust
 - wrought iron – able to resist corrosion and oxidation, and is typically used for fences, railings and gates
 - alloy steel – a type of steel that contains more than one element (alloying elements) that increases strength, hardness, wear, resistance and toughness
 - mild steel – also called low carbon steel. This steel is extremely ductile and is used for pipelines that transport oil, gas or water.

Examples of non-ferrous metals include:

- aluminium – a lightweight material that is easy to machine, shape and weld. It can be used for food cans, cookware, airplane parts, and some car parts
 - copper – a good conductor of heat and electricity. Copper is also highly ductile and malleable and is widely used for electrical wiring, and in appliances and cars
 - zinc – a medium strength metal that has a low melting point. It is used to galvanise iron and steel to prevent rusting
 - tin – a soft and malleable metal with a low tensile strength. It is used as a coating to prevent steel from corroding
 - nickel – able to resist corrosion even at high temperatures. It is used for coins, rocket engines, gas turbines, and armour plating
 - brass – used for fixtures and fittings including taps, hooks and doorknobs, as well as light fittings and screws.
 - lead – has a low melting point and low tensile strength, and is used in electrical power cables, batteries, pipes, fuels, paint and solder.
-

2. From the list below, complete the table by placing the metals in the FERROUS METALS and NON-FERROUS METALS columns.

List of metals: lead, cast iron, aluminium, mild steel, nickel, carbon steel, copper, alloy steel, tin, stainless steel, zinc, and wrought iron.

Ferrous metals	Non-ferrous metals

Model answer

Classifying metals according to ferrous metals and non-ferrous metals by giving examples:

Ferrous metals	Non-ferrous metals
cast iron	aluminium
carbon steel	copper
stainless	zinc
wrought iron	tin
alloy steel	nickel
mild steel	lead

3. Ferrous and non-ferrous metals generally have differing properties. Below is a list of each property. Compare ferrous and non-ferrous metals according to each one.

For example: Magnetic properties	Ferrous metal	most ferrous metals have magnetic properties
	Non-ferrous metal	non-ferrous metals are not magnetic
Resistance to rust and corrosion	Ferrous metal	
	Non-ferrous metal	
Weight	Ferrous metal	
	Non-ferrous metal	
Cost	Ferrous metal	
	Non-ferrous metal	
Recycling	Ferrous metal	
	Non-ferrous metal	

Model answer

For example: Magnetic properties	Ferrous metal	most ferrous metals have magnetic properties
	Non-ferrous metal	non-ferrous metals are not magnetic
Resistance to rust and corrosion	Ferrous metal	most ferrous metals are prone to rust and corrosion
	Non-ferrous metal	most non-ferrous metals can resist to rust and corrosion
Weight	Ferrous metal	most ferrous metals are heavy
	Non-ferrous metal	non-ferrous are light and malleable
Cost	Ferrous metal	most ferrous metals are cheap
	Non-ferrous metal	non-ferrous metals are expensive
Recycling	Ferrous metal	most ferrous metals can be recycled
	Non-ferrous metal	non-ferrous metals are not recyclable

4. Research the following using books, magazines, the internet or by speaking to different people.
- Is gold a non-ferrous metal? Explain
 - Which non-ferrous metal is the hardest element on earth? Explain.
 - Is stainless steel a ferrous or non-ferrous metal? Explain.

Model answer

- Yes, gold is a non-ferrous metal because it does not contain any iron.
- Titanium is the hardest non-ferrous metal on earth.
- Stainless steel is a ferrous metal because it contains iron.

Practical tasks

Demonstrate an understanding of identifying different types of metals by using a magnet.

Notes to educator

- Divide the learners into groups of five or five and hand out the resources and recording sheet to them.
- Revise the definition of ferrous and non-ferrous metals, and ensure that all learners understand how they differ.
- Make sure all learners participate in testing which materials are ferrous and which materials are non-ferrous.
- Once groups have completed testing their materials, ask them to hand in their materials together with their results for marking and correction..

Activity 6.1 Joining methods

Learner's Book page 77

1. What is the difference between a permanent joint and a non-permanent joint?

Model answer**Permanent joints**

A permanent joining process is when you join two or more objects permanently. In this process, a permanent joint is formed between the parts, which cannot be easily separated. A permanent joint does not allow the **dismantling** of joined parts without breaking them. Permanent joints are joined using welding and soldering processes.

Semi-permanent joints

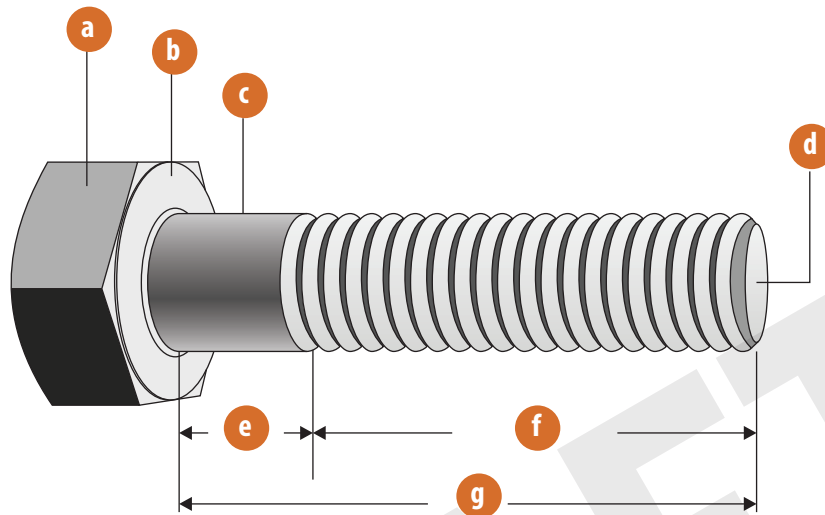
A semi-permanent joining process – also known as a temporary joining process – is designed to be permanent, however, when you join two or more objects, they can be separated without destroying the joint.

2. State THREE (3) types of bolt heads that are commonly used for bolts.

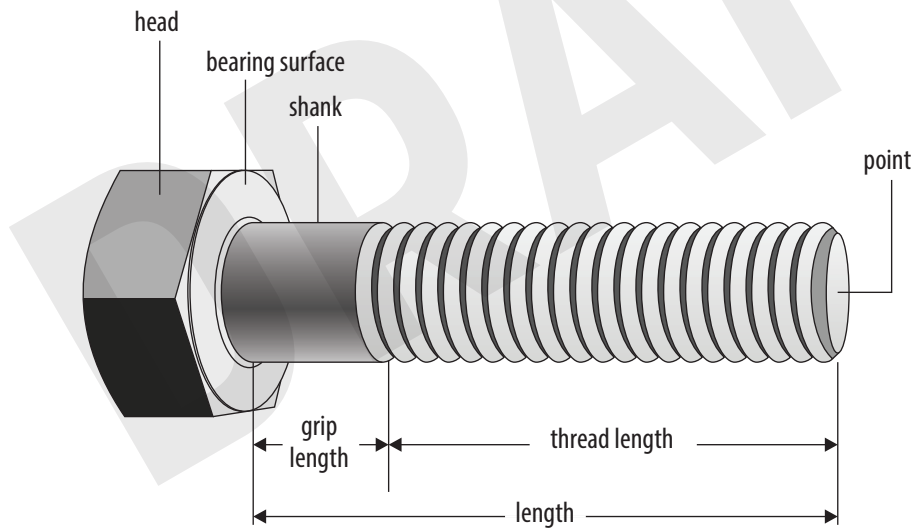
Model answer

Square head, hexagonal head, and socket cap

3. Redraw and label the different parts of this bolt.



Model answer



4. What do we call a type of fastener with a threaded hole? Explain what they are used for.

Model answer

A nut. Nuts are always used in conjunction with a matching bolt to fasten multiple parts together. Nuts used with bolts must match in diameter and thread form.

5. a) State whether the following statement is true or false: "A nut does not always have to be used together with a bolt, but a bolt is always used together with a nut."
b) If the statement is false, write the correct statement.

Model answer

- a) False
b) A bolt does not always have to be used together with a nut, but a nut is always used together with a bolt.

6. State TWO (2) functions of washers.

Model answer

- to reduce friction
- to increase tension

7. Complete the paragraph by filling in the missing words.

A _____ is sometimes used to protect the surface of the assembled parts. A nut or bolt head being turned during the _____ process can mark the part's surface around the hole. A washer can be used to take the abuse instead of the part. This may be important, especially when the parts are made using a softer material such as plastic, _____, or _____.

Model answer

A washer is sometimes used to protect the surface of the assembled parts. A nut or bolt head being turned during the tightening process can mark the part's surface around the hole. A washer can be used to take the abuse instead of the part. This may be important, especially when the parts are made using a softer material such as plastic, brass, or aluminium.

Activity 2: Screws

Learner's Book page xx

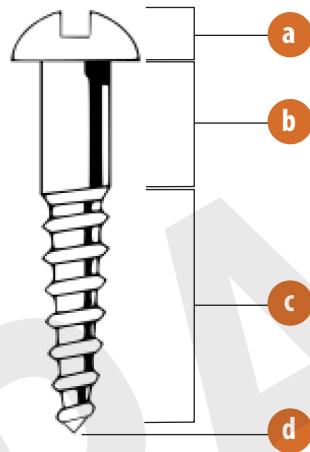
1. a) Provide a definition for each of the following terms:
(i) inclined plane
(ii) helical thread
(iii) slotted head
b) In your own words, describe how a screw is a combination of simple machines.

Model answer

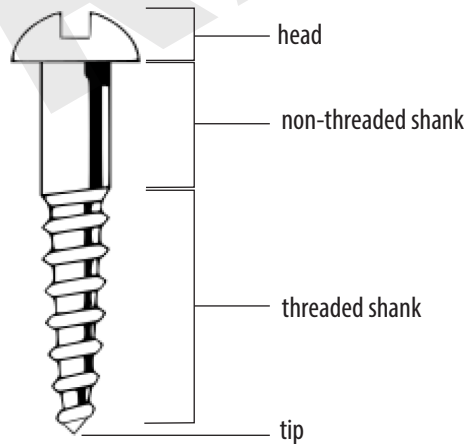
- a) (i) A sloping plane that is at an angle to the horizontal
(ii) The shape formed by the threads of a screw
(iii) A straight groove on the head of a screw

- b)** A screw is a combination of simple machines: the thread (an inclined plane) wrapped around a central shaft. The thread comes to a slender sharp-pointed pin with a raised helical thread running around it. This thread acts as a wedge as it pushes into the material being fastened. A screw will usually have a slotted head on one end that allows it to be turned with a tool, such as a screwdriver. The head is usually bigger than the body.

- 2.** Redraw and label the different parts of this wood screw.



Model answer



- 3.** Explain the function of screws.

Model answer

To connect two workpieces together as a fastener

4. State whether this statement is true or false: "Screws are used to join objects permanently."

Model answer



False, screws are used to join objects temporarily.

.....

5. Screws are used in semi-permanent joints, identify the types of screws in the table below:

Type	Pointer
a)	
b)	
c)	
d)	
e)	

Model answer

Type	Pointer
a)	
b)	
c)	
d)	
e)	

Activity 7.1 Centre lathe

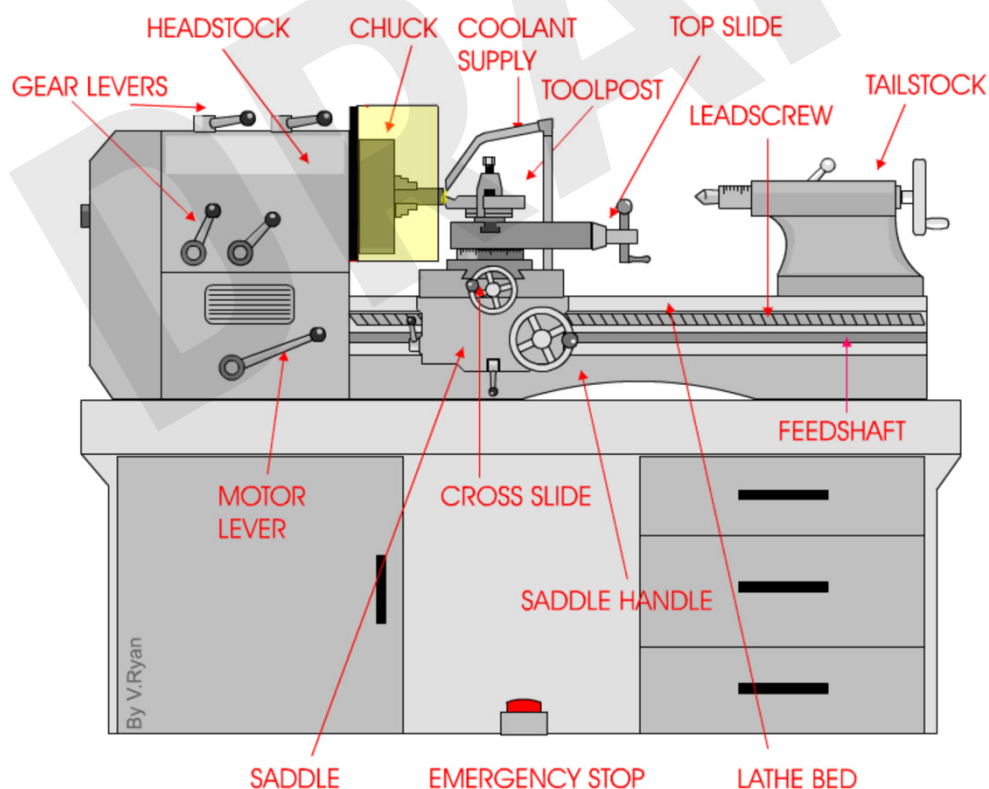
Learner's Book page 83

1. Briefly, explain how the centre lathe functions.

Model answer

The Centre lathe is a machine used to hold and rotate the work piece while the cutting tool moves along the surface of the rotating work piece. The cutting tool can be moved in many directions to do many operations.

2. A typical centre lathe is shown below. Add the missing labels.



Model answer

- head stock
 - lathe bed
 - tool post
 - compound rest
 - tail stock
 - lead screw
 - carriage
 - feed shaft
-

3. In which THREE (3) ways can the centre lathe be taken care of?

Model answer

- Clean lathe after use.
 - Cover lathe with plastic cover over weekends.
 - Oil lathe beds and parts to prevent rust.
-

Activity 7.2 Milling machine

Learner's Book page 86

1. What is a milling machine?

Model answer

A milling machine shapes workpiece that is clamped on the table vice by feeding it (workpiece) onto the revolving cutting tool.

2. Name any FIVE (5) parts of the Milling machine

Model answer

- motor
 - ram
 - head
 - table
 - on/off switch
 - column
 - handles (crank, transverse, cross-feed)
 - spindle
 - knee
 - base
-

ANY 5

3. State TWO (2) ways in which the milling machine can be taken care of.

Model answer

Care of a milling machine:

- clean after use.
- oil moving parts to prevent corrosion.
- cover with a plastic cover over weekends and during holidays.

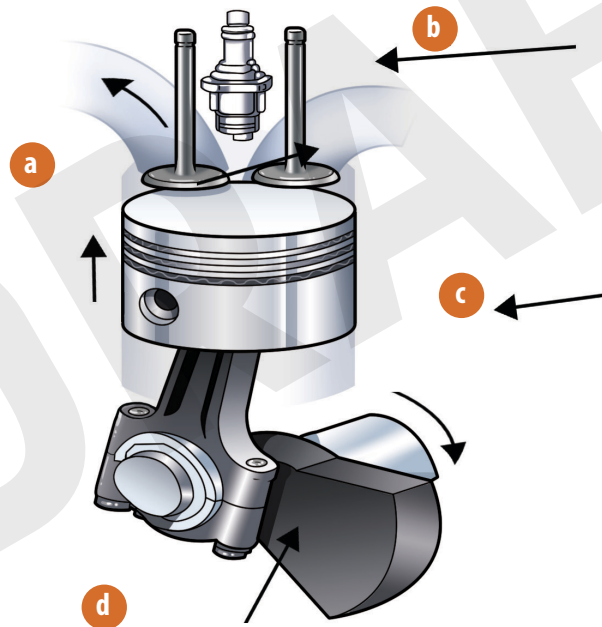
ANY 2

Activity 7.3 Engines

Learner's Book page 89

1. The illustration below shows the components of a four-stroke engine.

- a) Provide labels for the parts labelled a – d



Model answer

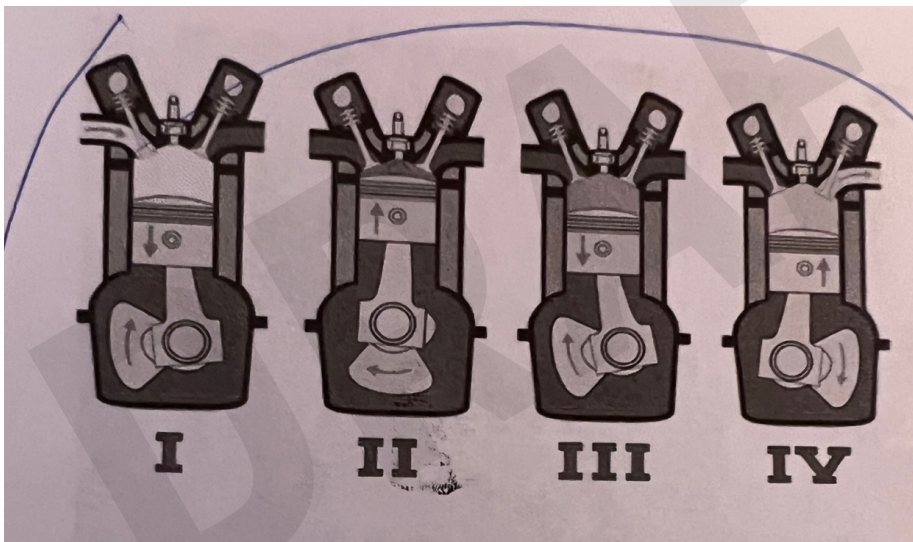
- a** Exhaust valve
- b** Spark plug
- c** Piston
- d** Crankshaft

- b) State the functions of each of the labelled components in the figure above.

Model answer

- Exhaust valve: It controls the exit of the burnt exhaust gases.
- Spark plug: It provides with the spark that will ignite the air fuel mixture in the combustion chamber.
- Piston: The component that moves up and down in the cylinder, creating vacuum, and sucking the new air/fuel mixture that enters through the inlet port. It compresses the mixture and pushes out the burnt exhaust gases.
- Crankshaft: Changes the linear movement of the piston to a rotary motion of engine parts.

2. In a four-stroke engine, the combustion process is made up of (i) intake; (ii) compression; (iii) power; and (iv) exhaust strokes.



- a) In your own words, describe each process.

Model answer

Intake: this involves drawing a mixture of fuel-air into the combustion chamber.

Compression: the fuel-air mixture is compressed.

Power: the fuel-air mixture is ignited.

Exhaust: the burned gases are expelled (removed) from the engine.

- b) Explain the role of the pistons in the engine.

Model answer

Pistons move up and down in the cylinder, creating a vacuum, and sucking the new fuel-air mixture that enters through the inlet port. It compresses the mixture and pushes out the burnt exhaust gases.

3. Match column A with the correct description in column B.

- | | |
|-----------------------|---|
| a) crankshaft | (i) contains engine oil |
| b) connecting rod | (ii) connects the piston to the crankshaft |
| c) cylinder block | (iii) houses the cylinders |
| d) combustion chamber | (iv) controls the opening and closing of the valves at different intervals |
| e) inlet valve | (v) controls the exit of burnt exhaust gases |
| f) cam | (vi) changes the linear movement of the piston to a rotary motion of engine parts |
| g) camshaft | (vii) moves up and down in the cylinder, creating a vacuum, and sucking the new fuel-air mixture that enters through the inlet port. it compresses the mixture and pushes out the burnt exhaust gases |
| h) spark plug | (viii) the space where the burning of gases (compressed mixture) takes place |
| i) valve spring | (ix) keeps the valve closed on its seat |
| j) exhaust valve | (x) provides the spark that will ignite the fuel-air mixture in the combustion chamber |
| k) cylinder head | (xi) the path where the engine coolant flows |
| l) water jacket | (xii) cams are machined on the camshaft which controls the valve opening and closing |
| m) piston | (xiii) controls the entry of fresh fuel-air mixture |
| n) crankcase | (xiv) covers the cylinders in the cylinder block |

Model answer

- | | |
|-----------------------|--|
| a) crankshaft | (vi) changes the linear movement of the piston to a rotary motion of engine parts. |
| b) connecting rod | (ii) connects the piston to the crankshaft. |
| c) cylinder block | (iii) houses the cylinders. |
| d) combustion chamber | (viii) the space where the burning of gases (compressed mixture) takes place. |
| e) inlet valve | (xiii) controls the entry of fresh fuel-air mixture. |
| f) cam | (iv) controls the opening and closing of the valves at different intervals. |
| g) camshaft | (xii) cams are machined on the camshaft which controls the valve opening and closing. |
| h) spark plug | (x) provides the spark that will ignite the fuel-air mixture in the combustion chamber. |
| i) valve spring | (ix) keeps the valve closed on its seat. |
| j) exhaust valve | (v) controls the exit of burnt exhaust gases. |
| k) cylinder head | (xiv) covers the cylinders in the cylinder block. |
| l) water jacket | (xi) the path where the engine coolant flows. |
| m) piston | (vii) moves up and down in the cylinder, creating a vacuum, and sucking the new fuel-air mixture that enters through the inlet port. it compresses the mixture and pushes out the burnt exhaust gases. |
| n) crankcase | (i) contains engine oil. |
-

Activity 8.1 Maintenance maintenance

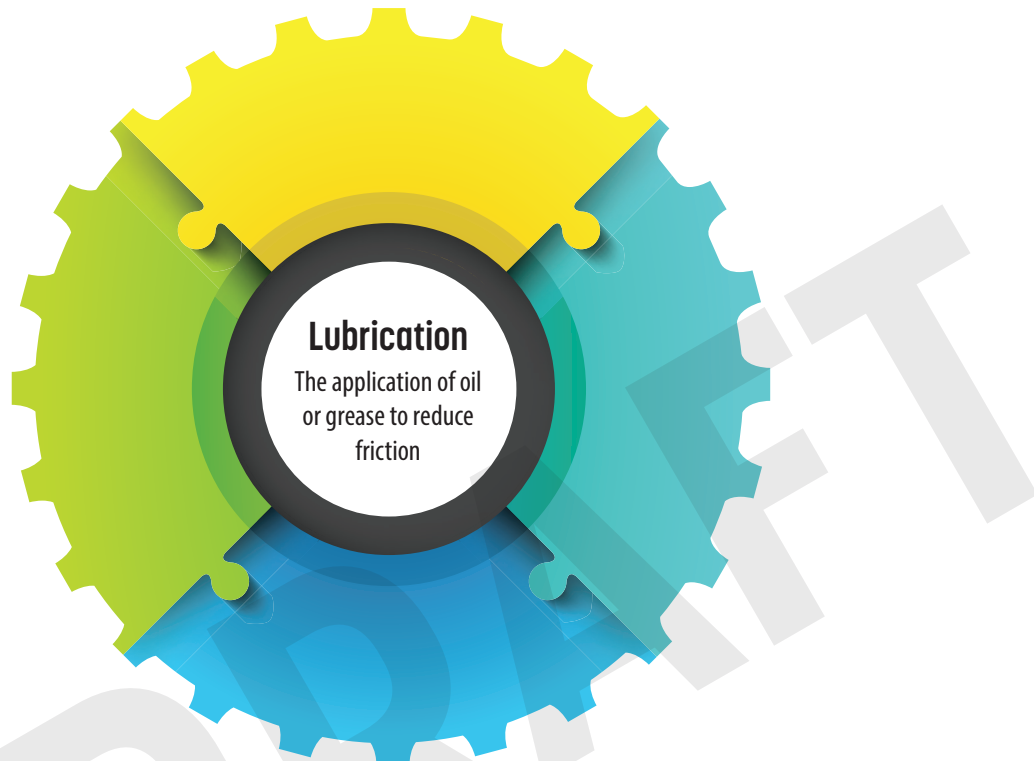
Learner's Book page 97

1. Fill in the missing words to complete the paragraph below:
Machine maintenance can be just a simple (a)_____ or (b)_____ process, or it may involve all the (c)_____ tasks (the work being done) on machinery and mechanical equipment in order to keep them (d)_____. Machine maintenance aims to keep (e)_____ to a minimum, keep employees safe from (f)_____ machinery, and minimise the costs of fixing a machine when it does break down due to (g)_____ failure.
2. List THREE (3) things that machine maintenance can include.
3. In your own words, define the following terms:
 - a) corrective maintenance
 - b) reactive maintenance
 - c) preventive maintenance
 - d) condition-based maintenance.

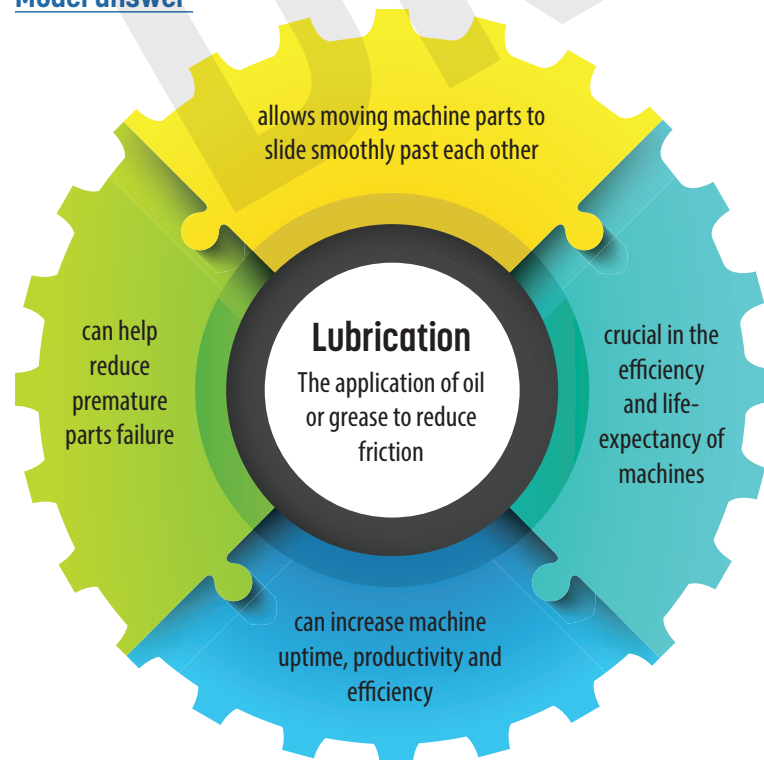
Model answer

1. Machine maintenance can be just a simple cleaning or lubrication process, or it may involve all the maintenance tasks (the work being done) on machinery and mechanical equipment in order to keep them functional. Machine maintenance aims to keep downtime to a minimum, keep employees safe from malfunctioning machinery, and minimise the costs of fixing a machine when it does break down due to unplanned failure.
2.
 - regularly scheduled services
 - routine checks
 - emergency repairs
 - the replacement or realignment of worn, damaged, or misaligned parts.
3.
 - a) corrective maintenance happens when a problem happens
 - b) reactive maintenance happens when a machine breaks down
 - c) preventive maintenance happens according to the manufacturer's schedule
 - d) condition-based maintenance happens when a situation requires the operator to perform a maintenance task before further use of the machine

1. Complete the following flow diagram:



Model answer



2. Which type of lubricant will be used on the following components:
- a) Bearings.
 - b) Manual gearbox.

Model answer

- a) Grease
 - b) Gear oil
-

3. Define the following terms:
- a) electrochemical reaction
 - b) oxidation

Model answer

- a) a process caused by or with an electric current
 - b) oxygen is added to a chemical substance causing it to change
-

4. List and explain FIVE (5) characteristics of a lubricant.

Model answer

- A high viscosity index (VI) – serves to form a lubricating film, cool machine components, and seal and control oil consumption.
 - A high boiling point and low freezing point – this is important so that the lubricant can stay liquid within a wide range of temperatures.
 - Thermal stability – refers to the ability of lubricants to resist breakdown at high temperatures. Poor thermal stability can result in sludge, deposits, and increased viscosity.
 - Hydraulic stability – refers to a lubricant's ability to resist chemical decomposition when water is added.
 - Demulsibility – refers to the ability of a lubricant to separate from water.
 - Corrosion prevention – corrosion refers to the destruction of a solid body by electrochemical reactions. Lubricants help machine parts to retain their original properties and avoid damage by corrosion.
 - Oxidation stability – refers to the ability of a lubricant to resist the chemical combination with oxygen. It can result in the creation of sludge and increased viscosity.
-

5. Explain why lubricants play an important role in a machine's functioning.

Model answer

- reduces wear of moving parts
- reduces friction between rotating parts and stationary parts
- absorbs shock
- reduces operating temperatures
- minimises corrosion of metal surfaces
- keeps contaminants out of the system
- seals and protects components.

6. Fill in the missing rules that need to be followed when handling and storing lubricants.

Correct handling of lubricants	Correct storage of lubricants
	Check the seals and seams cracks and containment.
Never eat or smoke when handling lubricant.	
Use correct PPE when handling lubricant.	Inspect the lubricant container for leakage and contamination.

Model answer

Correct handling of lubricants	Correct storage of lubricants
Use correct PPE when handling lubricant.	Keep the lubricant containers in good condition all the time.
Handle lubricant with care to avoid spillage.	Inspect the lubricant container for leakage and contamination.
Never eat or smoke when handling lubricant.	Keep the lubricant storage clean.
Label containers to avoid mixing lubricants.	Check the seals and seams cracks and containment.
	Storage of lubricant should be under strict control.

1. In your own words, explain why it is important to have a maintenance schedule.

Model answer

- Schedules and inspection reports should be available to everyone who works on the machine.
 - A list of what needs to be checked should be available to use during the inspection.
 - Inspections should be done at least once a week.
 - Machinery should be inspected after the initial installation and before it is first used.
-

2. List at least two things that an inspection should cover.

Model answer

- Focus on safety-related parts that are crucial for safe operation.
 - Check the condition of all electric cables, brakes, etc.
 - Check that the machine is functioning safely – this can be done on a weekly basis.
 - Every few months – or as stipulated in the manufacturer's guidelines – conduct a more extensive check on all moving parts, all safety features, levels of lubricants, and any portable equipment.
-

3. Choose a machine that you work on regularly.

- a) Draw up a maintenance schedule for 2 – 3 weeks.
- c) Decide on the frequency of the inspections – whether tasks should be done daily, weekly, or monthly.
- b) List all the tasks that need to be done during the inspection.
- e) Decide how you will record your inspection report.

Model answers

Learner's own work.

Practical tasks

Practical maintenance

Divide the learners in groups of three to four each.

Use the template to do Maintenance Checks on Machinery in the Workshop.

1. Use the template and identify machinery that needs maintenance.

Daily maintenance							
Machine	Serial number	Lubricant required	Lubricant level status	Action to be taken	Checked by:	Signature:	Date

Model answer

Daily Maintenance							
Component	Serial number	Lubricant required	Lubricant level status	Action to be taken	Checked by:	Signature:	Date
Example							
Centre lathe	00122	Oil	Half filled	Refill the oil	Elijah Matlhaku	E. Matlhaku	28/08/2022

Activity 9.1 Tools used in body works and spray painting

Learner's Book page 109

1. Identify the following tools and describe what they can be used for.



Model answer

- a) screwdriver
 - b) hacksaw
 - c) tin snip
 - d) spanner
 - e) shifting spanner
 - f) socket set
 - g) measuring tape
 - h) combination plier
 - i) long nose plier
 - j) planishing hammer
 - k) pick and finishing hammer
 - l) curve-pane and finishing hammer
 - m) cross- pane and finishing hammer
 - n) double ended dolly
-

2. Describe FIVE (5) panel beating hammers and explain what they can be used for.

Model answer

- planishing hammer – used for shaping different contours on panels, and for picking up small low areas and planishing the surface of a panel to a smooth finish
 - pick and finishing hammer – used for shaping different contours on panels, and for picking up small low areas and planishing the surface of a panel to a smooth finish
 - curve-peen and finishing hammer – used for shaping different contours on panels, and for picking up small low areas and planishing the surface of a panel to a smooth finish
 - cross-peen hammer – used for shaping different contours on panels, and for picking up small low areas and planishing the surface of a panel to a smooth finish
 - sledge hammer – used for heavy work on trucks and chassis
 - ball-peen hammer – used for riveting, chiselling, and rough forming and flattening heavy gauge metal
-

3. State whether the following statements are True or False. If the statement is False, correct it to make it True.

- i) The panel beating bumping file cannot be used as a hammer and its serrated face expands and stretches surfaces when being bumped against a dolly on the inner skin.
- ii) Orbital sanders are powerful air sanders that are ideal for light prep work, such as smoothing edges and sanding down old coats of paint.

- iii) Sandpaper can be used to finish and prepare a panel that will be sprayed. You should always use the highest grit of sandpaper regardless of the stage of preparation.

Model answer

- i) False – The panel beating bumping file is used as a hammer and its serrated face shrinks and stretches surfaces when being bumped against a dolly on the inner skin.
 - ii) True
 - iii) False – Sandpaper can be used to finish and prepare a panels that will be sprayed. The type and grit of the sandpaper used depend on the stage of preparation.
-

4. What are the uses of the following equipment?

- a) a disk sander
- b) adjustable body file
- c) a cross-peen hammer
- d) a wire brush

Model answer

- a) a disc sander is used to grind off paint during repairs of a panel and finishing of a minor dent
 - b) an adjustable body file is used for foring and shaping metal during body repair work
 - c) a cross-peen hammer is used for shaping different contours on panels, and for picking up small low areas and planishing the suface of a panel to a smooth finish
 - d) a wire brush can be used to clean iron filings after filing the metal
-

Activity 9.2 Spray painting

Learner's Book page 116

1. In your own words, explain what spray painting can be describe as.

Model answer

Spraypainting can be described as a painting technique in which a device sprays coating material through the air onto a surface.]

.....

2. The following tools are used in spray painting: sanding block, cutting knife, spreader or celluloid, blowgun and air compressor.
 - a) Choose any three spray painting tools.
 - b) Describe each tool in as much detail as possible.
 - c) Describe the use of each tool in spray painting.

Model answer

Sanding block

If you have to sand a vehicle by hand, it is best to use an automotive sanding block. When you sand with your hand, pressure is unevenly placed on the piece of sandpaper. The tiny variations in pressure can cause the surface of the vehicle to become wavy and uneven.

But when you use a sanding block, you wrap the sandpaper around the block to create a flat and even sanding surface. The block spreads out the pressure of your hand, resulting in a more even job. The difference may be slight, but once the paint goes on, the difference in the quality will be obvious.

Use

A sanding block is a block used to hold sandpaper. In its simplest form, it is a block of wood or cork with one smooth flat side.

The cutting knife

The cutting knife is used to cut paper and plastic masking, and to cut shapes when doing decorative work like striping.

The spreader or celluloid

A spreader or celluloid is made from either soft nylon or metal.

Use

The spreader or celluloid is used to spread spot putty over scratches.

The blowgun

An air blow gun is used for applying a required amount of compressed air for the removal of debris, non-contact drying and blowing. It consists of a nozzle that is attached to an airline that delivers a steady stream of compressed air.

Use

The blowgun is attached to an airline and has a trigger to control the flow of air through the gun. It is used to blow dust and water from under mouldings, rubbers, etc.

Air compressor

Air compressors are used for painting cars. It uses compressed air to deliver paint through a nozzle in a strong yet even flow.

Use

An air compressor for spray painting operates by breaking up paint with pressurised air and using that pressure to produce a fine mist of paint through a nozzle.

.....

3. Complete the following, by filling in the missing words:

- a) Spot and glazing putty are ideal for _____ and other small repairs to auto body panels. They can be used for filling _____ in body filler and for covering _____.
- b) _____ is used together with sandpaper. It helps to prevent the _____ of sandpaper and gives the area sanded a _____ and _____ finish.
- c) Body filler is used for filling _____ and small _____ in metal, plastic, wood and concrete. It has outstanding _____ and _____.

Model answer

- a) Spot and glazing putty are ideal for spot repairs and other small repairs to auto body panels. They can be used for filling pinholes in body filler and for covering minor sand scratches. They can also be used on metal, fiberglass and wood, as well as, sanded and primed or sanded and painted surfaces.
 - b) Water is used together with sandpaper. The water helps to prevent the clogging of sandpaper and gives the area sanded a smoother and polished finish.
 - c) Body filler is used for filling dents and small holes in metal, plastic, wood and concrete. It has outstanding adhesion and flexibility.
-

Practical tasks

1. Follow the procedures outlined below to clean and prepare body panels for dent repairs:

- » **Clean the repair area** – Begin by washing the area with soap and water, then use a wax and grease remover. Wipe the vehicle dry with a clean cloth.



- » **Grind the repair area** – Prepare areas to provide for the filler/putty/glaze with 36- to 50-grit sandpaper and a disc sander tool, then blow off debris with clean, dry air.



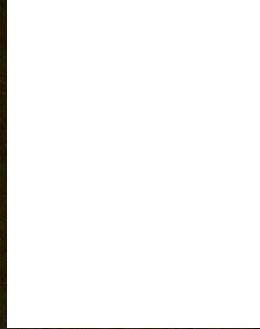
Model answer

Assist the learners with this task and simulation.

Notes to educator

Educator to demonstrate the procedure to learners before learners attempt the practical. They must first practice before the actual practical is done.

Other books in the series



Num re atiam est oportis reviris et; nulut egerimorum sentebus sitamdi temenam pestorum re nos mandam Romnosu lerficaec virmaximus condam ut L. Gravendemnos co ponventions rem publius uliciemus.

Is ex senicatuite factemoerra contiaciena, us, et il vesi esidestra cus il utebunteri se macchuit atiam Patil tuus hus, nemus huiusulla Sercest raetorei inti porum publicente ad inarion verente nonenda mdionem ari, ut pribus conc mis facrei sentiquis. Vertanduc tea dumus pribus ad det vessentio averes faut pecon pora nontelutum confin horec re ta mus nequi it; nes! Senterfiris, num andella benatiam ducermisum, sed aus. Ox sendiem oraelud effres fendeatus bonscrei pos, utem mentifex mium, quis cae, nissedemusa dio, vive, novestiam a nonfica L. Marbis tem ute in st? O tea non non vilint? Cernihilibus cotes redit. Que obses? Ostil vit; nossed corbis, adem in dem intrurnius etiem ilicto verissili, Caturtiquam dem, culinati, tandefaci pubis mo esse, Catus Catum crum nes es! Senatam que atem aucta Si in ve, P. Mae estiquidem fatrudactus, us; horibus, siterei et L. Furnum opublissil cus.

Unclum praet; Catusque rem tus bondiem Romnihi liena, con siciberribus taturibus bonfinemquam audamdit? Ituit, noxim vo, corditamdi, terris nostis deperfectus bonitrae num tandac mactata, quam iam publin talarei se aper ut accibulus iu is inatiam Paliemu nterbit; nos forus, tussi condit; habul until tala coenihil tui sidet vis.



9

781998

982769