TEACHER'S GUIDE

SERVICES TECHNOLOGY

GRADE 8

basic education
Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

KAGISO TRUST
Overcoming poverty

sasol

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Mechanical Technology Grade 8 Teacher's Guide

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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…	A facilitator/teacher is not 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	• 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**	• 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	• 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**	**Introduction of Graphic Communication** • 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) » Isometric drawings » 1st Angle Orthographic	**Demonstrate and apply all aspects of drawing** • 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**	• Identify tools, instruments and equipment and their uses (theory and practical application) » 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	• Care and maintenance of tools and equipment » 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**	• What is entrepreneurship? • Who is an entrepreneur? • Types of entrepreneurship • Marketing and branding products • Advertising on a media platform	• What is entrepreneurship? • Who is an entrepreneur? • Type of entrepreneurship. » 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**	• Introduction to and classification of material: » Ferrous metals » Non-ferrous metals	• Classification and application of materials: » Ferrous alloys » Non-ferrous alloys (Sheet metals, cold-rolled sheets, galvanised sheets, expanded sheets) » Plastics
6. **Joining methods**	• Definition of joining methods • Types of joining methods » Permanent joining methods (definition only) » Semi-permanent joining methods • Semi-permanent joining methods • Apply procedures of basic semi-permanent joining processes » Bolt and nuts (and washers) » Screws	• Demonstrate the processes of joining methods • Apply permanent joining method » Soldering » Arc welding • The Teacher demonstrates screw thread-cutting procedures • Screw cutting (Tap and Die ONLY) • ISO metric threads
7. **Terminology**	• Identify the different machines used in the Fitting and Machining Workshop and their uses. » Centre Lathe » Milling Machine • Engines » 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).	• 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** *(continued)*	• **Practical task 2** Use of an engine for learners to identify and explain the purpose of different engine components.	• **Terminology**: » Engine designs » Engines » TDC » BDC » Stroke » Bore • Fundamentals engine technology: » FOUR (4) Stroke (Petrol) Engine » Operation » Intake » Compression » Power » Exhaust » Function of engine systems • FOUR (4) Stroke (Petrol) – 1 cylinder » Comparison of the two engines » Inspect parts
8. **Maintenance**	• Introduction to machine maintenance • Lubrication » Definition » Identify lubricant for different components (engine oil, gear oil, automatic transmission fluid). » Correct handling and storage of lubricants. • **Practical task** » Plan and prepare to inspect and lubricate machines and equipment	• Introduction to machine maintenance (Grade 8 revision) • Lubrication: » Definition » The purpose of lubrication » Inspection frequency » Types of maintenance » Inspection and fluid top ups » Inspection of defects on motor vehicle • Engine maintenance » Importance of regular maintenance • Automotive batteries (lead, acid storage and gel type batteries) » Handling and care

TOPIC	GRADE 8	GRADE 9
8. **Maintenance** *(continued)*		• **Practical task 1** » Drain, refill or top up fluids and lubricants » Inspect for leaks and defects • **Practical task 2** » Remove and install battery in vehicle
9. **Body Works**	**PANEL BEATING** **Repair different coin-sized dents on ferrous body shells while applying safety rules** **Practical demonstration** • Repair a coin-sized dent on a body panel. **Tools** • Identify and assess the damage • Select appropriate tools to be used for repairs: » 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 **Perform surface preparation of a body panel** **Practical demonstrations** • 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	**PANEL BEATING** **Perform surface preparation of a body** **Panel grind and feather edging operations** • Identify the type of panel and name the material it is made from • Identify and assess the body panel to be repaired **Practical demonstration** • Wash panels in accordance with the workshop procedures • Grind and feather edging operations **Tools** • Electric disc sander/Air driven disc sander • Orbital sander • Sanding blocks **Material/Abrasives** • P150 Hook it disc • P80 sandpaper • P180 sandpaper • Prep sol • Metal cleaner **Practical task** • Wash panels in accordance with the workshop procedures • Grinding and feather edging operations

TOPIC	GRADE 8	GRADE 9
9. **Body Works** *(continued)*	• 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** • 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** • Electric disc sander/Air driven disc sander • Orbital sander • Sanding blocks **Material/Abrasives** • 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** • 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** • 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 9: Content outline for Term 1

TERM 1

Formal assessment requirements

All assessment tasks that make up a formal programme of assessment for the year are regarded as formal assessments. Mark and formally record formal assessment tasks for progression and certification purposes. All formal assessment tasks are subjected to moderation for quality assurance and to maintain proper standards.

The formal assessment provides you with a systematic way of evaluating how well learners progress in a grade and a particular subject. Examples of formal assessments include projects, oral presentations, demonstrations, performances, tests, examinations, practical tasks, etc. Formal assessment tasks form part of a year-long formal Programme of Assessment in each grade and subject.

Programme of Assessment		
School-based assessment	Practical activity	Exam
25%	25%	50%

The formal assessment requirements for maintenance are as follows:

School-Based Assessment (SBA): is written at the end of terms 1 and 2, shows the learner's progress throughout the terms, and accounts for 25% of the learner's promotion mark.

In Grades 8 and 9, all SBAs are set and moderated internally.

Practical Assessment Task (PAT): accounts for the skills the learner has mastered. This should be assessed at weekly intervals and requires the learner to engage in multiple practical sessions. During these sessions, skills such as simulation, experimentation, hand skills, tool skills, machine skills and workshop practice are honed and perfected to the point where the learner may engage in the tasks set out for that particular term. The PAT accounts for 25% of the learner's promotion mark.

In Grades 10 – 11, the Practical Assessment Tasks are set and marked internally but are moderated externally.

TERM 1

SUGGESTED ANSWERS

CHAPTER 1

Occupational health and safety

Learner's Book page 1

Activity 1.1 Health and safety

Learner's Book page 8

1. Explain the term maintenance and its role.

Model answer

Maintenance is a set of processes to ensure that all machines, equipment and processes run smoothly in a workshop. It can be 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 working (functional). 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.

Maintenance can include the following:

- routine maintenance
- planned maintenance
- corrective maintenance
- predictive maintenance.

To ensure that the machinery and equipment in a workshop works reliably throughout its lifecycle, regular maintenance is required. Not only will it save money, but it will ensure that everyone who works on the machine is kept safe.

The role of maintenance focuses on:

- safe parts that are crucial for safe operation of equipment and machinery.
- ensuring that all electric cables, brakes, etc. are in a safe working condition
- checking that all machines and equipment are functioning safely and optimally.
- every few months – or as stipulated in the manufacturer's guidelines – conducting a more extensive check on all moving parts, all safety features, levels of lubricants, and any portable equipment.

2. These illustrations suggest different types of work done in maintenance as a career. In not more than 5 lines, discuss the illustrations in a and b below.

Model answer

Figure **a** – accept any appropriate answer with reference to a mortise lock, mortiser, fitting a door handle.

Figure **b** – accept any appropriate answer about a toolbox and the different tools that is shown.

3. Complete the following by choosing the correct word to make the sentence correct.
   - **a)** I will always wear my _____(overall, suite, pants)
   - **b)** My overall will always be in _____condition. (white, good, dirty)
   - **c)** I will respect and observe the _____rules. (school, workshop, shop)
   - **d)** I will always _____and carry out instructions given by the workshop teacher. (obey, destruct, damage)

Model answer

a) I will always wear my overalls.

b) My overall will always be in good condition.

c) I will respect and observe the workshop rules.

d) I will always obey and carry out instructions given by the workshop teacher.

Activity 1.2 Housekeeping

1. In your own words, describe good housekeeping.

Model answer

"A clean, orderly workshop is a safe workshop". Good housekeeping means working in an orderly way, and always returning tools and materials to their correct places.

Good housekeeping is explained by the phrase "A place for everything and everything in its place". This practice ensures that the workshop is always kept clean and tidy, making it a better and safe place to work. Housekeeping is a crucial aspect of workplace safety as good housekeeping helps prevent accidents and reduces the severity or consequences of accidents.

2. List TWO (2) advantages of good housekeeping and TWO (2) disadvantages of poor housekeeping.

Model answer

Any TWO (2) of the following advantages:

Good housekeeping can:
- save time when trying to find tools and/or equipment
- ensure that tools are packed away safely
- prevent any stock from falling and injuring anyone
- prevent fires from starting
- ensure the risk of injuries are minimised.

Any TWO (2) of the following disadvantages:

Poor housekeeping can cause:
- workers to trip over loose objects on the floor
- stock or different articles from falling on workers
- slipping because of greasy, wet or dirty floors
- project delivery running late
- injury to hands or other parts of the body
- fires.

3. Study the illustration and identify the bad practices related to housekeeping.

Model answer

- everything is scattered
- saw dust cot cleaned
- no cleaning of spills
- everything is not in its place
- boxes and offcuts on the walkway
- any other relevant points

Activity 1.3 **Safety signs**

1. Identify the safety signs illustrated below.

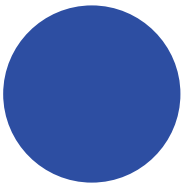
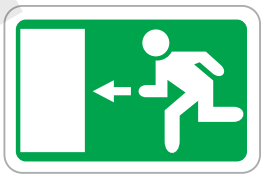
Model answer

- wear a helmet
- eye protection must be worn
- wear ear protectors
- wear a reflector vest
- respiratory musk must be worn
- protective footwear must be worn
- wear gloves
- all visitors and drivers must report to reception

2. Complete the following table by filling in the meaning and drawing an example for each safety sign:

Shape	Meaning	Colour	Examples
Circle with diagonal bar 		RED (contrast: white)	
Circle 		BLUE (contrast: white)	
Equilateral Triangle 		YELLOW (contrast: black)	
Square/Rectangle 		GREEN (contrast: white)	
Square/Rectangle 		RED (contrast: white)	

Model answer

Shape	Meaning	Colour	Examples
Circle with diagonal bar 	Prohibition	RED (contrast: white)	No smoking 
Circle 	Mandatory Action	BLUE (contrast: white)	Wear eye protection 
Equilateral Triangle 	Warning	YELLOW (contrast: black)	Danger flammable materia l 
Square/Rectangle 	Information about safe condition	GREEN (contrast: white)	Escape route – left 
Square / Rectangle 	Fire safety	RED (contrast: white)	Fire extinguisher 

3. Protective clothing/gear and equipment will protect you against health and safety risks when you perform dangerous tasks.

a) Identify all the protective equipment depicted below.
b) Explain when and where you would wear the protective gear listed in a).

Model answer

a)
- overalls
- ear protection
- safety boots
- dust mask
- goggles
- gloves
- helmet

b)
- overalls –when working with cement
- ear protection – when working with loud noise machines. e.g. grinder
- safety boots – when carrying heavy objects
- dust mask – when working in a dusty area
- goggles – when drilling above your head, using a grinder or sawing machine.
- gloves – when working/ handling materials such as cement, steel
- helmet – when working in a workshop to prevent head injuries in case of slippery/ when working on a construction site to avoid head injuries from falling objects

Activity 1.4 First aid

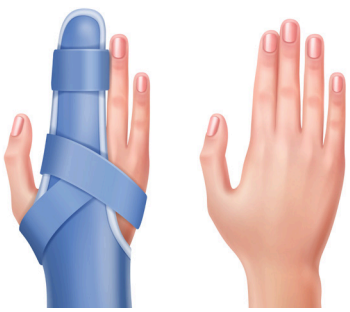
1. In your own words, explain what first aid is.

Model answer

First aid is the first and immediate assistance (help) given to a person suffering from either a minor or serious illness or injury. This assistance aims to preserve life, prevent the condition from worsening, or promote recovery before you can get the person to a doctor and/or hospital.

2. List the use/s of the following items that can be found in a first aid kit.

a)	Tweezers	
b)	Pliers	
c)	Surgical gloves	
d)	Gauze pad	

e)	Bandage	
f)	Safety pins	
g)	Bolts and nuts	
h)	Eye patches (cloth patch)	
i)	Cleaning agents (alcohol wipes or ethyl alcohol)	
j)	Splint	

Model answer

Name	First aid supply	Uses
Tweezers		• Used to remove debris such as glass, dirt, or splinters from a wound. • Also used to remove stingers left behind by bees.
Pliers		• Used to cut wire strings, twisting, and or fastening.
Surgical gloves		• Gloves must be worn as a single-use item for each invasive procedure, contact with sterile areas, and broken skin.
Gauze pad		• Used to absorb blood. • Also used to apply ointments or clean wounds.
Bandage		• Used to hold dressings and splints in place. • Also used to reduce swelling or provide support to a sprained area like an ankle.

Name	First aid supply	Uses
Safety pins		• Used to fix bandages. • Also used to fasten pieces of fabric or clothing together.
Bolts and nuts		• Mainly used to hold and tighten splints in position.
Eye patches (cloth patch)		• Used to cover a lost or injured eye.
Cleaning agents (alcohol wipes or ethyl alcohol)		• Antiseptic is used for cleaning wounds. • Sterile water is used as an eye wash. • Antiseptic hand cleanser is used for a higher level of sanitation, both pump bottle and wall-mounted dispensers can be used.
Splint		• Used to stabilise a broken bone while the injured person is being taken to the hospital for more advanced treatment.

3. List the TWO (2) tools that can be used for cutting in a first aid kit.

Model answer

Scissors, pliers

4. What do we use to absorb blood?

Model answer

gauze pad

Activity 1.5 First aid

1. For each of the following statement, say whether they are True or False.
   a) When the cut is clean, DO NOT press a clean cloth or bandage to the area for at least 15 minutes.
   b) Use rubbing alcohol, hydrogen peroxide, or iodine to clean the cut, as it can slow healing.
   c) If glass or debris is lodged in the wound, you can do more damage by trying to remove it yourself.
   d) If you can see a layer of fat (yellow-tan, lumpy tissue), muscle (deep-red, stringy tissue) or bone (tan-white, hard surface) through the cut; or if the cut is wide and jagged, the injured person will probably not need to get stitches.
   e) To prevent the clotting blood from coming off when you remove the pressure dressing, use a non-stick cloth to remove it.

Model answer

a) False. When the cut is clean, press a clean cloth or bandage to the area for at least 15 minutes.

b) False. DO NOT use rubbing alcohol, hydrogen peroxide, or iodine to clean the cut, as it can slow healing.

c) True

d) False. If you can see a layer of fat (yellow-tan, lumpy tissue), muscle (deep-red, stringy tissue) or bone (tan-white, hard surface) through the cut; or if the cut is wide and jagged, the injured person will probably need to get stitches.

e) True

2. Explain the steps that need to be followed when treating a severe deep cut.

Model answer

Step 1: Call emergency services

- Get an ambulance or doctor as quickly as possible. If you and the injured person are alone, make sure that extreme bleeding is under control before going for help.

Step 2: Put gloves on if you are treating someone else

- Keep a barrier between you and someone else's blood. Medical gloves will protect you from any possible transfer of disease from the other person's blood.

Step 3: Check the severity of the wound and the injured person's responses to the injury

- Check the person's breathing and circulation. Ask the person to lie down or sit down if possible. This will allow them to rest and relax.
- Check to see what the problem is. Cut away clothing, if needed, so that you can see the wound. Be careful to avoid getting debris in the wound as you cut away the clothing.

Step 4: Assess life-threatening issues

- If the wound is causing severe bleeding from an arm or leg, ask the patient to elevate his or her affected limb.
- Place supports, such as pillows or folded blankets, under the limb or have someone hold it up. Keep it in this position until the bleeding stops.
- Shock can also be a life-threatening issue. If the person is in shock, keep him or her warm and relaxed as much as possible. Symptoms of shock include being pale, cold, clammy skin, disorientation, and decreased alertness.
- Do not try to remove any object, such as a glass splinter – removal could cause severe blood loss if the object is the only thing stopping the flow of blood.

Step 5: Dress the deep cut

- Put a clean and non-fluffy dressing pad over the cut. Apply firm pressure directly to the cut.
- A compression bandage can be made from clothing, fabric, rags, etc., if you don't have any first-aid bandages. If you have one available, wrap the compression bandage around the wound. Do not wrap too tightly – ensure that two fingers can slip under the bandage.

Step 6: Place another dressing over the bandage if blood seeps through

- Do not attempt to remove the existing dressing and bandage, as this would disturb the wound.
- This will help to leave in place any clots that might form. Clots prevent more blood from flowing out of the wound.

Activity 1.6 **CPR**

1. In your own words, explain what you must do in case a person is affected by an electric shock.

Model answer

It may not be immediately clear, but if you think someone is suffering from electric shock, approach them with extreme caution.

- NEVER touch the person receiving the electric shock, or you could also be shocked.
- Turn off the electricity supply, for example, by unplugging the appliance or by turning the mains off at the fuse box. Then separate the person from the source of electricity as quickly as possible. If this is not possible, try to remove the source of electricity from the person using a piece of insulating material, such as a length of wood.
- If the person is unconscious after removing them from the source of electricity, call for an ambulance immediately.
- If the person is conscious and seems well, monitor their condition. Effects of an electric shock may not be obvious immediately. An electric shock may lead to a condition known as electroporation, where cells within the body rupture, leading to tissue death. Additional problems might include deep-seated burns, muscle damage, and broken bones.

2. To perform CPR, you must: (1) give chest compressions; (2) give rescue breaths.
   a) Explain the procedure for giving chest compressions.

Model answer

- Kneel beside the person on the floor, level with their chest.
- Place the heel of one hand towards the end of their breastbone, in the centre of their chest.
- Place the heel of your other hand on top of the first hand and interlock your fingers, making sure you keep the fingers off the ribs.
- Lean over the person, with your arms straight, pressing down vertically on the breastbone, and press the chest down by 5 – 6 cm.
- Release the pressure without removing your hands from their chest. Allow the chest to come back up fully – this is one compression.
- Repeat 30 times, at a rate of about twice a second, or the speed of the song 'Staying Alive'.
- Give two rescue breaths.

b) Explain the procedure for giving rescue breaths.

Model answer

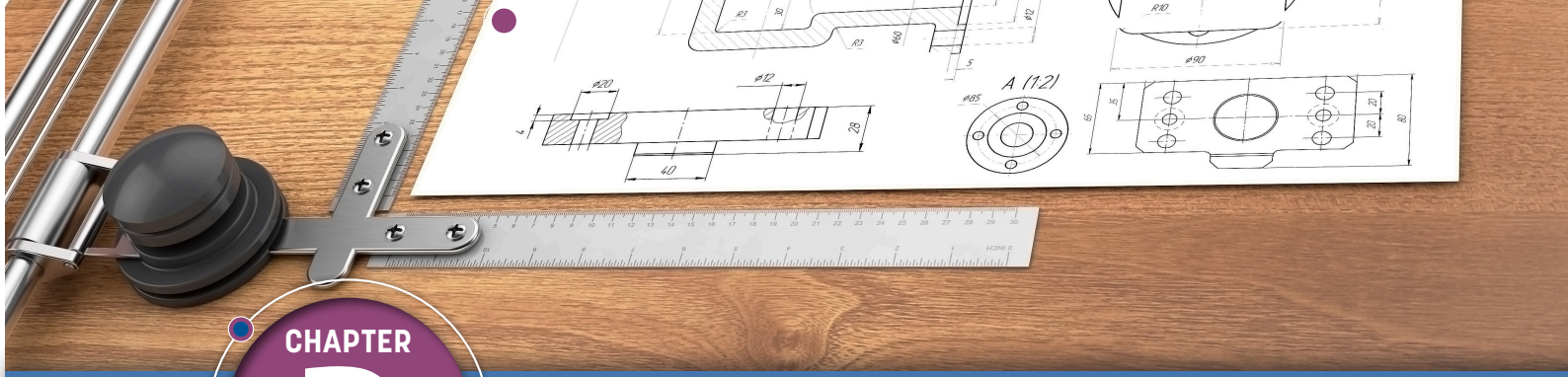
- Ensure the person's airway is open.
- Pinch their nose firmly closed. Take a deep breath and seal your lips around their mouth.

- Blow into the mouth until the chest rises.
- Remove your mouth and allow the chest to fall.
- Repeat again.
- Carry on giving 30 chest compressions followed by two rescue breaths for as long as you can, or until help arrives.

3. Fill in the missing words to explain how to put someone in the recovery position.
   - The recovery position will keep a person's _____ open.
   - Kneel _____ to them on the floor.
   - The next three steps are for if you find the person _____ _____. If you find them lying on their side or their front you may not need all three:
     - » Place the _____ nearest to you at a _____ angle to their body, with their palm facing upwards.
     - » Take the other arm and place it _____ their chest so the back of their hand is against the cheek nearest you and hold it there. With your other hand, lift their far _____ and pull it up until their _____ is flat on the floor.
     - » Now you're ready to roll them onto their side. Carefully pull on their _____ and roll them towards you. Once you've done this, the _____ _____ should be supporting the head and the _____ should be on the floor to stop them from rolling over too far.

Model answer

- The recovery position will keep a person's airway open.
- Kneel down next to them on the floor.
- The next three steps are for if you find the person lying on their back. If you find them lying on their side or their front you may not need all three:
  - » Place the arm nearest to you at a right angle to their body, with their palm facing upwards.
  - » Take the other arm and place it across their chest so the back of their hand is against the cheek nearest you and hold it there. With your other hand, lift their far knee and pull it up until their foot is flat on the floor.
  - » Now you're ready to roll them onto their side. Carefully pull on their bent knee and roll them towards you. Once you've done this, the top arm should be supporting the head and the bent leg should be on the floor to stop them from rolling over too far.



CHAPTER 2

Graphic communication skills

Learner's Book page 20

Activity 2.1 **Graphic communication**

1. In your own words, explain what graphic communication is.

Model answer

Graphic communication can be defined as a language that enables us to describe the exact size and shape of physical objects. It combines lines, symbols and signs used to create technical drawings that clearly communicates a message to a builder, engineer or producer.

2. Name three drawing principles that should always be adhered to.

Model answer

These drawing principles should always be adhered to:

- neatness
- quality linework
- accuracy.

3. Explain each step in correctly setting up drawing paper. Use an illustration to enhance your explanation.

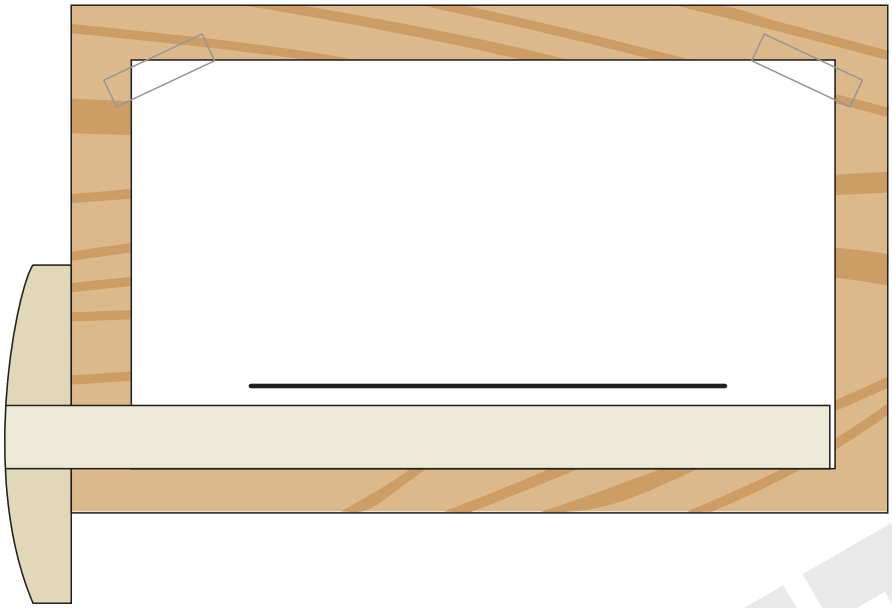
Model answer

Step 1: Place the drawing board on a table with the paper on the board. Make sure to leave equally sized spaces all around the page. Place the T-square edge to the left-hand side of the drawing board.

Step 2: Gently move or slide the T-square to the top edge of the paper. Set the top edge of the paper parallel to the edge of the T-square. Make sure that the stock of the T-square is held firmly against the edge of the drawing board on the left-hand side.

Step 3: Hold the paper in place by putting four pieces of adhesive tape on the edges. Alternatively, you can use two metal clips to hold the paper in place.

Step 4: Slide the T-square down without moving the paper.

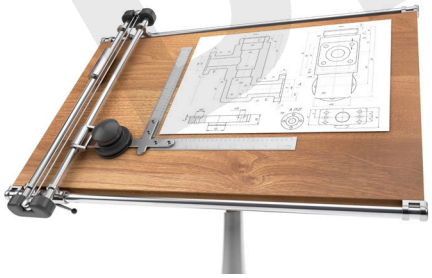
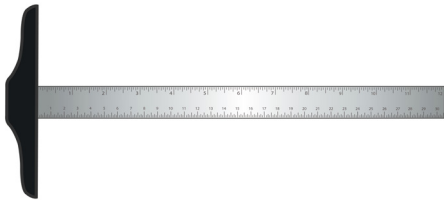


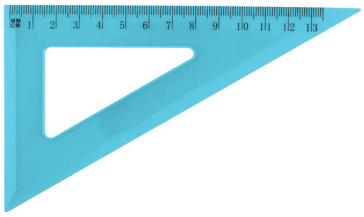
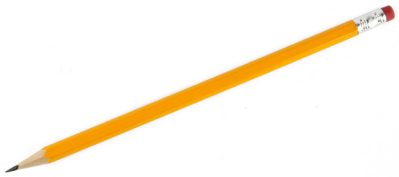
Activity 2.2 **Drawing instruments**

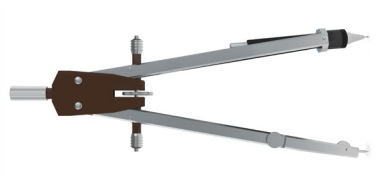
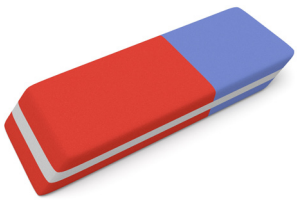
1. Name FOUR (4) drawing instruments.
   a) Explain what your selected drawing instruments are used for.
   b) Explain how to care for your selected drawing instruments.

Model answer

Any FOUR (4) of the following:

Name	Use	Care
drawing board 	Used for any kind of drawing, writing, or sketching on a piece of paper.	Clean your board by using a household degreaser or low odour white spirit.
T- square 	Used to draw horizontal lines and guides when drawing vertical lines.	Wipe with a clean cloth, preferably a yellow duster.

Name	Use	Care
45° set square 	Used to draw parallel and perpendicular lines, and standard measure angles (45 ° and 90°).	Wipe with a clean cloth preferably a yellow duster.
30° /60° set square 	Used to draw parallel and perpendicular lines, and standard measure angles (30° /60° and 90°).	Wipe with a clean cloth preferably a yellow duster.
scale rule 	Used to measure length, width and height.	Wipe with a clean cloth, preferably a yellow duster.
protractor 	Used to measure angles.	Wipe with a clean cloth, preferably a yellow duster.
compass 	Used to draw circles and arcs.	The lead on the compass must be kept sharp.
pencils 	Used for lettering and drawing lines. Pencils come in different grades (H, B, F and HB).	Keep sharpened at all times.

Name	Use	Care
pair of dividers 	Used to transfer the measured distances on maps and drawings onto paper.	Always ensure that the points remain sharp for accuracy.
eraser 	Used to clean the dirt off the drawing and for making changes or correcting errors in a drawing.	Use a cotton cloth or soapy water to clean it. It must be totally dry before use.

2. Explain why it important to be careful when using drawing instruments.

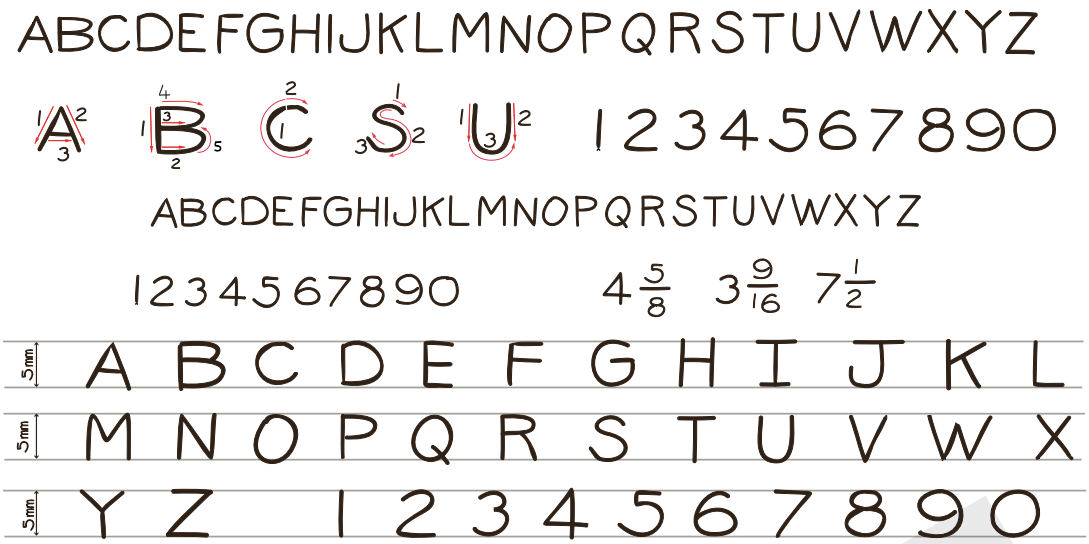
Model answer

When working with drawing instruments, it is important to work safely. Some instruments – for example, dividers and compasses – are sharp and could cause injury or bleeding if incorrectly used. Injuries and bleeding might lead to others contracting the Human Immunodeficiency Virus (HIV), which is the virus that causes Acquired Immunodeficiency Syndrome (AIDS). HIV attacks the immune system, making humans more vulnerable to diseases and infections.

Activity 2.3 Freehand lettering and numbering

1. Use an A4 sheet and print the given alphabet letters in capitals and print the given numbers.
   Use very feint **7 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
2. Use an A4 sheet and print the given alphabet letters 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



Activity 2.4 **Geometric construction**

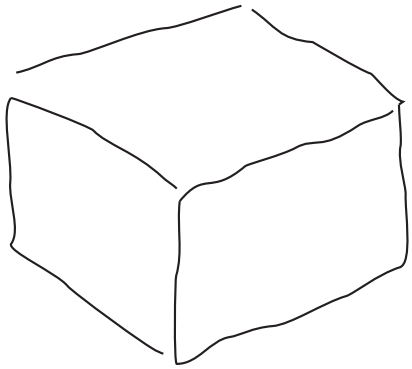
1. Use an A4 paper to draw and label ALL the types of lines used in graphic communication.

Model answer

	Line type	Description	General application
A		continuous line – dark	Used for visible outlines and edges.
B		continuous line – light	Used for dimension lines, extension lines, hatching lines, and leader lines.
C		continuous line – very light	Used for construction lines, projection lines, and guidelines for printing.
D		dashed line – light	Used to show hidden details.
E		chain line – light	Used for centre lines, pitch lines and circles, and lines indicating symmetry.
F		chain line with dark ends	Used for cutting planes.
G		short break line	Used for irregular boundaries.
H		long break line	Used for limits of views and sections if the line is not an axis.

2. Use a freehand drawing to make an isometric drawing of a cube. Include dimensions of 50 mm × 50 mm × 50 mm.

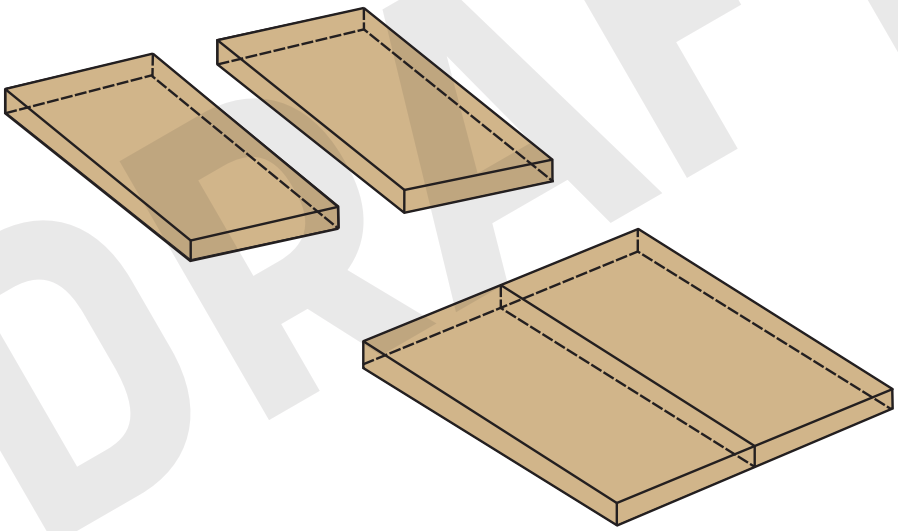
Model answer



3. a) Using a drawing board, set up an A4 drawing sheet. Add a general name and title for your drawing.

   b) Use a freehand drawing to redraw one of the following:

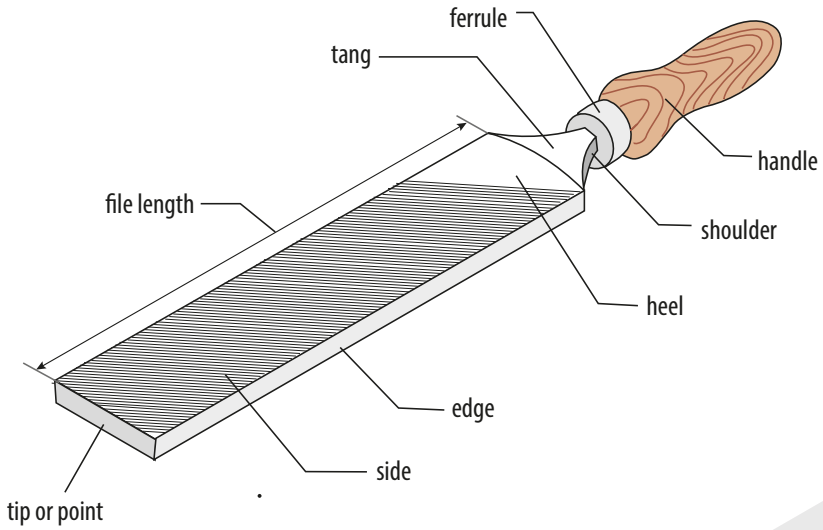
   (i) a woodworking joint (butt joint).



Model answer

Learner's own work.

(ii) a tool with labels written using freehand lettering.



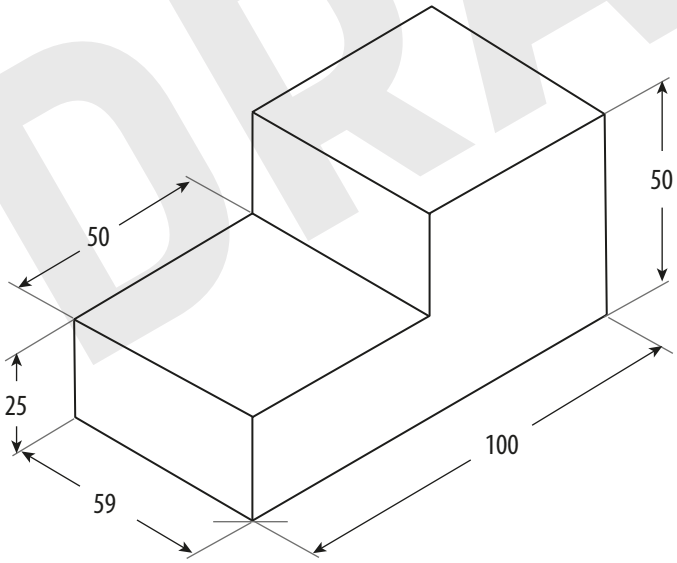
Model answer

Learner's own work.

(iii) a geometric construction with freehand dimensions.

Model answer

Learner's own work.



CHAPTER 3

Entrepreneurship

Learner's Book page 35

Activity 3.1 Entrepreneurship

1. Define the term' entrepreneur'.

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. In your own words, explain why entrepreneurs are important.

Model answer

- **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).

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

Model answer

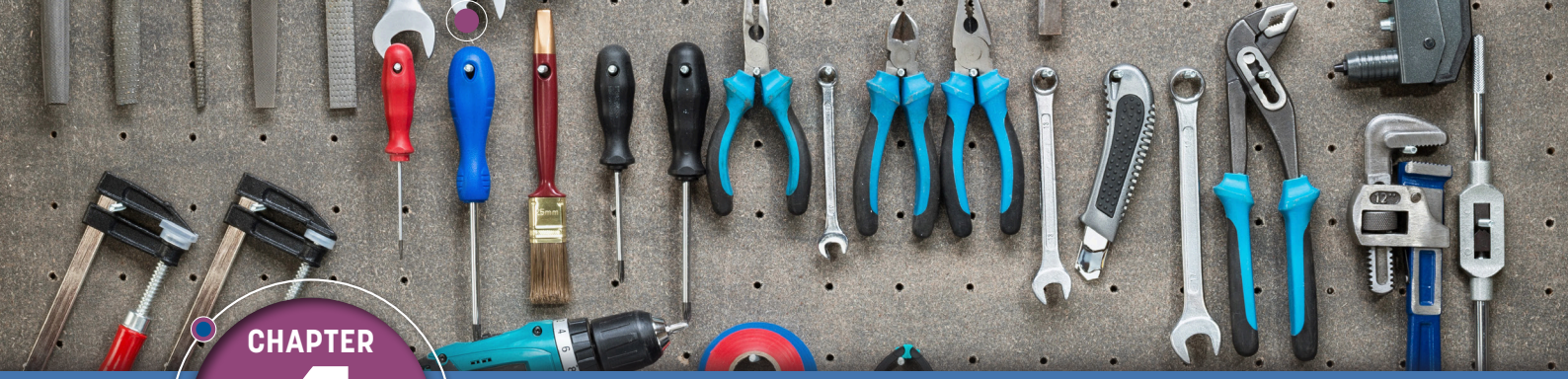
There are four major types of entrepreneurship. Any THREE (3) of the following:

- **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 must 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. Why would they need entrepreneurship? 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.

4. Search the internet and find ONE (1) example of a social entrepreneur. Explain what products they sell, who you think their target market is, and list the reasons you think they can be classified as a social entrepreneur.

Model answer

Learner's own work.



CHAPTER 4

Tool and equipment

Learner's Book page 56

Activity 4.1 General safety rules for tools and equipment

1. Most accidents and injuries in the workplace are caused by unsafe handling of tools and equipment.
   a) Which precautions would you take against injuring yourself when using sharp tools?
   b) How would you carry sharp tools in the workshop?
   c) What would you do if a machine is faulty?

Model answer

a) Follow these rules when you are working with sharp tools:
- Always wear eye protection.
- Wear the right safety equipment for the job.
- Use tools that are the right size and type for your job.
- Follow the correct procedure for using every tool.
- Keep your cutting tools sharp and in good condition.
- Do not work with wet, oily or greasy hands.
- Handle sharp-edged and pointed tools with care.
- Always carry pointed tools by your side with the points and heavy ends pointing down.
- Keep your punches and chisels in good condition – mushroomed heads can chip and cause injuries.
- Store tools and materials vertically, with the points and heavy end down.
- Cut away from yourself when you use chisels and other edged tools.

b) Always carry pointed tools by your side with the points and heavy ends pointing down.

c) If anything breaks or malfunctions, report it to your teacher at once.

2. Why is it necessary to clean tools after using them?

Model answer

We need to clean tools after using them to prevent the build-up of materials that could cause damage or rust. Always return it to its proper storage place so that it is easily accessible the next time you need to use it.

3. List FIVE (5) general safety precautions regarding hand tools.

Model answer

Any FIVE (5) of the following:

- Always wear eye protection.
- Wear the right safety equipment for the job.
- Use tools that are the right size and type for your job.
- Follow the correct procedure for using every tool.
- Keep your cutting tools sharp and in good condition.
- Do not work with wet, oily or greasy hands.
- Handle sharp-edged and pointed tools with care.
- Always carry pointed tools by your side with the points and heavy ends pointing down.
- Secure all small and/or short work with a vice or clamp.
- Never carry tools in your pockets.
- Do not use tools that are damaged, faulty or cracked.
- Keep your punches and chisels in good condition – mushroomed heads can chip and cause injuries.
- Do not use a file without a handle.
- Do not pry or hammer with a file – it could shatter.
- Do not use screwdrivers as chisels or pry bars.
- Do not try to increase your leverage by using a "cheater" with a wrench. Wrenches are designed at the right strength for their size and length.
- After using a tool, clean it and return it to its proper storage place.
- If anything breaks or malfunctions, report it to your teacher at once.
- Never place tools and materials hanging from the edge of a bench.
- Do not use tools for things they were not meant for.
- Store tools and materials vertically, with the points and heavy end down.
- Cut away from yourself when you use chisels and other edged tools.
- Do not force screws; make sure that the correct screw for the job is being used.

4. In your own words, explain why electric power tools should not be used in wet conditions.

Model answer

Electrical power tools should not be used in wet conditions because water is an excellent conductor of electricity, and when water comes into contact with an electrical power tool, it can create a pathway for electricity to flow through the water and into the user's body. This can result in electrical shock or electrocution, which can cause serious injury or even death.

Water can also cause metal parts of the tool to rust or corrode, and it can cause damage to the electrical components of the tool, leading to malfunction or failure.

5. List FIVE (5) general safety precautions regarding electrical power tools.

Model answer

Any FIVE (5) of the following rules:

- Make sure the lighting is good – if the area is artificially lit, ensure that the lights do not cause a stroboscopic effect.
- Power tools should only be handled by one person at a time.
- Ensure that there is sufficient space around the machinery.
- Never touch or attempt to adjust moving parts.
- Report any damaged or malfunctioning machinery.
- Follow the operating instructions and warning labels on the tool itself.
- Keep floors dry and clean to avoid slipping while working with or around dangerous tools.
- Keep cords from presenting a tripping hazard.
- Never carry a power tool by its cord.
- All electrical power tools should have a double-action safety switch.
- Use tools that are double-insulated and plugged into a grounded receptacle.
- All the hazardous, moving parts should be covered with guards.
- Do not use electric tools in wet conditions unless they are approved for that use.
- Use appropriate PPE.

TERM 2

CHAPTER 5

Metalwork

Learner's Book page 65

Activity 5.1 Identifying metals and working safely

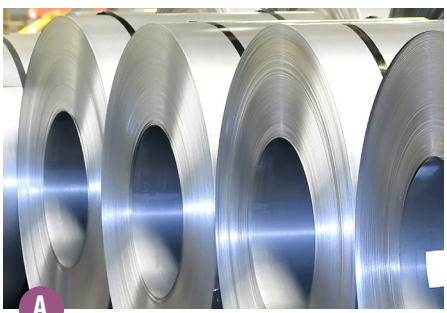
1. Name FIVE (5) safety regulations that must be adhered to when working in a metalwork workshop.

Model answer

Any FIVE (5) of the following:

- Don't run in the workshop.
- Always wear an apron.
- Wear strong appropriate shoes.
- Don't rush to complete your projects, but work smartly and safely.
- Tie up long hair or cover your hair using a hair net.
- Roll up your sleeves.
- Never work alone in the workshop.
- Wear the necessary safety goggles.
- Turn the machine off at the wall before cleaning it.
- Always listen to the teacher.
- Know where the emergency stop button is located.
- Listen carefully and concentrate when a teacher is demonstrating something.
- A machine must be operated by one learner at a time.
- Enter the workshop only with a teacher's permission.
- Report any damage or failures on the machines.

2. Identify the following materials used in metalwork.


A


B


C

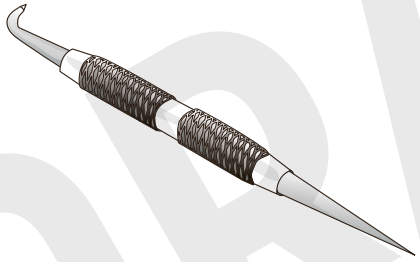
Model answer

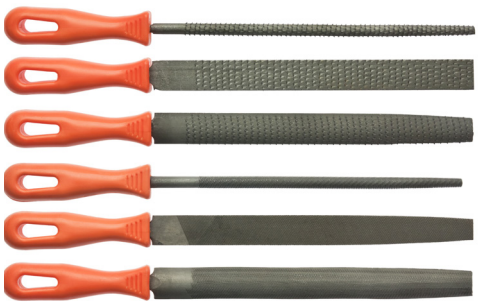
A sheet metal

B mild steel

C copper

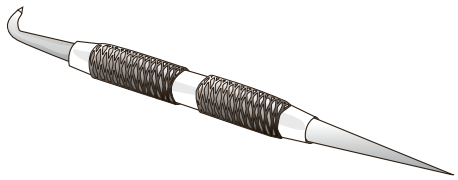
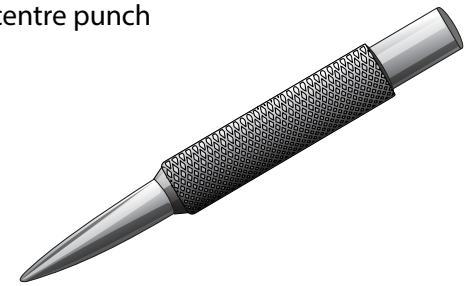
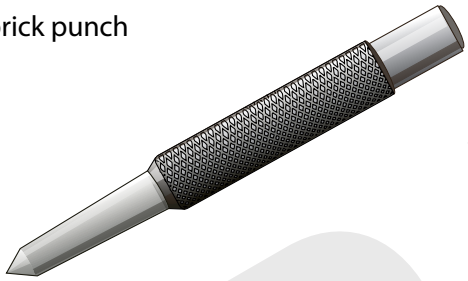
3. Identify the following tools/equipment and describe the appropriate use of each tool.

	Name	Use
a)		
b)		
c)		
d)		
e)		

	Name	Use
f)		
g)		
h)		

Model answer

Name and example	Use
steel rule 	• A steel rule is a simple measuring instrument that is used for measuring distances and ruling straight lines.
measuring tape 	• A measuring tape is used to measure the length of materials that are longer than a metre. • They are also used when a project is set out.

Name and example	Use
scriber 	• A scriber is a hand tool used to mark lines on workpieces before machining or cutting.
centre punch 	• A centre punch is used to enlarge a 'pop' mark – a mark made by a prick punch – on a surface. This is then used to guide a drill when a hole needs to be drilled.
prick punch 	• A prick punch is used to mark or 'pop' scribed lines and holes on a workpiece so that they are more prominent. • It is also used to indicate the centre of a circle.
engineering chalk 	• Engineering chalk is used for marking metal and steel with a clear wax-like mark.
square 	• A square is generally used to check the straightness of objects, test squareness, and to set out a project

Name and example	Use
files 	• A file is a tool used to remove fine amounts of material from a workpiece.
hack saw 	• Hacksaws were originally and principally made for cutting metal, but can also cut various other materials, such as plastic and wood. • Plumbers and electricians often cut plastic pipe and plastic conduits using a hacksaw.
tin snip 	• Tinsnips are designed to cut and trim sheet metal and other thin yet tough materials. • They can also be used for cutting lighter metals such as copper and aluminium.
electric drill 	• Electric drills are used for drilling holes through materials of different thicknesses. • They can also sometimes be used as a screwdriver. • With the right attachments, electric drills can polish or grind, and drill with a hammer action. • They can also be used with stirring attachments to mix paint and other liquid materials such as glazing materials for ceramics.

Name and example	Use
angle grinder 	• Angle grinders are used for cutting, grinding and polishing metals.

Activity 5.2 Methods of soldering and welding

1. Distinguish between two soldering methods.

Model answer

Soft soldering is a process used for filling very small gaps in metals or to permanently join metals that will undergo only light stress at low temperatures. It can be used to join any types of metals that have been damaged during the soldering process at higher temperatures.

Hard soldering joins two elements of metal and provides a stronger bond when compared to soft soldering. A higher temperature (of more than 450 °C) is needed to melt the metal used in hard soldering, therefore, a blowtorch is normally used. The two metals spread out into the holes of the component and become bonded to the component.

2. State whether the following statements are True or False. If False, rewrite the statement to make it True.
   a) A tin-lead alloy is used as the space filler metal.
   b) Welding is a joining method in which heat – with or without pressure – is applied to a component, and a filler material is added.
   c) The liquefying temperature of the space filler alloy must not be more than 450 °C.
   d) Welding cannot be used in both small-scale and large-scale industries.
   e) A gas torch is not used as a heat source, for the soft soldering procedure.

Model answer

a) True

b) True

c) False, the liquefying temperature of the space filler alloy must not be more than 400 °C.

d) False, welding is used in both small-scale and large-scale industries

e) False, a gas torch is used as a heat source for the soft soldering procedure.

3. Name some examples of metals used in soft soldering.

Model answer

Some examples of metals used in soft soldering include:

- tin-zinc for bonding aluminium
- tin-lead for general usage
- zinc-aluminium for aluminium
- cadmium-silver for power at high temperatures
- lead-silver for strength higher than room temperature, weakening confrontation
- tin-silver & tin-bismuth for electrical products.

4. Hard soldering can be split into two types. Name them and describe each type.

Model answer

Silver soldering	Braze soldering
• Silver soldering is an unsoiled method that supports: » the fabrication of small components » abnormal maintenance » built-up tools. • It makes use of an alloy that contains silver as a space-filler metal. • Silver soldering is, however, not suggested for space-filling – a different weld flux is recommended for accurate silver soldering.	• Braze soldering is a procedure for connecting two terminals of the base metals by forming a liquid metallic space filler. • This metallic space filler runs by the attraction of a vessel through the joints and cools down to give a solid union through diffusion and atomic magnetism. • It produces a very strong joint. It makes use of brass metal as a space-filler agent.

5. Explain how the modern methods of welding can be classified.

Model answer

Modern welding methods can be classified in different ways:

- Based on the welding process: Welding processes can be broadly classified into fusion welding and solid-state welding. Fusion welding involves melting the base metal and the filler material to form a molten pool, which solidifies to form the welded joint. Examples of fusion welding methods include arc welding, gas welding, and laser welding. Solid-state welding methods, on the other hand, do not involve melting the base metal but rely on heat and pressure to join the metals together. Examples of solid-state welding methods include friction welding, ultrasonic welding, and explosive welding.
- Based on the type of energy source: Common energy sources include electricity (e.g. arc welding), gas (e.g. oxy-fuel welding), and light (e.g. laser welding)
- Based on the type of filler materials: For example, some methods use a separate filler metal (e.g. gas metal arc welding), while others use the base metal as the filler (e.g. friction stir welding).
- Based on the type of joint: For example, some methods are better suited for butt joints (e.g. gas tungsten arc welding), while others are better suited for lap joints (e.g. spot welding).
- Based on the level of automation: Some methods, such as manual arc welding, require significant manual intervention, while others, such as robotic welding, can be fully automated.

Activity 5.3 Semi-permanent joining methods

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

Model answer

A permanent joint is typically intended to be a one-time operation that cannot be easily reversed, while a semi-permanent joint is designed to be reversible, but still provides a strong and durable connection during use.

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

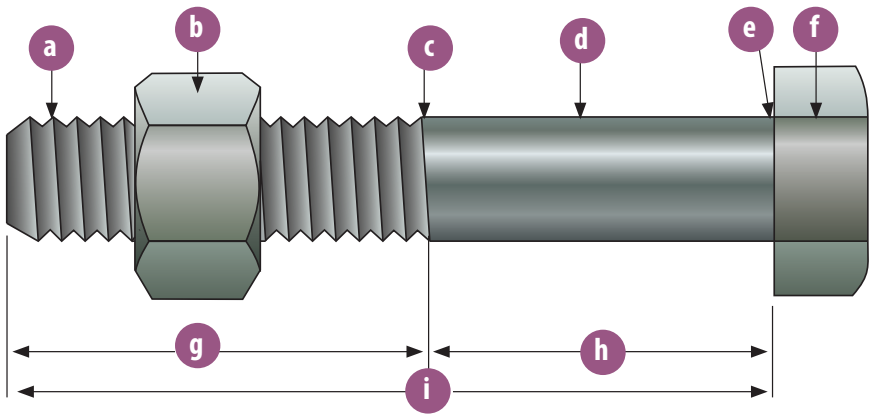
Model answer


crown nut

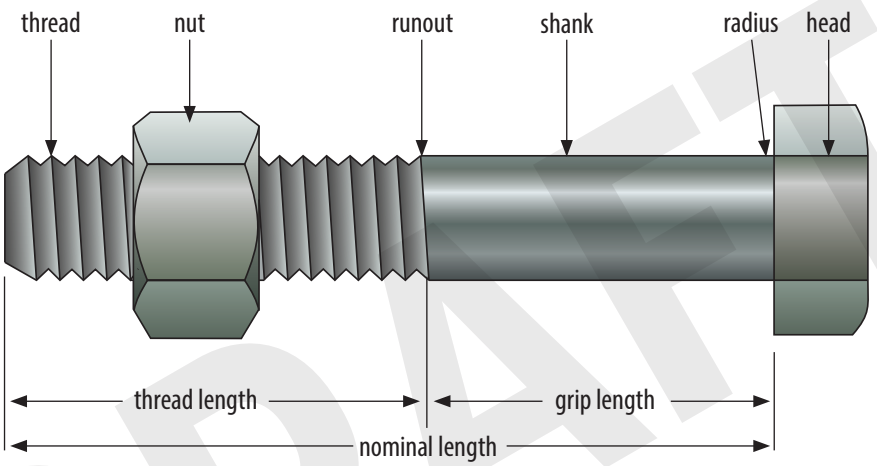

wing nut


wing nut

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

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, however, 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

- they spread the load applied to the surface
- they prevent loosening that can be caused by vibrations or movement

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.

CHAPTER 6

Mechanical maintenance

Learner's Book page 80

Activity 6.1 **Maintenance**

1. List FOUR (4) safety precautions that must be adhered to when working on a vehicle.

Model answer

- Never smoke in or near repair bays or garages – vehicles contain flammable and combustible fluids and gases that can easily be set alight if hot ash from a cigarette were to come into contact with it.
- Keep work areas clean and organised – pick up tools that are laying around and use tool cabinets to store them. Always keep walkways clear and free from clutter.
- Never wear loose clothing or clothing that is ripped or torn – wear customised overalls and work apparel that you can buy from an accredited uniform service company.
- Wear appropriate protective gear at all times – goggles, gloves, and ear protection should be worn when making certain types of repairs.
- Make sure that fire extinguishers are accessible and that the appropriate type of fire extinguishers are available for different types of fires such as petrol, oil, electrical, and so on.
- When you are working with an electrical system or around electrical wiring, it is important that you disconnect the source. For a vehicle, that means disconnecting the battery because even if it is switched off, there is still the potential for current to pass through electrical wiring.
- Never place your hands, tools, or other objects near the engine while it is running. The moving parts and components could cause injury to a person or the vehicle itself.
- Never work underneath a vehicle unless it has been properly supported with a jack and/or trestles. When you raise a vehicle off the ground to access its underside, you need to make sure that it is stable, and that there is no risk of the vehicle falling.
- Always remove the keys from the ignition. The key can draw an electrical charge from the battery.
- Avoid unplugging fuses and wiring harnesses while the key is in the "on" position as there is a risk of electrical shock and electrical surges that may damage electronic parts and wiring.
- Be aware of the vehicle's temperature before beginning any work.

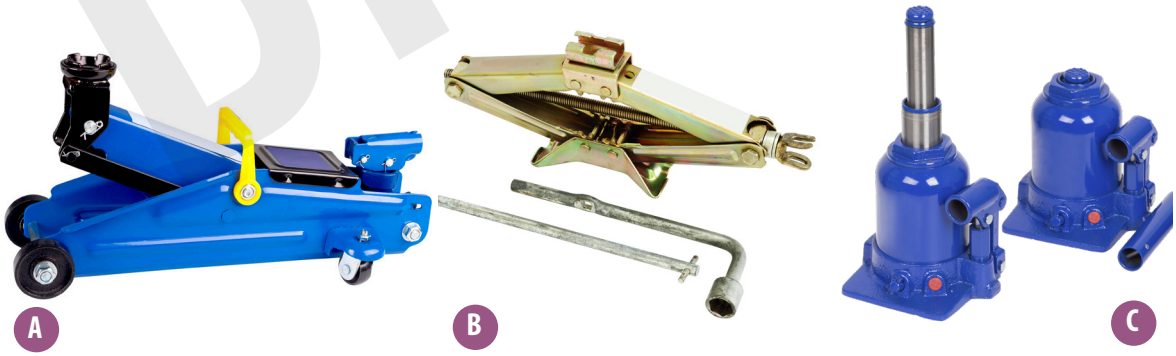
- The engine, manifold, exhaust system, and radiator could be hot and cause skin burns, and the radiator coolant is still pressurised

2. Name the THREE (3) types of tyre wear and explain the cause of each one.

Model answer

Overinflated tyre	Underinflated	Precise inflation
If tyre pressure is too high, then more of the tyre centre and less of the sides touch the ground. As a result, the car will bounce around on the road. When tyres are bouncing instead of being firmly fixed on the road, grip is also affected by stopping distances. There will be a decrease in ride comfort.	Underinflated tyres can cause a vehicle's rolling resistance to increase and increase the rate of fuel consumption. It will also result in the tyres wearing on the outer edges of the surface and reduce a driver's control of the vehicle, increase braking distances, and increase the risk of skidding.	Precise inflation will provide more responsive handling of tyres to the ground, greater fuel efficiency and tread wear will be even. The manufacturer's manual indicates the optimum tyre pressure to achieve the best handling of a vehicle.
		
Figure 6.4 An overinflated tyre	**Figure 6.5** An underinflated tyre	**Figure 6.6** A tyre with precise inflation

3. a) Identify the following vehicle lifting mechanisms.



b) Explain how ONE (1) of them works.

Model answer

a) A – trolley jack

B – scissor jack

C – bottle hydraulic jack

b) Any ONE (1) of the following:

How a trolley jack works

- Step 1 – Park the vehicle
- Place the vehicle and jack on a level surface, wedge the wheels of the vehicle, and make sure that the handbrake is engaged.
- Step 2 – Close the release valve on the jack
- Attach the end of the handle to the release valve on the jack and close it tightly by turning it clockwise.
- Step 3 – Place the trolley jack under the vehicle
- Place the trolley jack under the vehicle so that the saddle will be ready to come into contact with it. Make sure the vehicle is centered to avoid slipping
- Step 4 – Pump the handle
- Pump the handle up and down until the saddle of the trolley jack comes into contact with the vehicle. Make sure you check to see if the saddle is still correctly positioned
- Step 5 – Adjust the height of the jack
- Raise the jack to the desired height.
- Step 6 – Place trestles underneath the vehicle
- Place axle stand trestles of the correct capacity under the vehicle.
- Step 7 – Lower the vehicle
- Once you have completed maintenance or repairs on the vehicle, raise the jack so you can remove the trestles. Open the release valve slowly by turning it anti-clockwise. The slower you turn the release valve, the slower the jack will lower.

How a scissor jack works

- If a vehicle has a flat tyre, move or drive the vehicle to a safe area with a flat, level surface. Make sure that the parking brake is engaged.
- Prepare the scissor jack, spare tyre, and crank handle.
- Place a wedge (such as a brick or stone) in front of one of the tyres to make sure that the vehicle does not move.
- Loosen the bolts slightly using a wheel spanner.
- Find your vehicle's jack point.
- Set the scissor jack underneath the vehicle. The large flat part should be at the bottom and should face you lengthwise.
- Rotate the screw to lift the vehicle.

How a bottle hydraulic jack works

- The jack consists of a cylindrical bottle-shaped chamber that contains hydraulic fluid, a piston that fits snugly into the chamber, and a pump mechanism that pressurizes the hydraulic fluid. To use the jack, the user first places the jack on a solid and level surface, such as the ground or a sturdy platform. They then position the load to be lifted on top of the jack's saddle, which is the flat metal platform that comes into contact with the load.
- Next, the user pumps the handle of the jack, which activates the pump mechanism and pressurizes the hydraulic fluid in the chamber. This pressure causes the piston to move upward, lifting the load on the saddle. The user continues pumping until the load has been lifted to the desired height
- To lower the load, the user turns a release valve on the jack, which allows the hydraulic fluid to flow back into the chamber and the piston to move downward, lowering the load back to the ground

Activity 6.2 Basic maintenance of mechanical devices

1. Describe the safety precautions that one must follow when working on a battery.

Model answer

Safety with the battery

- Battery acid is a poisonous and corrosive liquid which has the potential to cause burns and irritation to the skin and eyes.
- Always handle the battery with care and keep it upright
- Use eye protection and protective clothing where there is any acid splashing or spillage risk.

2. Name the TWO (2) battery terminals?

Model answer

Negative and positive

3. State THREE (3) filters that are found in a car and explain what they are used for.

Model answer

- air filter
- oil filter
- fuel/petrol filter

4. In your own words, explain the purpose of the following fluids used in a vehicle:
   - engine coolant
   - brake fluid

Model answer

- Engine coolant – is a water-based liquid that absorbs the heat from the engine. As a result, the engine coolant becomes hot and is transferred to a radiator at the front of the car.
- Brake fluid – also known as hydraulic fluid, is responsible for moving the various components of your vehicle's braking system.

5. Identify the following car dashboard light symbols and explain what they mean.

Model answer

A – temperature warning

B – oil pressure low

C – handbrake warning

D – battery/ alternator warning

E – low fuel

CHAPTER 7

Electricity

Learner's Book page 103

Activity 7.1 Introduction to electricity

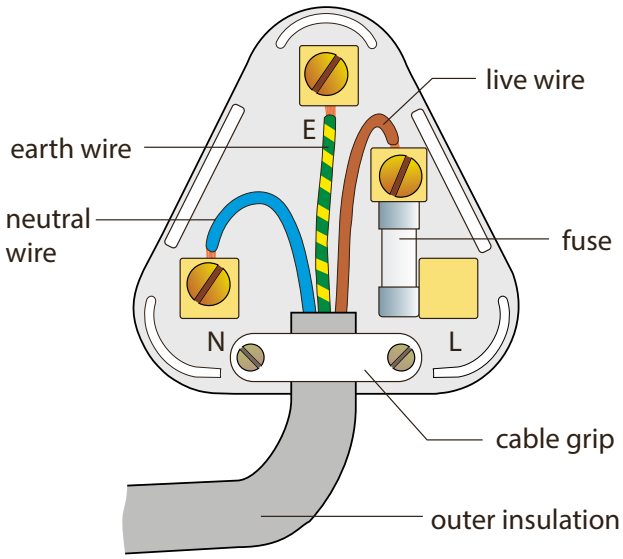
1. Name the colour that is used for the following prongs (terminals):
   a) Neutral
   b) Live
   c) Earth

Model answer

- a) Neutral Terminal – **Blue** or **Black**
- b) Live Terminal – **Brown** or **Red**
- c) Earth terminal – **Green** and **Yellow**

2. Use a neat freehand drawing to illustrate an electrical plug. Indicate the following on your drawing:
   a) Neutral terminal
   b) Live terminal
   c) Earth terminal
   d) cable grip
   e) cable insulation

Model answer



3. Name FIVE (5) safety procedures/rules you should obey when working in an electrical workshop.

Model answer

Any FIVE (5) of the following:

- Keep the workplace floor free (clean) from oil, water, and grease.
- Make sure that all cables or conductors you use fulfills its size (rating) and has suitable insulation.
- Make sure that every electrical installation has effective earthing.
- Always check for rust in cables and electrical fittings.
- Do not dismantle an electrical component or device without your teacher's knowledge.
- Ask your teacher to assist you when you are using electrical equipment for any assigned work.
- Switch an electrically powered tool off after each use.
- In case of an emergency or accident, inform your teacher immediately.
- Switch off all electrical supplies after finishing a job and before leaving the workshop.

Activity 7.2 **Light bulbs**

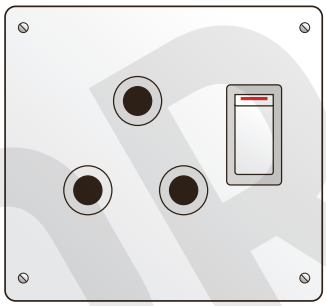
1. In your own words, explain the different between hand tools and electrically powered tools.

Model answer

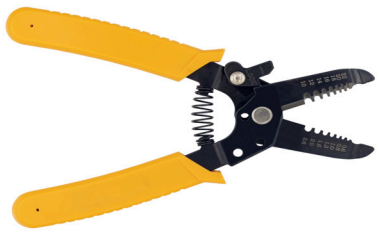
Hand tools are tools used for performing tasks on materials using only the tool and your hand. Electrical hand tools, however, are tools with an electrically powered motor. These tools are made for specific purposes and should always be handled with care.

2. Identify the following electrical tools and components and mention the purpose/use of each tool. Then, redraw the table in your workbook.

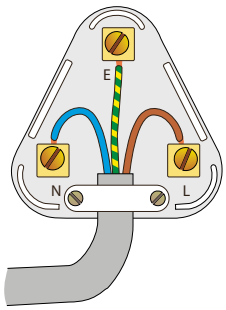
a)		• Used to control switch for opening and closing the circuit. ON/ OFF switch.
b)		• Used for cutting thin wires. • Also used to grip small objects in places difficult to reach.
c)		• Used to strip the electrical insulation from electric wires of different diameter sizes.
d)		• Used to grip, splice, cut wires, and strip insulation wires.
e)		• Used to measure current, volts, and amps in a circuit.

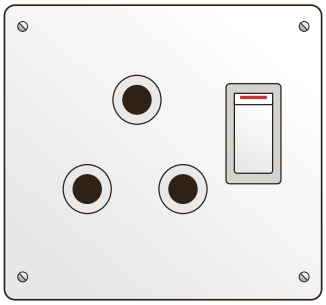
f)		• Used for stripping insulated wires. • Also used for cutting wires.
g)		• Used to loosen and tighten screws with slotted heads. • The handle and shaft are insulated to protect the user from any possible electrical shock.
h)		• Mainly used for connecting plugs to supply electricity to appliances.
i)		• Used for cutting solid and stranded copper conductors. • Also used for twisting wires. • The gas grip is used for gripping objects such as cables in the jointing process.

Model answer

Name	Illustration	Purpose/use
wire stripper		• Used to strip the electrical insulation from electric wires of different diameter sizes.

Name	Illustration	Purpose/use
combination pliers		• Used for cutting solid and stranded copper conductors. • Also used for twisting wires. • The gas grip is used for gripping objects such as cables in the jointing process.
side cutter		• Used to grip, splice, cut wires, and strip insulation wires.
electrician screwdrivers		• Used to loosen and tighten screws with slotted heads. • The handle and shaft are insulated to protect the user from any possible electrical shock.
long nose plier		• Used for cutting thin wires. • Also used to grip small objects in places difficult to reach.
measuring tape		• Used to measure lengths.
utility knife		• Used for stripping insulated wires. • Also used for cutting wires.

Name	Illustration	Purpose/use
3-pin plug		• Used to supply electricity to electrical appliances safely.
multimeter		• Used to measure current, volts, and amps in a circuit.
angle grinder		• Used for grinding and cutting.
portable drilling machine		• Used for drilling holes. • Can also be used as a screwdriver.
single pole switch		• Used to control switch for opening and closing the circuit. ON/ OFF switch.

Name	Illustration	Purpose/use
socket plug		• Mainly used for connecting plugs to supply electricity to appliances.

Activity 7.3 **Light bulbs**

1. Explain the differences between incandescent, energy-saving and LED light bulbs.

Model answer

- Incandescent: An incandescent light bulb works by heating a wire filament heated to a high temperature by passing an electric current through it, until the filament glows with visible light.
- Energy-saving light bulbs: This light uses 13-15W of electricity by ionizing mercury vapour in a glass tube. This causes electrons in the gas to emit photons at UV frequencies. UV light is converted into standard visible light using phosphor coating on the inside of the lamp.
- LED lights: produce light when voltage is applied to negatively charged semiconductors, causing electrons to combine and create a unit of light.

2. Identify the following electrical components


a


b

Model answer

- A – diode
- B – light-emitting diode

3. In your own words, explain how to safely replace a light bulb.

Model answer

Steps to follow:

- Identify the bulb type that needs to be changed – check whether it is a screw-in or bayonet light bulb and whether you have a new one in stock.
- Switch off the mains switch on the distribution board.
- Switch off the light at the light switch or wall socket.
- Remove the faulty bulb.
- If the bulb is a bayonet type, place the new one carefully into the light socket. Twist it gently until the bayonet pins slot into place.
- If the bulb is a screw-in type, place the new one carefully into the light socket and turn it clockwise until it sits firmly.
- Switch on the mains switch on the distribution board and then switch on the light.
- Discard the old light bulb safely.

4. List the advantages and disadvantages of TWO (2) types of light bulbs.

Model answer

Any TWO (2) of the following:

Figure 7.3 (a) Screw-in incandescant light bulb **(b)** Bayonet incandescent light bulb

Advantage	Disadvantage
• The bulb has a smooth spectral output that is based on its body temperature.	• Light produces a large amount of heat as a by-product. • Approximately 90% of the energy that is used in a bulb is released in a form of heat, while only 10% is converted to visible light. • The bulb has a shorter life span when compared to other light bulbs.

Figure 7.4 (a) Screw-in energy-saving light bulb **(b)** Bayonet energy-saving light bulb

There are both advantages and disadvantages to this type of light bulb:

Advantage	Disadvantage
• Good for areas where lights will be left on for long periods. • Uses 75% less energy and lasts 6 – 15 times longer than traditional incandescent light bulbs.	• Energy-saving light bulbs can develop a chemical leak and contaminate the environment. • A broken light bulb can release a small amount of mercury into the environment. • These light bulbs are more expensive than incandescent lights. • They cannot be connected to dimming mechanisms.

Figure 7.6 (a) Different examples of light-emitting diodes (LED)
(b) The symbol to indicate a light-emitting diode (LED) in an electrical circuit

There are both advantages and disadvantages to this type of light bulb:

Advantage	Disadvantage
• Emits less heat than incandescent light bulbs. • Is more resistant to breakage than other bulbs. • Uses at least 75% less energy and last 15 – 25 times longer than traditional incandescent light bulbs. • It turns on instantly – no warm-up period is needed.	• Lighting is more expensive than traditional light sources. • Temperature sensitivity – at high temperatures there are changes in the light output.

5. Complete the following by filling in the missing words:
   a) Ionising means to convert an _____, molecule or substance into _____.
   b) Electrons are particles that have a _____ energy charge.
   c) Photons are particles that carry _____ .
   d) UV frequencies emit _____ radiation.
   e) Phosphor is a substance that gives off _____ when it is exposed to _____ energy.

Model answer

a) Ionising means to convert an atom, molecule or substance into ions.
b) Electrons are particles that have a negative energy charge.
c) Photons are particles that carry energy.
d) UV frequencies emit electromagnetic radiation.
e) Phosphor is a substance that gives off light when it is exposed to radiant energy.

Activity 7.4 Basic electric circuits

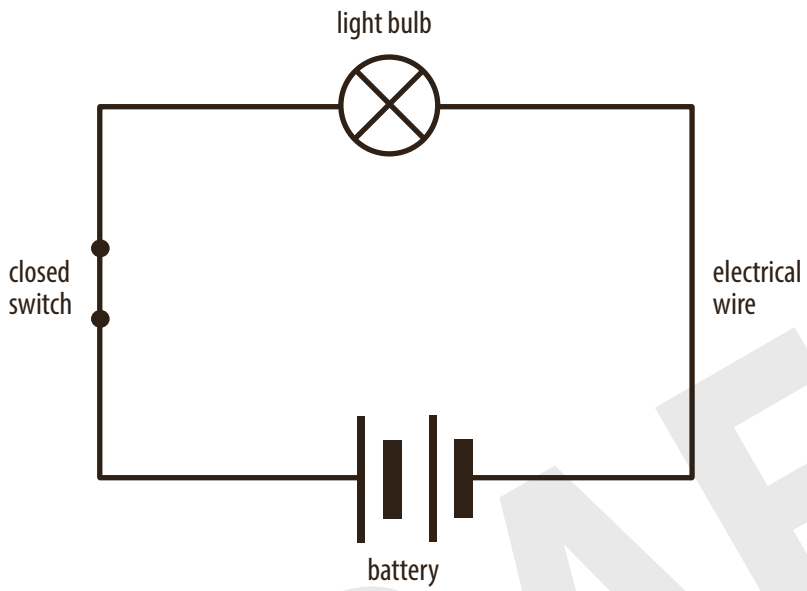
1. Name TWO (2) types of electric circuits.

Model answer

- open circuit
- closed circuit

2. Draw a simple circuit diagram and show the following:
   - Light bulb
   - Electrical wires
   - Battery
   - Closed switch

Model answer



3. In your own words, explain what load shedding is.

Model answer

Load shedding (loadshedding) is a way to distribute demand for electrical power across multiple power sources. Load shedding is used to relieve stress on a primary energy source when the demand for electricity is greater than the primary power source can supply.

4. List FIVE (5) ways in which we can save electricity.

Model answer

- Manage your geyser. Switch it off if unused or if you leave on holiday.
- Install a timer on your geyser.
- Cover your hot water heater with an insulation blanket.
- Reduce the temperature of your geyser thermostat to 55°C or less.
- Invest in a solar geyser and save up to 40% on your electricity bill.
- Save up to 16% on your bill by insulating your home properly.
- Consider installing energy-efficient windows.
- Save up to 10% on your bill by setting your pool pump to run for a shorter period each day: 6 hours in summer and 4 in winter are enough.

- Replace your old bulbs with an LED equivalent. They use 90% less electricity and last up to 20 years.
- Invest in Energy STAR appliances and electronics.
- Save 6% on your bill by switching off your appliances at the wall.
- Run full loads in the washing machine and dishwasher
- Don't set your fridge temperature colder than necessary: set your refrigerator between 2°C and 5°C and your freezer between –20°C and - 22°C
- Install an energy saving-showerhead: they are designed to use up to 40% less hot water.
- Track your consumption with Powertime Dashboard and Powertime's energy monitors available on the Powertime Store.

5. Say whether the following statements are true or false. If they are false, correct the statement.
   a) A circuit diagram uses standard symbols to represent components in an electrical circuit.
   b) A source provides power/energy to the circuit, but an electric current will still flow if the circuit does not have a power source.
   c) If the cord is damaged at the end close to the plug, you can splice the cords together.
   d) A switch controls the flow of current in the circuit and is used to close or open the circuit.
   e) Load shedding (loadshedding) cannot distribute the demand for electrical power across multiple power sources.

Model answer

a) True

b) False, a source provides power/energy to the circuit. An electric current will not flow if the circuit does not have a power source.

c) False, if the cord is damaged at the end close to the plug, cut the cord and replace the plug.

d) True

e) False, load shedding (loadshedding) is a way to distribute demand for electrical power across multiple power sources.

TERM 3

CHAPTER 8

Plumbing

Learner's Book page 120

Activity 8.1

1. Having proper tools when joining and repairing pipes is very important to enable you to do the job effectively.
   a) List any FIVE (5) plumbing tools.
   b) Name the purpose of each tool you have listed above.

Model answer

a) Any FIVE (5) of the following:
- water pump plier
- spanner
- shifting spanner
- hacksaw
- screwdriver
- pipe cutter

b) Any FIVE (5) of the following:
- water pump plier: used to grip and turn tight fixtures open or closed
- spanner: can be used to help repair leaks in pipes and taps
- shifting spanner: used to tighten or loosen bolts and nuts
- hacksaw: used to cut through metal and plastic pipes
- screwdriver: used for sinking screws of different head types
- pipe cutter: used to cut pipes to produce a clean cut and is a faster, cleaner, and more convenient way of cutting pipe than using a hacksaw

2. Identify the type of material used to manufacture the pipes in (a) – (c) and explain where these pipes can be used.

a) 

b) 

c) 

Model answer

a) polyvinyl chloride (PVC)

b) polycop pipe

c) copper

3. Name any THREE (3) pipe fittings and their uses.

Model answer

Any THREE (3) of the following:

- straight coupler – to connect straight pipes.
- reducer – allows a change in connection size, from bigger to smaller or vice versa.
- 90° elbow fitting – to connect pipes at 90° angles.
- 45° elbow fitting – to connect pipes at 45° angles.
- T-pipe – to make a t-shaped connection.
- reducing tee – to make a T-shaped connection where one opening is larger or smaller than the others.

Activity 8.2

1. Ladders are made of different types of materials. List THREE (3) materials that ladders can be made of.

Model answer

- wood
- aluminium
- fibreglass

2. Name FIVE (5) safety precautions that must be adhered to when using a ladder to clean gutters.

Model answer

- Ensure that the ground on which you place the ladder is level.
- Brace the ladder by tying it off near the base or by anchoring the ladder into the ground. It can also be held by someone while you ascend or descend the ladder. This will stop you from tipping over sideways or sliding off the ladder.
- Never place the ladder against the gutter, the weight from the ladder can damage, crush, or even tear off the gutter. Put it up against the wall or support it on the rooftop using a ladder bracket support.
- Always extend the ladder above the roof line for easy and safe gutter cleaning.

- Always work within your range rather than trying to stretch over to reach a different section of the gutter – this may lead to falling over or injury – rather reposition the ladder.

3. Name TWO (2) methods that can be used to unblock the sewerage system, and explain each of them.

Model answer

- plunger
- drain rods

CHAPTER 9

Painting and waterproofing

Learner's Book page 134

Activity 9.1

1. Describe FOUR (4) safety rules that apply to painting.

Model answer

- Make sure that the area you are painting is well-ventilated by opening as many windows and doors as possible.
- Refrain from allowing people to occupy a freshly painted room.
- If necessary, wear a respirator.
- Wear all necessary personal protective clothing.
- Do not paint or store paint near a heat source because paint could be highly flammable.
- Make sure the equipment, such as the ladder or scaffolding you are using, is in good working order.

2. Explain why flammable and non-flammable materials should be stored in a separate designated area?

Model answer

Follow these precautionary measures when storing flammable and non-flammable materials:

- Store flammable liquids in well-ventilated storage areas. This will reduce the risk of fire, explosion and bodily harm.
- Employ good housekeeping practices. All materials should always be clearly labelled, and any damaged containers should be replaced immediately.
- If there is a spill in the storage area, clean it up immediately.
- Wear all the necessary personal protective clothing when working with these materials.
- Avoid lighting any fires in the storage area.
- Remove all equipment that could cause a spark and start a fire.
- Never use plastic or glass containers to store the materials.
- Keep all containers closed when not in use.

3. What are the following tools and equipment used for in painting:
   a) scaffolding
   b) paintbrushes/rollers
   c) scraper

Model answer

a) scaffolding: This is a temporary structure that can be used on the outside of a building for reaching high or hard-to-reach places. It is usually made from wooden planks and metal poles. Scaffolding is used by workers when they are painting, building, repairing, or cleaning buildings.

b) paintbrushes/rollers: These are used to apply paint on different types of surfaces and materials.

c) scraper: A scraper is a tool that has a small handle and a metal or plastic blade. It can be used for scraping a particular surface clean.

4. List at least FIVE (5) precautions to take when using painting materials and equipment.

Model answer

Any FIVE (5) of the following:

- Make sure that the area you are painting is well-ventilated by opening as many windows and doors as possible.
- Refrain from allowing people to occupy a freshly painted room.
- If necessary, wear a respirator.
- Wear all necessary personal protective clothing.
- Do not paint or store paint near a heat source because paint could be highly flammable.
- Make sure the equipment, such as the ladder or scaffolding you are using, is in good working order.

Activity 9.2

1. List the differences between interior and exterior paints.

Model answer

Exterior paint has the following characteristics:

- The resins used in the paint can withstand the changes in temperature that may cause the paint to expand or contract.
- Additives prevent fading and the build-up of mould. It also enables the paint to adhere (stick) to rough surfaces.
- These paints are available in semi-gloss or gloss enamel.

Interior paints differ from exteriors paint in the following ways:

- They are easier to clean and resist scuffs marks.
- They are available in matte, eggshell, satin, semi-gloss and gloss.

2. List and explain FOUR (4) waterproofing methods.

Model answer

- Sealer: A sealant material used to form a hard coating on a porous surface. The substance seals joints or cracks. Before applying the sealer, you must clean the surface using a wire brush and allow to dry completely. Once dried, you can apply a layer of sealer substance and cover it using gauze, then apply another layer in between allowing it to vapourise.
- Epoxy: Creates a permanent, water-resistant bond.
- Membrane: A multilayer compound waterproofing, composed of a layer of high-density polyethylene especially designed for underground basement structure waterproofing.
- Sika waterproofing: A pre-bagged structural waterproofing system used to control water ingress on a new build and repair and refurbishment projects.

3. State whether the following statements are True or False. If they are False, correct them.
   a) A primer is also known as an undercoat and is used before painting.
   b) Primers do not enable you to create a foundation for a paint job that has less imperfections, nor will it reduce the number of coats that you'll need to apply to the surface you are working with.
   c) A primer can cover up cracks that you may have repaired.
   d) A primer creates a rough surface for when you apply your coats of paint.

Model answer

a) True

b) False, primers enable you to create a foundation for a paint job that has less imperfections, and it will reduce the number of coats that you'll need to apply to the surface you are working with.

c) True

d) False, a primer creates a smooth surface for when you apply your coats of paint.

CHAPTER 10

Glazing

Learner's Book page 142

Activity 10.1

1. List the THREE (3) types of glasses and their uses.

Model answer

- Clear: Used most typically as transparent glazing material for windowpanes, glass doors, house tabletops, and so on.
- Tinted: Used for wall construction, cabinet doors, and so on. It can also provide privacy and decrease the heat in a room thus keeping the room cool.
- Tempered: Used as passenger vehicle windows, shower doors, architectural glass doors and tables, refrigerator trays, and mobile screen protectors because of its strength and stability.

2. Choose the correct use from column B to match the tools listed in column A. Write down the question number and tool and write only the correct letter from column B.

COLUMN A	COLUMN B
a) Glass-breaking plier	A. Drawing a straight line squared to the edge.
b) T-square	B. Sealant applicator that creates an airtight seal on windowpanes.
c) straight edge	C. Tool for cutting glass, which must be lubricated with paraffin.
d) Putty chisel/knife	D. Drawing a straight line to aid the glasscutter to cut straight.
e) sealant gun	E. The glass is broken by bending the pane in a controlled manner after scoring.
	F. Putty removal on window rebates and spreading/ levelling putty.

Model answer

COLUMN A		COLUMN B
2.1 Glass-breaking plier	E	A. Drawing a straight line squared to the edge.
2.2 T-square	D	B. Sealant applicator. It creates an airtight seal on window panes.
2.3 straight edge	A	C. Tool for cutting glass must be lubricated with paraffin.
2.4 Putty chisel/knife	F	D. Drawing a straight line to aid the glass-cutter to cut straight.
2.5 sealant gun	B	E. The glass is broken by bending the pane in a controlled manner after scoring.
		F. Putty removal on window rebates and spreading/ levelling putty.

CHAPTER 11

Woodwork

Learner's Book page 142

Activity 11.1 Tools and equipment

1. List FOUR (4) safety rules that must be followed when working in a woodwork shop.

Model answer

Any FOUR (4) of the following:

- Follow the rules set out by your teacher. Safety rules are set to keep you and your fellow learners safe. Always listen to your teacher's instructions.
- Wear protective gear. Always wear personal protective equipment that protects your eyes, ears, lungs and hands. Always wear safety goggles to protect your eyes from wood chips or other particles. Wear earplugs to protect your ears and thick gloves to protect your hands from cuts, sparks and sharp edges. Make sure the PPE is your size and fits you correctly.
- Keep your work area clean and neat. Remove all unnecessary tools, cables, and toolboxes from your work area. Keep the tools in an easy-to-access place in case you need anything.
- Be aware of the power cables in your surroundings. Remove any tripping hazards and secure them in position so you won't cut or damage them.
- Avoid distraction when working with tools/equipment. Focus on the task at hand when working with tools and/or equipment. Distractions can be dangerous and could lead to avoidable accidents.
- Stay alert, and be aware of your surroundings. Always know where the first aid station is located, and in the case of an emergency, inform your teacher immediately.
- Do not use drugs and alcohol in the workshop. These impair your judgement and could cause serious harm or accidents.
- Take time to do the job right. Make sure that you use the correct tools/ equipment for the task that you are working on. Work carefully and take your time instead of rushing to get the task done as this could lead to accidents and/or injury.
- Develop a safety attitude. Safety is important in every workspace.

2. List FIVE (5) rules about hand tools.

Model answer

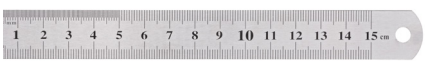
Any FIVE (5) of the following:

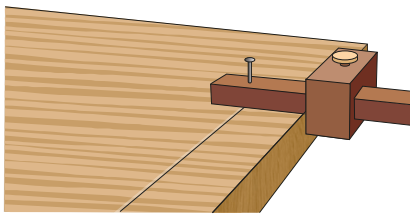
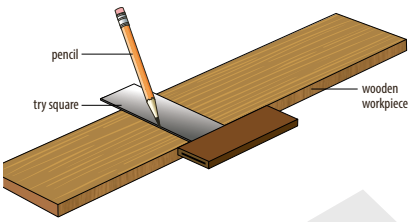
- Always wear protective glasses or goggles when using power tools, when chiseling, sanding, scraping, or hammering overhead.
- Always wear ear protectors when using power tools.
- Loose hair, jewelry and clothing can get caught in equipment. Always tie up your hair and remove any loose clothing and accessories.
- When sanding or sawing materials, use the proper respirator or face mask.
- Always ensure that the blades of tools/equipment are kept sharp. A dull blade requires a lot of force, can slip, and cause accidents.
- If the wooden handles of tools have cracks in them, they should be repaired or discarded immediately. If tools or equipment have metal parts with chips in them, they should be repaired or replaced as they could fail and cause injury.
- Secure all materials before drilling, shaping, or sawing.
- Store oily rags that can spontaneously combust in a safe storage place.
- Always read the owner's manual for all tools/equipment before you use them.
- Always unplug power tools when changing settings or parts.

3. List THREE (3) measuring and marking tools and explain what they can be used for.

Model answer

Any THREE (3) of the following:

Name	Illustration	Uses
tape measure		• A measuring tape is a long, thin piece of plastic or metal that is marked with units of length (such as centimeters) and is used for measuring different things and large areas. • The measurements are usually labeled with large lines and next to each line, a number.
steel rule		• Steel rules are narrow steel rulers with one set or more of graduated marks, which are referred to as a scale. • When you measure with a steel rule, you use the interchange method of measurement because you observe both ends of the part feature at the same time.

Name	Illustration	Uses
marking gauge		• A marking gauge is a tool used to mark timber or a workpiece. The **stock** is made from Beechwood. The **stem** is made from Beechwood. The **thumbscrew** is made from Boxwood and plastic. The **spur** is made from steel. • It is used for marking the width and thickness of timber. • It can also be used to find the centre of the width of timber without using a ruler.
try square (also known as a T-square)		• A try square (T-square) is a woodworking tool used for marking and measuring a square piece of wood. It generally consists of two parts: » The 'blade' is the longer portion, usually made of metal. » The 'handle' (or 'stock') is usually made of wood, plastic, or metal.

4. Choose the correct tool from the table below and write it next to the correct question number.

Jig saw, hammer, chisel, mallet, measuring tape, steel rule, jack plane, marking gauge, try square.

a) Narrow steel strips with one set or more of graduated marks.
b) To check a surface's straightness or correspondence to an adjacent surface.
c) Used for measuring large areas.
d) Can make quick cuts with precision or allow you to cut a variety of shapes.
e) Used for driving nails.
f) To remove sawing marks on rough wood.
g) To find the centre of the width of timber without using a ruler.
h) Tapping joints into position during assembling and glueing a project.

Model answer

a) steel rule
b) try square
c) measuring tape
d) jigsaw
e) hammer
f) jack plane
g) marking gauge.
h) mallet

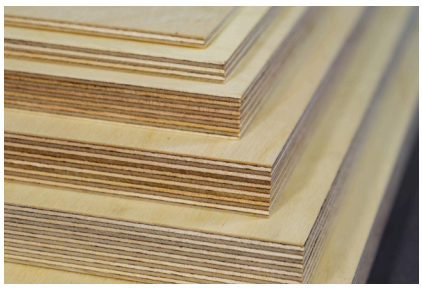
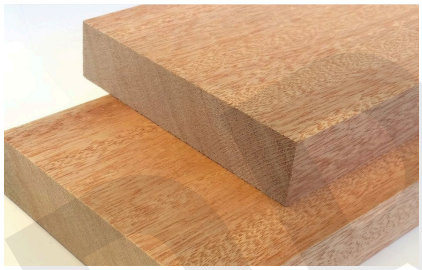
Activity 11.2

1. Redraw the table on your workbooks and fill in the blank spaces.

Material	Application	Uses
_____	• Used where a quality finish is not required	_____ _____
Meranti	_____ _____	• Floors • Skirting
Plywood	_____ _____	_____ _____
_____	• External cladding • Paneling	_____ _____
South African Pine – Softwood	_____ _____	_____ _____

Model answer

Name and illustration	Application	Uses
chipboard 	• Used where a quality finish is not required. • It is an economical board for general construction purposes.	• Formwork for concrete • Suspended floors • Cupboards

Name and illustration	Application	Uses
plywood 	• Used inside lagging formwork for a smooth finish of the concrete. • Also used as timber joinery products and shear walls.	• Bottom of drawers • Wall paneling • Door panels • Cupboards panels
Saligna - hardwood 	• Carpentry • Flooring • External cladding • Paneling • Cabinetmaking	• Floorboards • Fencing • Formwork • Boxes/crates • Furniture
Meranti – hardwood 	• Construction • Veneer and Plywood • Paneling • Interior and exterior joinery	• Durable furniture • Moulding • Floors • Skirting
South African Pine – Softwood 	• For cheap furniture • Carpentry • Construction on building sites • Shelving • Joinery	• Floorboards • Moulds • Ceilings • Furniture • Decorative veneers

2. Explain the difference between contact glue and cold glue.

Model answer

- **Contact glue** – an adhesive used on surfaces, which dries by quick evaporation of a flammable solvent. It is used for gluing together materials that are non-porous, such as laminate countertops. When used on a porous or semi-porous material such as wood or plywood, a first 'priming' coat of contact adhesive may be needed to pre-seal the material so that not too much adhesive is absorbed to form a strong bond. This should be followed by a second gluing coat.
- **Cold glue** – a multi-purpose wood glue that forms a strong bond. It sets quickly and can be used for woodworking, furniture manufacture and other joinery work.

3. Use a rough sketch to draw a screw and indicate the different parts by labelling them.

Model answer

[aw from px from LB]

4. In this section you learnt about two types of nails. Use the internet or talk to someone who does woodwork and find out about TWO (2) other types of nails used in woodworking. List and describe each one and their uses.

Model answer

Learner's own work.

Activity 11.3

1. In your own words, explain how you would replace three hinges on a door.

Model answer

- Make sure you have replacement hinges that are the same size and style as the ones that you are replacing.
- If you have three hinges, you can replace them one at a time without taking the door off.
- Remove the screws for one hinge on both the door and the frame.

- Replace it with the new hinge. Make sure that the head of the pin is turned up.
- Also, make sure that the hinge folds together the same way as the door will close.
- Put the hinge in place and install the screws.
- If the wood is worn, you may need to use a larger diameter or longer screw.
- Repeat this process for all three hinges, one at a time.
- If you need to replace two hinges – you will need to follow the same procedure, but you may have to take down the door and replace the hinges in halves.

2. Explain the differences between polyurethane varnish and water-based polyurethane varnish.

Model answer

Polyurethane varnish

- Delivers a clear coating.
- Multiple layers can give a substrate a plastic-type finish, which provides strong protection against an array of substances.
- The solvents are petroleum-based, so the coating is relatively safe.
- The coating can be somewhat difficult to apply and requires a 30-day curing period.
- Paint removers can effectively remove the coating, but after the curing period, the coating is quite durable.

Water-based polyurethane varnish

- A water-based polyurethane that produces a clear coating without the plastic look.
- It works well on products that are exposed to UV and are safer to use than traditional polyurethane varnish.
- The coating dries rapidly, so care must be taken in brush and spray application.
- The curing period is the same as polyurethane varnish, after which the coating is durable.
- Paint removers also work to remove water-based polyurethane.

3. Which type of finish would you use for an external wooden building. Explain why.

Model answer

Oil wood finishes

4. List FIVE (5) types of wood finishes and their distinguishing characteristics.

Model answer

Any FIVE (5) of the following:

Wax	• Easy to use and apply. It produces a nice shine. • Easy also to remove. • Often need to be reapplied and only provides minimal protection.
Shellac	• A clear finish, with some grades, carrying a distinct yellowish tint. • Shellac can be completely removed using alcohol, is compatible with other coatings, and acts as an effective base layer. • It provides its substrate with moderate water protection and provides effective protection against solvents – except alcohol. • The coating is durable and does not require reapplication.
Nitrocellulose lacquer	• A clear coating that creates a hard, glossy finish. • Nitrocellulose lacquer can be removed. • It provides good substrate protection and has strong durability. • There are several toxic solvents in the mixture, thus the applier needs to use a protective mask to avoid inhaling toxic fumes. • The coating requires a spray-on application method, which further releases toxins into the air, but alternative brush methods can be used.
Conversion varnish	• Conversion varnish resembles nitrocellulose lacquer. • Results in a hard, glossy finish and is durable and hard to remove. • The coating requires a spray-on application method, which releases toxins into the air, and can only be applied in shops using specialised spray equipment. • The coating can resist an array of substances, providing strong substrate protection.
Polyurethane varnish	• Delivers a clear coating. • Multiple layers can give a substrate a plastic-type finish, which provides strong protection against an array of substances. • The solvents are petroleum-based, so the coating is relatively safe. • The coating can be somewhat difficult to apply and requires a 30-day curing period. • Paint removers can effectively remove the coating, but after the curing period, the coating is quite durable.

Water-based polyurethane	• A water-based polyurethane that produces a clear coating without the plastic look. • It works well on products that are exposed to UV and are safer to use than traditional polyurethane varnish. • The coating dries rapidly, so care must be taken in brush and spray application. • The curing period is the same as polyurethane varnish, after which the coating is durable. • Paint removers also work to remove water-based polyurethane.
Oil wood finishes	• Oil finishes, such as tung oil and linseed oil, can be used to accentuate the wood's grain but do not provide much protection. • They give the wood a warm glow and increases the wood's durability when the oil is layered. • Application is easy but drying takes 12 hours or longer. • The substrate must be sanded down to remove oil finishes because oil absorbs into the wood.

CHAPTER 12

Bricklaying and plastering

Learner's Book page 166

Activity 11.1

1. Choose the correct description from column B to match the material listed in column A. Write down the question number and material and write only the correct letter in column B.

COLUMN A	COLUMN B
a) Fine sand	A. Are made of either concrete or ash and are available in various sizes.
b) Blocks	B. It ensures chemical reaction/binding on all other parts into a hard, durable, water-resistant mass when water is added.
c) Bricks	C. Are made of either concrete or clay.
d) Water	D. Needs to be clean and free of impurities.
e) Cement	E. It increases the plasticity of mortar and plaster mixtures.
f) Concrete	F. The material of smaller particles/granules used in the preparation of mortar for laying bricks and patching.
	G. Is a structural material consisting of three basic components: aggregates (sand and stones) and cement in a powder form acting as a binding agent when proportionally mixed with water.

Model answer

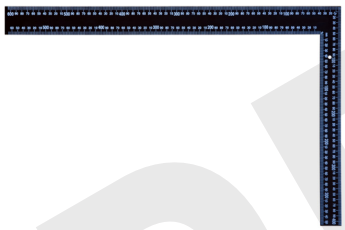
COLUMN A		COLUMN B
a) Fine sand	F	A. Are made of either concrete or ash and are available in various sizes.
b) Blocks	A	B. It ensures chemical reaction/binding on all other parts into a hard, durable, water-resistant mass when water is added.
c) Bricks	C	C. Are made of either concrete or clay.
d) Water	D	D. Needs to be clean and free of impurities.
e) Cement	B	E. It increases the plasticity of mortar and plaster mixtures.
f) Concrete	G	F. The material of smaller particles/granules used in the preparation of mortar for laying bricks and patching.
		G. Is a structural material consisting of three basic components: aggregates (sand and stones) and cement in a powder form acting as a binding agent when proportionally mixed with water.

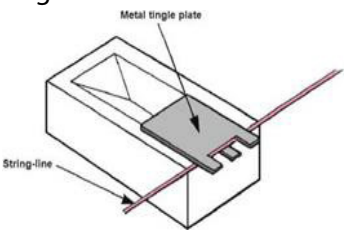
2. Name FIVE (5) tools and equipment used in bricklaying and plastering, their uses and how to maintain and care for them.

Model answer

Any FIVE (5) of the following:

Name and illustration	Use	Maintenance and care
square shovel 	• Remove/clean loose material on site. • Clean rubble on site.	• Clean tool after use. • Thin oil must be applied to prevent rust. • Store tool properly in a shaded area to prevent rust.
round shovel 	• Mixing concrete and mortar.	
bucket 	• Multiple uses • Carrying anything on-site (within its capacity). • Mixing and roughly measuring the mortar.	• Thoroughly clean the bucket after use. • Ensure the handle is properly fitted. • Never carry hot substances in a plastic building bucket.
wheelbarrow 	• Used for proportional gauging of concrete and mortar mix ratio. • Carrying objects and other materials on site. • Moving fresh concrete and bricks to the building site.	• Thoroughly clean the wheelbarrow after use. • Store in such a way that it does not collect water in the bucket side – turn it upside down. • Grease the wheel axle and apply thin oil to the bin to prevent rust.

Name and illustration	Use	Maintenance and care
measuring tape 	• Measuring lengths in mm, cm and m. • Setting out of buildings. • Measuring layouts.	• Never release the tape to roll it back too fast – it damages the hook tip. • Do not expose it to direct sunlight and avoid moisture. • Never oil the measuring tape.
straight edge 	• Drawing straight lines between points. • Checking straightness. • Levelling with the aid of a spirit level.	• Check that the edges are clean, with no damage. • Store flat or hang them. • Store in a cool dry place. • Sandpaper lightly if rust sets in or markings become indistinct.
steel square 	• Checking the straightness and squareness of large objects. • Setting out foundations using a 3:4:5 method.	
spirit level 	• Checking/testing horizontal, vertical, and 45° surfaces of buildings, foundations, and roof trusses. • Transferring levels from one point to another.	• Clean the tool after use and avoid cement getting stuck on the gauge. • Avoid dropping the tool.
chalk/string line 	• Drawing lines on flat surfaces, for example, floors and ceilings.	• Reel it back carefully after use and avoid knotting the string. • Add powder chalk when the line fades.

Name and illustration	Use	Maintenance and care
building line 	• Setting out for foundation excavations and laying of bricks. • Ensuring the correct alignment of doors and windows during construction.	• Reel it back carefully after use and avoid knotting the string. • Wipe the line clean after use. • Never pull it too hard as this will break the line.
tingle 	• Used to hold the building/ string line on long lengths of the wall to prevent sag.	• Avoid bending the tool.
brick trowel 	• Used to place and spread mortar when laying bricks. • Also used to remove excessive mortar and tap the edges of bricks/blocks to line them up properly.	• Make sure that the handle fits properly and/or replace the tool if it is damaged. • Clean the tool after use. • Use water for cleaning it, dry it, and store it properly.
pointing trowel 	• Used to finish off short joints in the brickwork and vertical joints.	
finishing/jointing trowel 	• A small trowel used for digging, applying, smoothing, or moving small amounts of mortar.	

Name and illustration	Use	Maintenance and care
long jointers 	• Used to clean and shape long horizontal mortar joints (either square or rounded).	• Clean tool after use. Use water for cleaning it, dry it, and store it properly.
short jointers 	• Used to clean and shape short vertical mortar joints (either square or rounded).	
brick hammer 	• Used to dress bricks and blocks. • Also used to roughen smooth surfaces so plaster and tiles can adhere. • The square head is for normal hammering, while the chisel head is used for cutting bricks and blocks	• Replace loose handles or fix them using a wedge. • Keep the hammer head clean and make sure that the handle is firmly attached to the head. • Wedged hammer heads must be sharpened regularly.
comb hammer 	• The square head is used for normal hammering. • The chisel head is grooved to fit a steel comb and is used to cut or dress bricks and blocks.	
club hammer 	• Used with chisels to either cut bricks/blocks or chase walls. • Used where heavy hammering is necessary. • Also used to hammer pegs into the ground.	

Name and illustration	Use	Maintenance and care
bolster chisel 	• Used for chasing walls for electric conduits and water pipes. • Also used for cutting concrete, bricks, and blocks.	• Sharpen the tool when it becomes blunt. • Grind the tool head when it is mushrooming. • Oil the tool to prevent rust, especially when stored for a long time
cold chisel 	• A flat and broad chisel used for cutting bricks and blocks accurately to size. • Also used for removing tiles.	
concrete mixer 	• Used to mix large amounts of concrete, screed, and mortar.	• Clean the drum properly after use. • Do not leave water inside the drum after use. • Turn the drum upside down to drain it until it is dry.

3. Why do you think it is important to keep your work area clean and not to have any tools lying around?

Model answer

A cluttered floor can lead to accidental trips or falls that can be extremely dangerous when working with hand tools and power tools.

4. Kobus works as a bricklayer and does not wear a harness when he works in high places. Explain to Kobus what PPE he should use/wear and why it can save him from getting hurt.

Model answer

Always wear the correct PPE:

- this includes items like safety goggles, face masks, earplugs, hard hats, gum boots, safety harnesses and work gloves.

Activity 11.3

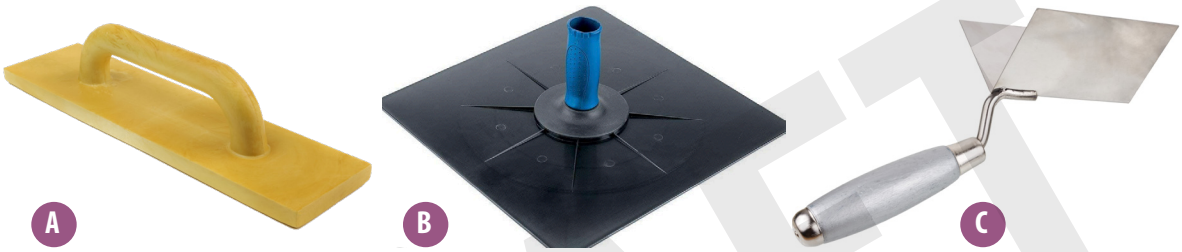
1. List FOUR (4) purposes of plastering.

Model answer

Plastering is done to achieve the following objectives:

- To protect the external surfaces against penetration of rainwater and atmospheric agencies.
- To give a smooth surface in which dust and dirt cannot lodge.
- To give a decorative effect.
- To protect surfaces against vermin.
- To conceal inferior materials or defective workmanship.

2. a) Identify the tool shown below.



b) Name the purpose of each tool.

c) Explain how you would maintain these tools.

Model answer

a) A wooden float
B hand hawk
C corner tool (external)

b) A Used to smoothen the topping of a floor and compact plaster against the wall, that is, levelling and floating.
B Used to mix small quantities of fillers/plaster to make it workable.
Holds quantities of mortar temporarily so that it can be applied to a wall.
Holds small plaster scraped from the wall by the plastering trowel.
C Used to create a rounded outside edge on the corner rise and tread of a step.
Also used to form a rounded safe edge on the external wall corners and reveals.

c) A Wash the tool after use and dry it before storage.
Ensure the face side is clean and smooth.
Replace it when corners are worn out.
B Do not allow mortar to dry on the face of the float, trowel, and hawk.
Clean the tool properly after use.
C Store it dry and in a dry place.
Clean bristles to remove any mortar, wet cement, and/or screed.
Oil the blade to prevent rust.

CHAPTER 13

Flooring and tiling

Learner's Book page 181

Activity 13.1

1. Explain what wooden/laminate flooring is.

Model answer

Wooden flooring is solid wood planks that have tongue and groove joints or butt joints. They are given a protective coating.

Laminate flooring is compressed fiber board planks covered with an image of timber, stone, or tiles. They are also given a protective coating.

2. Write down the procedure that must be followed when installing laminated flooring.

Model answer

Fitting the laminate flooring

- Clean the floor and make sure it is completely dry.
- Lay the underlayment and trim it to the correct size.
- Lay each laminate in the direction of the length of the room.
- Join laminate planks using the tongue and groove joints and tap it using a mallet to ensure it fits securely.
- If there are any gaps, cut pieces of laminate planks to size to fill up the gaps.
- Fit the beadings along the walls (finishing).

3. What is a tack strip?

Model answer

Tack strips are strips nailed along the walls (except on doors and thresholds). They hold the carpet in place ensuring that there is no shifting/ movement.

4. How can you install a carpet?

Model answer

Fitting a carpet flooring

- Install the tack strips along the walls (except on doorways and thresholds).
- Lay the underfelt/underlayment and trim it to the correct size using a utility knife.
- Install the carpet properly.
- Use a seam roller to ensure the joints are seamless.
- Fit the beadings along the walls (finishing).

5. What is the purpose of the following tools?
   a) seam roller
   b) rubber mallet
   c) carpet stapler
   d) tapping block
   e) tack strip cutter

Model answer

a) seam roller – puts pressure pm the carpet seam and it is specially designed for loop pile carpets

b) rubber mallet – usually used to knock pieces together and to drive other tools when more effort is required

c) carpet stapler – used to fasten one end to another, or one material to another

d) tapping block – protects objects from hammer blows

e) tack strip cutter – used to cut the tackles strip to size

6. List the safety aspects that need to be followed when working with flooring.

Model answer

Here are some basic safety tips that you can follow when you work with tools:

- Always use the proper lifting techniques when moving furniture and old carpeting materials before the installation of new flooring.
- Rotate your tasks as much as possible to prevent repetitive use injuries.
- Always wear the correct PPE:
  - wear knee pads to protect your knees from tack strips and flooring irregularities
  - wear gloves to protect your hands against injuries from carpet-cutting tools, sharp tack strips, sewing materials, and staples
  - use the proper eye protection to guard your eyes from flying objects and sharp tool edges.

- Ensure that cutting tools are in good working condition before you start on a new project.
- If your tools are damaged and/or broken, notify your teacher right away.
- When cutting, be careful where you place your hands and knees as sharp objects or ends could inflict an injury by accident.

Activity 13.2

1. List FOUR (4) materials used to manufacture tiles.

Model answer

Any FOUR (4) of the following:

- ceramic
- stone
- metal
- baked clay
- glass

2. Explain the following terms:
   a) tile adhesive/cement
   b) grout
   c) spacers
   d) edge trims

Model answer

a) tile adhesive/cement – A cement-based adhesive that is mixed with water to produce mortar for laying tiles.

b) grout – A cement-based adhesive that is mixed with water to produce mortar for filling gaps between the tiles.

c) spacers – Small pieces of plastic (most often) used to space tiles equally and equidistant from one another. They also assist with getting all of the tiles lined up properly.

d) edge trims – Narrow lengths of metal or plastic used to finish off tile walls, backsplashes, and flooring. The trim finishes the edges and protects the tile from chipping.

3. Choose the correct use from column B to match the tools listed in column A. Write down the question number and the correct letter from column B.

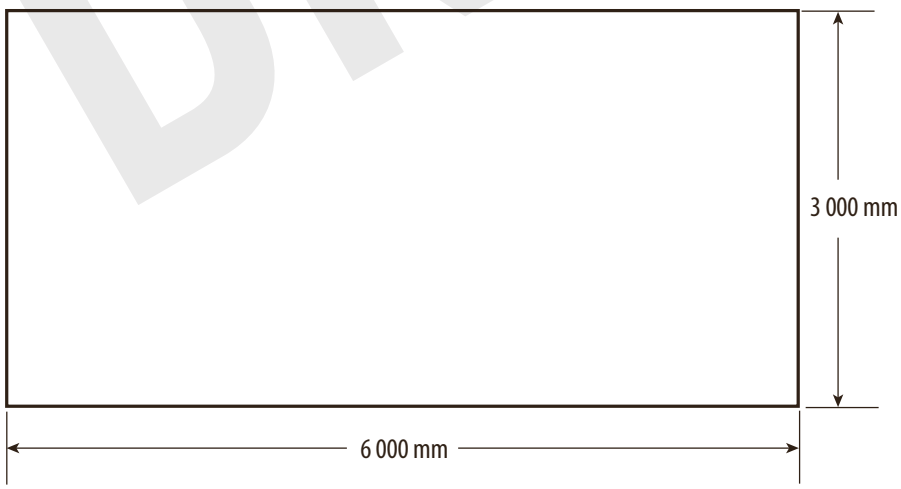
COLUMN A	COLUMN B
a) bucket	A. To break off small pieces of tile.
b) pincher/nipper	B. Mix in it and roughly measure mortar.
c) tile cutter	C. Used to spread the mortar.
d) angle grinder	D. Tap the ceramic tiles to make them even on the floor surface.
e) tile trowel	E. Used to spread grout into the joints between tiles.
f) mallet (rubber)	F. Cut tiles straight or angled within the capacity of the table.
	G. Used to cut tiles when fitted with a diamond blade.

Model answer

COLUMN A		COLUMN B
a) bucket	B	A. To break off small pieces of tile.
b) pincher/nipper	A	B. Mix in it and roughly measure mortar.
c) tile cutter	F	C. Used to spread the mortar.
d) angle grinder	G	D. Tap the ceramic tiles to make them even on the floor surface.
e) tile trowel	C	E. Used to spread grout into the joints between tiles.
f) mallet (rubber)	D	F. Cut tiles straight or angled within the capacity of the table.
		G. Used to cut tiles when fitted with a diamond blade.

Activity 13.3 Calculating the area of a building

1. The diagram below shows the internal floor area of a one-bedroom.



a) What is the length of the bedroom in metres?
b) What is the breath of the bedroom in metres?
c) Calculate the floor area of the bedroom in square metres.

Model answer

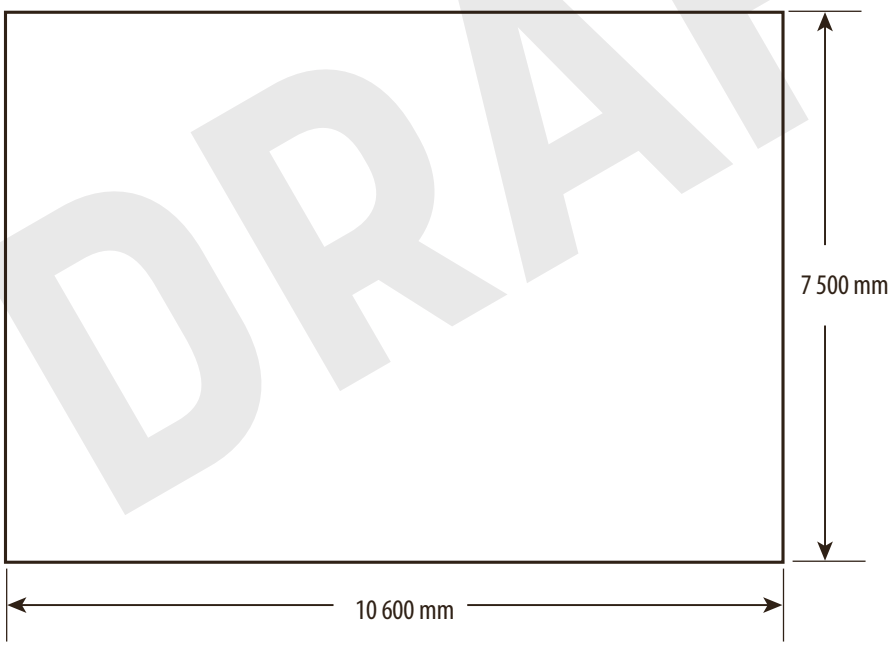
a) 6 m
b) 3 m
c) $6 \times 3 = 18\ m^2$

2. A bathroom floor which is 4 600 mm long and 2 800 mm wide, needs to be tiled. Calculate the area of the bathroom.

Model answer

$l \times b$
$= 4{,}6 \times 2{,}8$
$= 12{,}88\ m^2$

3. The diagram below shows the internal floor area of a garage. Calculate the total floor area of the garage.



Model answer

$l \times b$
$= 10{,}6 \times 7{,}5$
$= 79{,}5\ m^2$

4. Calculate the total area of the following rooms:
   a) kitchen 5 780 mm long and 4 780 mm wide.
   b) Dining room 4 000 mm side by side.
   c) Sitting room 7 840 mm long and 6 520 mm wide.

Model answer

a) $l \times b$
$= 5{,}78 \times 4{,}78$
$= 27{,}6284\ m^2$

b) $s \times s$
$= 4 \times 4$
$= 16\ m^2$

c) $l \times b$
$= 7{,}84 \times 6{,}52$
$= 21{,}1168\ m^2$

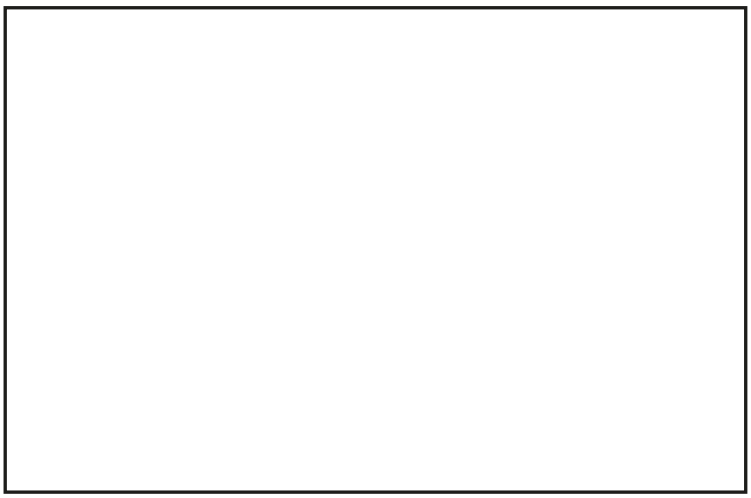
Activity 13.4 CALCULATING AREA

1. The diagram below shows an elevation of a wall. Calculate the total area of the wall.

Model answer

$l \times b$
$= 6{,}8 \times 2{,}5$
$= 17\ m^2$

2. The diagram below shows an elevation with an opening. Calculate the total area of the wall that must be tiled.



Model answer

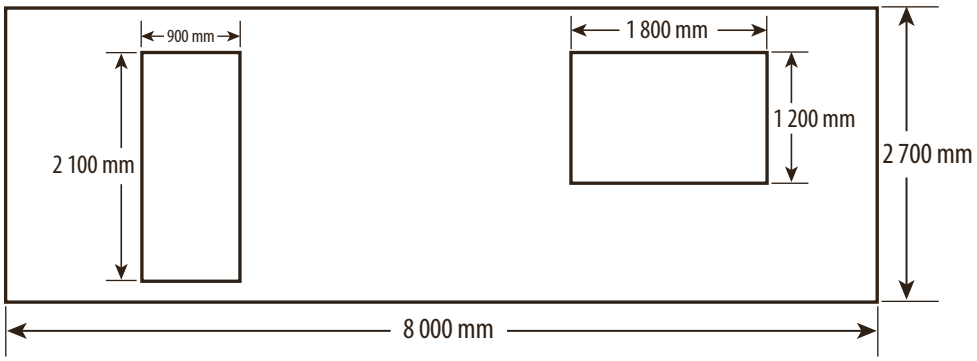
Area of the wall, including the door
$l \times b$
$= 7 \times 2{,}8$
$= 19{,}6\ m^2$

Area of the door
$l \times b$
$= 2{,}1 \times 0{,}9$
$= 1{,}89\ m^2$
Total area $= 19{,}6 - 1{,}89 = 17{,}71\ m^2$

OR

(area of the wall) – (area of the door)
$(l \times b) - (l \times b)$
$= (7 \times 2{,}8) - (2{,}1 \times 0{,}9)$
$= 19{,}6 - 1{,}89$
$= 17{,}71\ m^2$

3. The diagram below shows an elevation that needs to be tiled. Calculate the total area to be tiled, excluding the opening. Ignore reveals.



Model answer

Area of the wall, including the door
$l \times b$
$= 8 \times 2{,}7$
$= 21{,}6\ m^2$

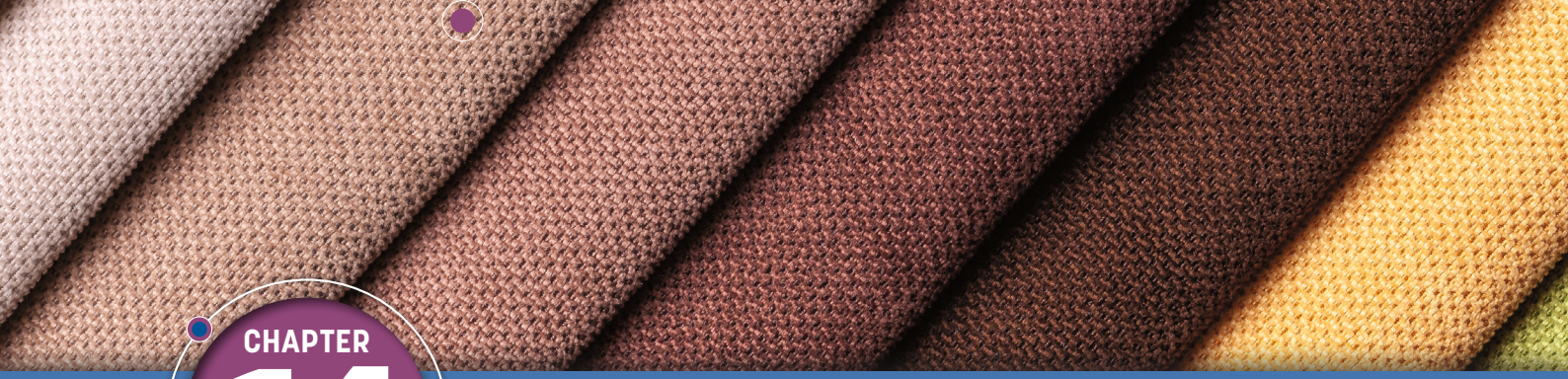
Area of the door
$l \times b$
$= 2{,}1 \times 0{,}9$
$= 1{,}89\ m^2$

Area of the window
$l \times b$
$= 1{,}8 \times 1{,}2$
$= 2{,}16\ m^2$

Total area $= 21{,}6 - 1{,}89 - 2{,}16 = 17{,}55\ m^2$

OR

(area of the wall) – (area of the door) – (area of the window)
$(l \times b) - (l \times b) - (l \times b)$
$= (7 \times 2{,}8) - (2{,}1 \times 0{,}9) - (1{,}8 \times 1{,}2)$
$= 21{,}6 - 1{,}89 - 2{,}16$
$= 17{,}55\ m^2$



CHAPTER 14

Upholstery

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Activity 14.1 Learning about upholstery

1. Explain the safety measures you would apply when working with the following basic upholstery equipment.
   a) staple gun
   b) scissors
   c) upholstery tack hammer

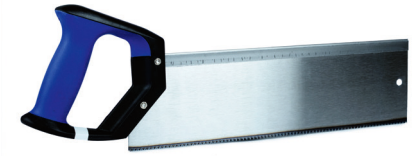
Model answer

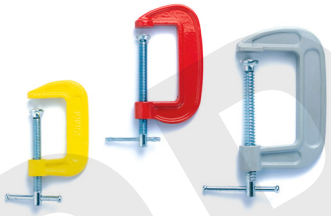
a) staple gun – should be used on the fabric which is being upholstered. Any failure to use it properly would result in the staples piercing into the flesh of the learner.

b) scissors – should be taken that the scissors do not cut the fingers while cutting the fabric.

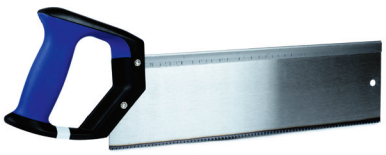
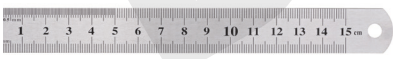
c) upholstery tack hammer – the handle of the hammer must be secured firmly on the head so it does not fly off and cause injuries to the learners.

2. Complete the table below by:
   a) Identifying the hand tool.
   b) Naming the use of the tool.
   c) Explaining how you would take care of the tool.

Hand tools	Uses	Care
		
		

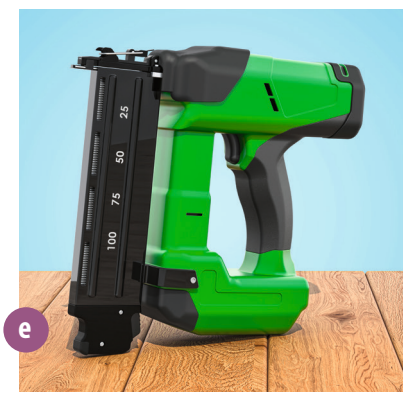
Hand tools	Uses	Care
		
		
		
		
		
		
		

Model answer

Hand tools	Uses	Care
claw hammer 	• Suitable for pounding nails. • The claw part is suitable for pulling nails out.	• To avoid rust, do not store in a damp area.
tenon saw 	• Used to cut small pieces of wood and most joints. • It has a fine-toothed crosscut for sawing plywood, thin wood, and large joints.	• Store on the profile board after every use.
staple remover 	• Angled for the easy removal of staples of any size.	• Store in its container after every use.
staple lifter 	• Allows for the quick removal of a staple from a material without causing damage.	• Store in its container so that the sharp part does not get damaged.
rubber mallet 	• Used for upholstery work to give a softened strike with a positive drive.	• Store on the profile board after every use.
meter ruler 	• Used for accurate measurements.	• Wipe the meter ruler with a clean cloth to remove fabric dust. • To avoid rust, do not store in a damp area.
G-clamps 	• A type of clamping device used to hold a wood or metal workpiece. • It is often used in carpentry and welding.	• Put it on the profile board after every use.

Hand tools	Uses	Care
circular needles 	• Used for knitting in the round and flat pieces.	• Store away in its container after use. • To avoid rust, do not store in a damp area.
upholstery tack hammer 	• A lightweight hammer used for securing upholstery fabric to furniture frames using tacks or small nails.	• Put it on the profile board after every use.

3. Identify the following air equipment and tools.



Model answer

a) air drill

b) form cutter

c) spray glue gun

d) cutting table

e) brad nail gun

4. List any FIVE (5) consumables used in upholstery.

Model answer

Any FIVE (5) of the following:

- form
- upholstery fabrics
- staples
- marking chalk
- cotton
- form glue
- wood glue
- wood (chipboard and pine)
- woodscrews
- brass studs
- brad nails
- webbing
- propylene (poly–prop)

5. Convert the following Units

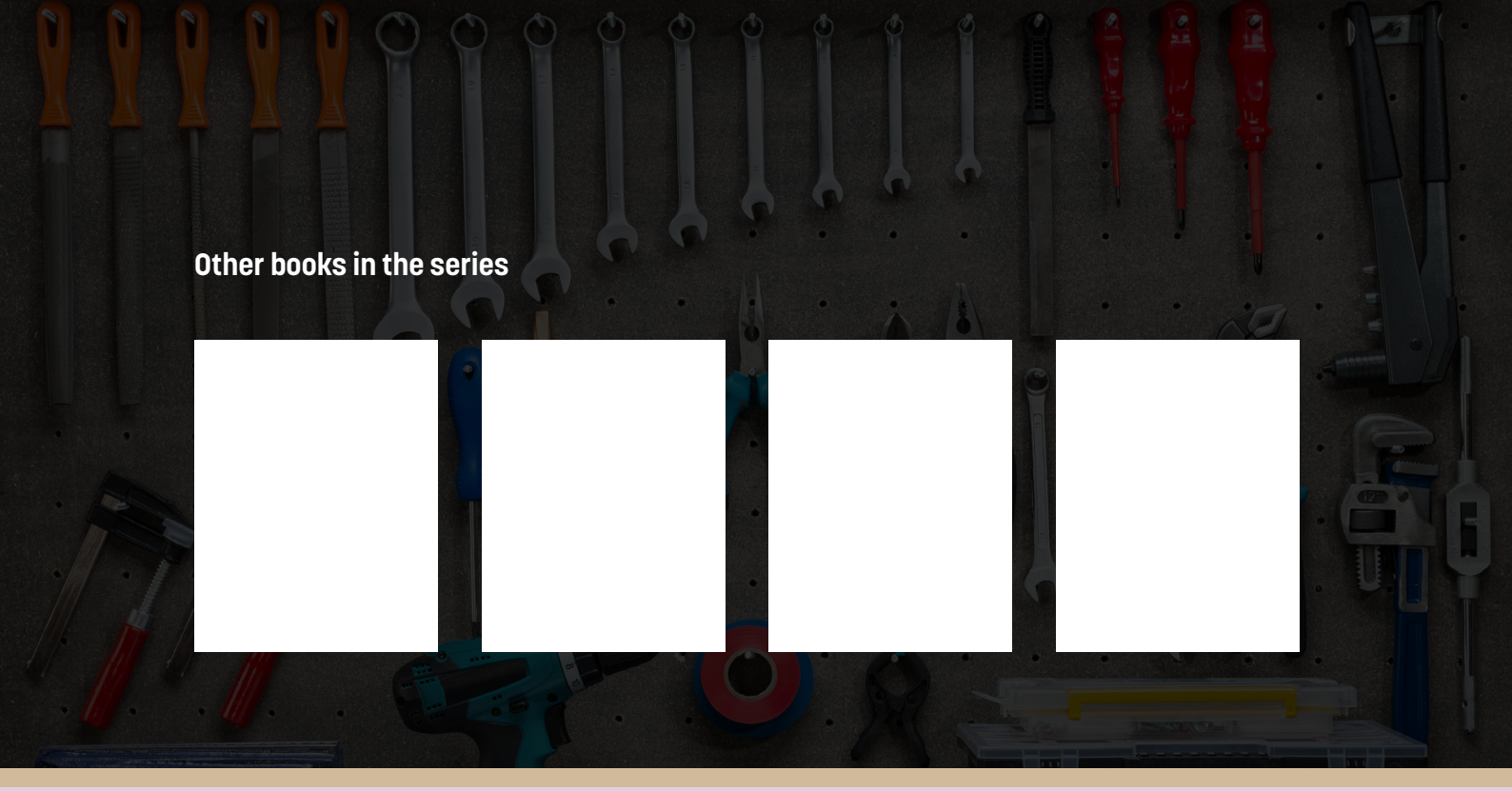
Model answer

a) 15 mm = 1,5 cm

b) 3 700 m = 3,7 km

c) 4 300 mm = 4,3 m

d) 60 cm = 0,6 m



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