



GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

REMOTE LEARNING ACTIVITY BOOK

(RELAB)

SUBJECT: WELDING & METALWORK

GRADE: 10

LEARNER WORKBOOK



INTRODUCTION AND PURPOSE OF THE RELAB

The Covid 19 pandemic has caused serious impact to schooling resulting in major learning loss and instructional time. This scenario has resulted in school implementing rotational timetables-where learners attend school on alternate days or weeks. The Remote Learning Activity Book was conceptualized to engage learners in constructive learning on days they are at home. Hence the RELAB was developed as a strategy to enhance remote learning.

The RELAB is underpinned by the following Legislative demands:

- a) Responding to GDE Strategic goal 2 promoting quality education across all classrooms and schools
- b) **DBE Circular S13 of 2020** the requires the GDE to support the implementation of the Recovery Annual Teaching Plan (RATP)
- c) **GDE Circular 11 of 2020** requiring districts to issue Learning Activity Packs to support schools for lockdown learning. Understanding learning constraints at home as majority of learners do not have access to devices or data to use for online learning. Many households are depending on schools to provide them with learning resources packs

RELAB is designed as workbook with activities based on the Revised Annual Teaching Plan. The exercises are pitched at a standard to expose learners at Grade 10 & 11 to content at different cognitive levels. The NSC diagnostic reports in different subjects have revealed that learners fail to analyse questions and as a result fail to respond accordingly.

The RELAB is intended to ensure that learners work on exercises that consolidate and reinforce topics taught while at school. These exercises are be completed at home and would receive feedback as groups or individually when at school. It is therefore of paramount importance that teachers assess the work with learners in class, as a way of providing constructive feedback. Teacher are also required to diagnose learner responses, remediate where necessary and plan further intervention.

Educators are encouraged to create whatsapp groups to remind learners on what is expected of them in a particular week/ day(s). Effective utilisation of the RELAB activity book would further ensure that all topics in the RATP are covered simultaneously. Feedback from learners at home will confirm usage of the RELAB material and assist to prepare learners for formal assessments.

TOPICS- Welding and Metalwork

- 1. Safety – Generic**
- 2. Terminology - Welding**
- 3. Tools – Generic**
- 4. Machining- Specific**
- 5. Joining Methods - Generic**
- 6. Forces- Generic**
- 7. Terminology – Welding (Symbols and Joints)**
- 8. Maintenance – Generic**
- 9. Terminology - Developments**
- 10. Materials- Generic**

Activity One

SAFETY

- 1 Write a short paragraph about your understanding around the following issues about HIV/AIDS:
 - Your understanding about the illness and its causes
 - How it affect our community and specially in the workplace
 - How to prevent HIV/AIDS
- 2 Explain why you think if it is important to know your status?
- 3 In your opinion, why do you think it is important to have first aid kits?
- 4 Name at least 10 basic contents that must be in a first aid kit.
- 5 Occupational Health and Safety

Activity 5.1 - Multiple-choice questions

5.1.1. Workplace related injuries, illnesses and deaths impose costs upon?

- (a) Employers
- (b) Employees
- (c) The community
- (d) All of the above

5.1.2. What are the most common injuries in the hospitality industry?

- (a) Sprains and strains
- (b) Being hit by falling objects
- (c) Falls
- (d) Sun-related injuries

5.1.3. What does the provision of security of people's assets while at the workplace entail?

- (a) Having all assets under lock and key
- (b) Preventing theft, pilferage and damage of assets

- (c) Being vigilant with the security of the assets
- (d) Issuing security badges and identity cards to all people at the workplace

5.1.4. What is the primary emergency telephone number in South Africa?

- (a) 011
- (b) 177
- (c) 012
- (d) 112

5.1.5. What is the role of the workplace's health and safety representative?

- (a) To represent the workers' views and concerns on the workplace's OH&S practices to the employer
- (b) To document the workplace's OH&S policies and practices
- (c) To check on whether all workers are complying with the workplace's OH&S policies and practices
- (d) To train and assess all workers in their knowledge of the workplace's OH&S policies and practices

5.1.6. Which of the following is not a type of health hazard?

- (a) Magical
- (b) Ergonomic
- (c) Chemical
- (d) Biological

5.1.7. What is the most important reason why all accidents should be investigated and recorded?

- a Comply with health and safety law
- b Satisfy the enforcement officer

- c Prevent similar accidents in the future
- d Something to read on the loo

5.1.8. What is the best way to protect an employee working at a noisy machine?

- (a) Allow the machine to only be used for short periods of time
- (b) Reduce or eliminate noise from the machine
- (c) Provide a pair of ear muffs
- (d) Shout really loudly at them when they do something wrong

5.1.9. Under the Health and Safety Act, an employer must:

- (a) Provide a bright, cheerful place to work
- (b) Provide personalized hard hats in a variety of colours
- (c) Give everyone their very own copy of company safety policy
- (d) Safeguard the safety and health of all employees

5.1.10. What is the best way to prevent injury at work?

- (a) Remove the hazard or redesign the task
- (b) Restrict access to the hazard
- (c) Provide gloves and a bobble hat
- (d) Send all employees home - they'll much safer there

5.1.11. Define ergonomics.

- (a) The biology of the relations and interactions between organisms and their environment
- (b) The interaction between people, equipment and their environment

- (c) A study of the production, distribution, and consumption of goods and services
- (d) A study of big and clever words

Activity 5.2 - True or false questions

Highlight or circle the correct answer, or enter your answer in the space provided.

Answer true or false about occupational health and safety		
5.2.1.	Emergency procedures have been devised to keep everyone safe.	True False
5.2.2.	A hazard is any situation that has the potential to cause injury, illness, or death.	True False
5.2.3.	If no notification is made of an injury sustained compensation can be obtained for that injury.	True False
5.2.4.	To reduce injury, a risk control process accompanied by hazard-management procedures needs to be established.	True False
5.2.5.	Safety signs can prevent accidents.	True False
5.2.6.	A duty of care in the workplace is the responsibility of the employer only.	True False
5.2.7.	The direct costs of workplace-related injuries are workers' compensation premiums paid and workers' compensation payments.	True False
5.2.8.	When providing a safe working environment for staff, employers must eliminate all risks to health and safety.	True False
5.2.9.	The safety and wellbeing of people in the workplace also includes guests and customers of the workplace.	True False
5.2.10.	If you have to evacuate the workplace during an emergency, ensure that you take all of your personal belongings before evacuating the building.	True False






Activity 5.3
Answer the following Questions






- 5.3.1. What is the significance of the Occupational Health and Safety Act?
- 5.3.2. All workers (educators and learners) should know their Human Rights that protect them within a work place (workshop). These rights are contained in the Bill of Rights, Chapter 2 of the South African Constitution. Mention FIVE human rights within the work place.
- 5.3.3. Your employer has the right to monitor communications within the workplace as long as you're aware of the monitoring before it takes place. Mention FIVE communications that can be monitored by the employer within the workplace.
- 5.3.4. According to the OHS Act both the employer and the employee are responsible for the safety in the workshop. List FIVE responsibilities of the employer and FIVE responsibilities of the employee within a workplace.
- 5.3.5. What do you understand by the term housekeeping?
- 5.3.6. Mention TEN general safety measures that must be followed to ensure safety in a mechanical workshop.
- 5.3.7. A workplace hazard is anything that has the potential to cause harm to a person. Health and safety hazards exist in every workplace. Give FOUR workplace hazards and also provide a brief description of each.
- 5.3.8. Planning and the proper workshop layout will enable you a good and pleasant work. When planning the workshop layout, it is necessary to consider a number of factors that affect your work. Mention FIVE factors that must be considered when planning the workshop layout.
- 5.3.9. What is the definition of an accident?
- 5.3.10. Unsafe conditions are the cause of many accidents. Name five unsafe conditions in a mechanical workshop
- 5.3.11. It has been found that unsafe actions, more so than unsafe conditions are the root cause of the vast majority of occupational injuries and accidents. Give FIVE unsafe acts that may transpire in a mechanical workshop.






5.3.12. Name four basic safety colours and explain the significance of each






COLOUR	MEANING OR PURPOSE	INSTRUCTION & INFORMATION
RED		
YELLOW or AMBER		
BLUE		
GREEN		
RED(fire-fighting signs)		






5.3.13. Identify the following signs in an electrical workshop by mentioning their description and colour.

	SIGN	DESCRIPTION	COLOUR
What the group name of this type of signs: <i>Information Signs</i>			
			
			
			
			

	SIGN	DESCRIPTION	COLOUR
Safety Signs What is the group name of this type of signs:			
			
			
			
			

	SIGN	DESCRIPTION	COLOUR
What is the group name of this type of signs: <u>Prohibition Signs</u>			
			
			
			
			

	SIGN	DESCRIPTION	COLOUR
What is the group name of this type of signs: <i>Fire Safety Signs</i>			
			
			
			
			

	SIGN	DESCRIPTION	COLOUR
<p><i>Regulatory Signs</i></p> <p>What is the group name of this type of signs:</p>			
			
			
			
			

Activity 5.4

- 5.4.1. All the electrically operated equipment must have a disconnecting device, to make it easy to break the circuit in case of emergency. Where must the main switch be placed on an electrical machine?
- 5.4.2. All domestic installation must have a disconnecting device, to make it easy to break the circuit in case of emergency. Where should the main switch of a domestic installation be placed?
- 5.4.3. Briefly describe the meaning of critical and non-critical emergencies.
- 5.4.4. You are busy in the mechanical workshop busy using the welders, when, all of a sudden the transformer catches fire. Which class of fire is it and how you would extinguish that fire?
- 5.4.5. What are the main causes of electrical fire?
- 5.4.6. Fires are divided into different classes. Name the main classes of fires as well as the extinguishers to be used to extinguish these fires.

Activity 5.5

- 5.5.1. Name the main causes of electrical shocks.
- 5.5.2. Explain the steps that must be taken to help a person who has been electrocuted.
- 5.5.3. In the event of an emergency in a mechanical workshop, certain steps need to be taken for successful evacuation of the workshop. Name at least five steps for a successful evacuation.
- 5.5.4. Why must you work in a well-ventilated room when you etch a PCB?
- 5.5.5. Mention SIX precautions to be taken when making a PCB.

Safety - Hand tools

6.1. Describe how you would use the following tools safely:

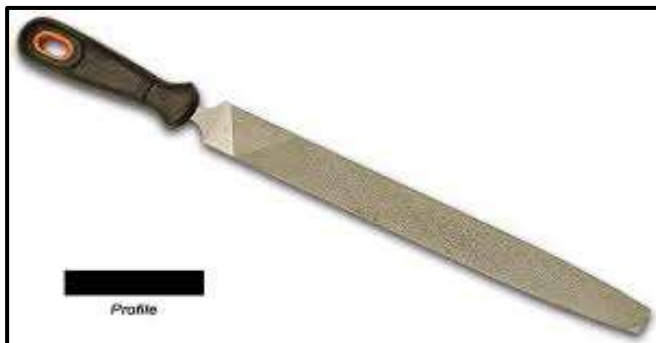
6.1.1.



6.1.2.



6.1.3.



6.1.4.



6.1.5.



6.1.6.



6.1.7.



6.1.8.



6.2. Describe the safety precautions that must be observed when working with the following machine:



- 7.1.1. Name four safety precautions to follow when working with a lathe or a milling machine.
- 7.1.2. Name five safety precautions to observe when working with a grinding wheel.
- 7.1.3. Name five steps to follow when installing a grinding wheel.
- 7.1.4. Name three safety precautions you must observe when working with a bender.
- 7.1.5. Name six safety precautions that you must observe when working with a power saw.

TERMINOLOGY-Welding Specifics
Activity 1

Topic: Welding Terms.

Question1: Define the following welding terms.

- 1.1 Arc
- 1.2 Arc length
- 1.3 Leg length
- 1.4 Included angle
- 1.5 Parent metal
- 1.6 Root run
- 1.7 Run
- 1.8 Toe of a weld
- 1.9 Weld bead
- 1.10 Tack welding.

marks]

[20

Activity 2

Topic: Templates

2.1: State two factors that determines the choice of materials for making templates.

2.2: Identify three materials that are used for making templates in welding and fabrication.

2.3: Use of templates in fabrication simplifies the life of a boilermaker. State five advantages that comes with the use of templates.

[10]

Activity 3

Topic: Arc Welding

3.1 Principles and functions of AC and DC welding machines. Draw and label the electric circuit in arc welding.

(11)

3.2 State the function of the electrode lead and work lead in the electric circuit of arc welding.

(4)

[15]

Activity 4

Topic: Arc welding

4.1 Identify seven accessories required for arc welding and state their functions.
(14)

4.2 It is important to always wear Personal Protective Equipment when welding for safety reasons. Identify six PPE required when conducting a welding activity.
(6)

[20]

Activity 5

Topic: Gas welding

5.1 State the function of the following gas welding apparatus.

5.1.1 Regulator

5.1.2 Flashback arrestors (4)

5.2 What do you understand by the term Back feeding (backfiring) (4)

5.3 State the different between an Oxygen cylinder and Acetylene (3)

5.4 Name and explain the seven steps involved in the assembly of oxy-acetylene
(14)

[25]

Activity 6

Topic: Welding flames

6.1 With the aid of the Sketches, identify and explain how to produce the welding flames.

(12)

[12]

TOOLS

- 1.1. When should you use an open-ended spanner?
- 1.2. Which accessories can be used with ratchets, and specify where each of them can be used.
- 2.1. Name the pliers that you must use to cut a split-pin.
- 2.2. Where would you use long nose pliers?
- 3.1. Answer the following questions on hammers:
 - 3.1.1. Name the three parts of a hammer.
 - 3.1.2. Name four properties of a good hammer shaft.
 - 3.1.3. Give two uses of the ball pein hammer.
 - 3.1.4. How is the shaft fitted to the hammer?
 - 3.1.5. Explain the use of a soft face hammer.
4. Explain in your own words why Phillips screwdrivers are preferable to flat screwdrivers.
5. Where would you use Allen keys?
6. Answer the following questions on hacksaws:
 - 6.1. Name two types of frames.
 - 6.2. How are the blades classified?
 - 6.3. How is the length of the blade determined?
 - 6.4. Why are the teeth of hacksaw blades set?
7. Name four methods of classifying files.
8. What are the angles of the cut of a double-cut file?
- 9.1. Name four types of chisels and their uses.
- 9.2. Name four aspects to consider when using a chisel.
- 9.3. Why must the cutting edge of the flat chisel be slightly curved?
- 10.1. Name three different types of files.
- 10.2. How is the coarseness of file different?
- 10.3. Explain where you would use the following files:
 - a) Flat files
 - b) Square files
 - c) Round files
 - d) Half-round files
 - e) Three-square files
- 10.4. Describe a safety precaution when handling files regarding file handles.

- 9.1. What is an engineer's square made of?
- 9.2. Explain briefly how to test a work piece for square-ness using an engineer's square.
- 12.1. Explain what you can do with the square and blade of a combination set.
- 12.2. Explain how you can use the protractor head alone to determine the incline of a work piece.
- 12.3. Explain how you will determine the centre on a round work piece with a combination set.
- 13.1. State the use of a steel tape.
- 13.2. What is the case made of?
- 14.1. Name the material that a steel rule is made of.
- 14.2. How should you look after a steel rule?
- 15.1. Give the correct use of the scribe.
- 15.2. What material is a scribe made of?
- 16.1. Name the included angles of a:
 - (a) Prick punch
 - (b) Centre punch
- 16.2. When would you use a prick punch?
- 16.3. What materials are punches made from?

JOINING METHODS

1. You are given two pieces of 25 mm thick steel plate to join together by means of a double bolted lap joint with a chain arrangement.
 - 1.1. Calculate the bolt diameter, pitch (P), distance between centre lines (C1) and margin (M)
 - 1.2. Use a scale of 1:2 to construct a neat top view of the joint, indicating all the important distances you have calculated.
- 2.1. What is a semi-permanent joining application?
- 2.2. Which five factors will help you decide on an appropriate bolt or machine screw for a bolted joint?
- 2.3. Give an example of where studs are often used.
- 2.4. Name the five categories that locking devices are divided into and sketch an example of each type.
- 2.5. Why are locking devices so important?
- 2.6. Give a brief description of how a solid riveted joint is set up. Use a sketch to clarify your explanation.
- 2.7. Sketch three different types of blind rivets and mention where they are commonly used.
- 2.8. State one use for each of the following machine pins: hardened and ground dowel pins, taper pins, clevis pins and cotter pins.
- 3.1. What are keys commonly used for in engineering?
- 3.2. Sketch the Gib-head key and state why it has a small head attached to it.

FORCES

Activity

- 4.1. Describe what you understand to be tensile, compressive and shear stress.
Use illustrations to assist you in your description.
- 4.2. Explain how you would demonstrate shear stress.

FORCES

Parallelogram of forces

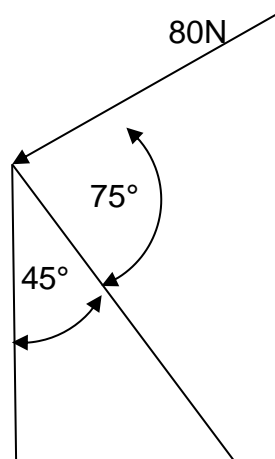
Use a scale of 1 cm = 10 N to solve the following exercises.

- 1.1. Two strings are attached to a nail. One string is pulling in an easterly direction with a force of 60 N. The other string is pulling with a force of 40 N in a direction of 60° north of east. Determine the resultant force on the nail.
- 1.2. Two rods are attached to a pin. One rod pulls on the pin with a force of 70 N on a bearing of 90° . The other rod pushes on the pin with a force of 95 N on a bearing of 120° . Determine the resultant force exerted on the pin.
- 1.3. Two rods are attached to a pin. One rod pushes on the pin with a force of 65 N on a bearing of 45° . The other rod pushes on the pin with a force of 85 N on a bearing of 180° . Determine the resultant force exerted on the pin.
- 1.4. Two forces act at a point. One force pulls on a bearing of 210° with a magnitude of 50 N and the other pulls on a bearing of 120° with a magnitude of 65 N. Determine the magnitude and the direction of the equilibrant.

Triangular forces

Use a suitable scale to solve the following exercises.

- 2.1. The diagram represents the lines of action of three forces which are in equilibrium. One of the forces is 80 N. Determine the other two forces.



- 2.2. Two ropes with lengths of 2 m and 4 m are attached to a body with a mass of 800 kg. The free ends of the ropes are attached to two points which are 5 m apart in the same horizontal line. Determine the tensions in the ropes.
- 2.3. A rod pushes vertically downwards on a pin with a force of 80 N and a rope pulls upwards at a bearing of 30° with a force of 120 N. Determine the resultant force on the pin.
- 2.4. The diagram Below Fig 2.4 shows a mass suspended from the end of a **jib**, AB, which is held in position by a tie, BC. The lengths of AB and BC are 1,0 m and 1,2 m respectively. AB is horizontal and AC is vertical. Determine the magnitude of the mass and tension in the tie when the force in the jib is 480 N.

2.5.

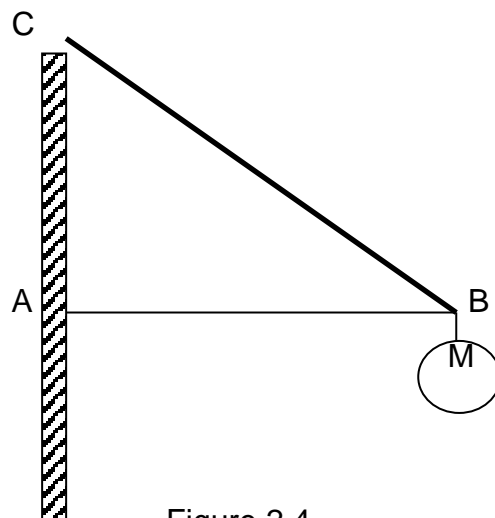
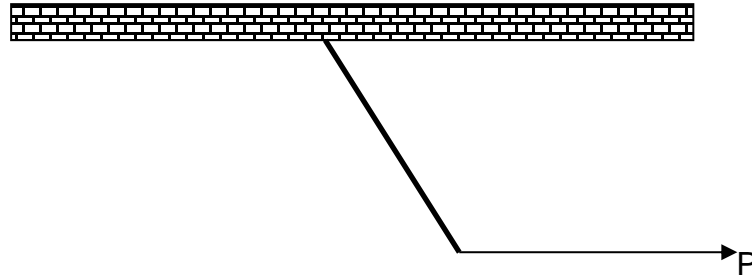


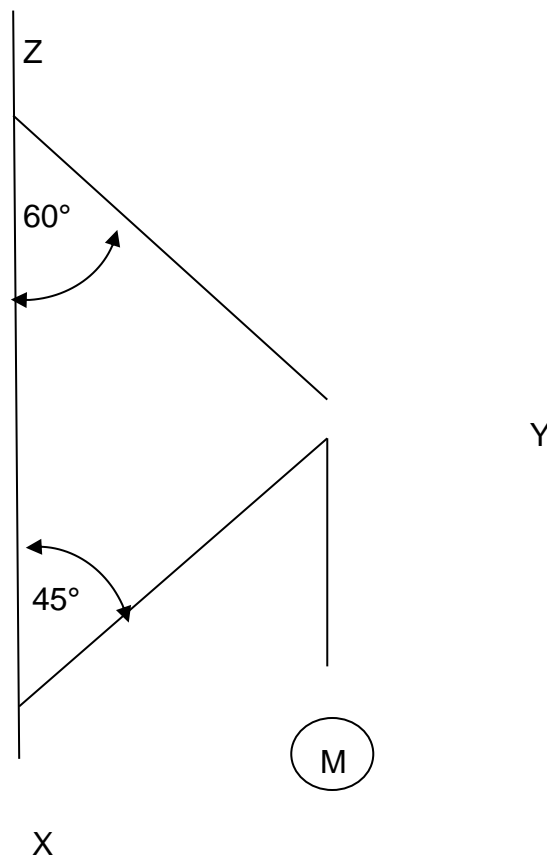
Figure 2.4

- 2.5 A mass of 1 200 kg is supported by two ropes which are inclined at 30° and 45° respectively to the horizontal. Determine the tensions in both ropes

- 2.6. A body with a mass of 1 000 kg is suspended by a rope. It is pulled in an easterly direction by the horizontal force of P, until the rope is inclined at 30° to the vertical, as shown in the diagram. Determine the magnitude of force P and the tension in the rope.



- 2.7. The following diagram shows a mass suspended from a **derrick**. If the maximum load this derrick can carry is 4 000 N, what will the tension in cable YZ be?



Horizontal and vertical components of a single force

Use a scale of 1 cm = 10 N to solve the following exercises.

- 3.1. A force of 45 N is applied to a body. The force is inclined at a bearing of
- (a) 20°
 - (b) 45°
 - (c) 90°
 - (d) 210°

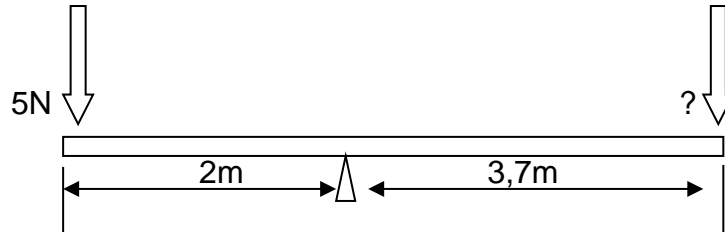
Determine the horizontal x and the vertical y components of the force in each case. (Draw four separate force diagrams.)

- 3.2. If the components of a force in the horizontal (x) axis is 60N and the vertical (y) axis is 80N, determine the magnitude and the direction of the force.

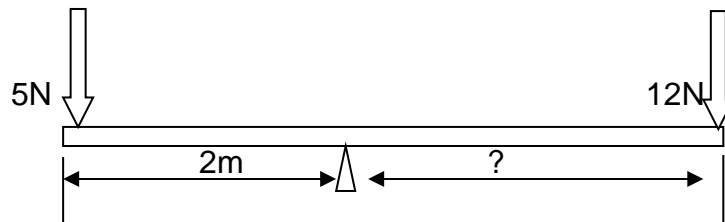
MOMENTS OF FORCE

Investigate the following questions regards moments of force. By means of calculations, determine the unknown element in each question. All the beams must be in equilibrium.

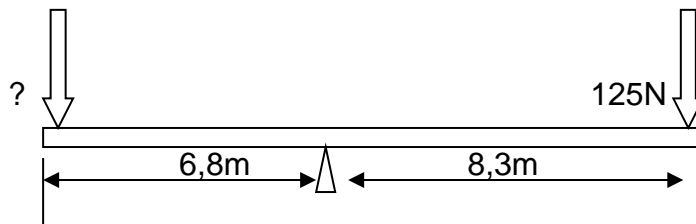
4.1



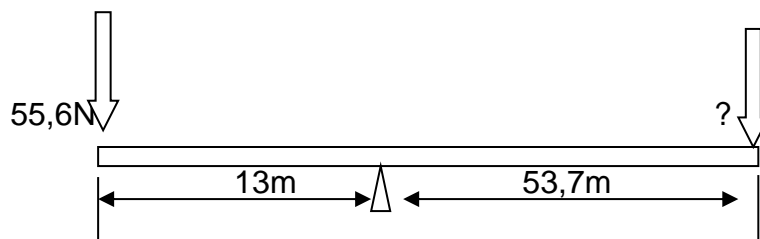
4.2



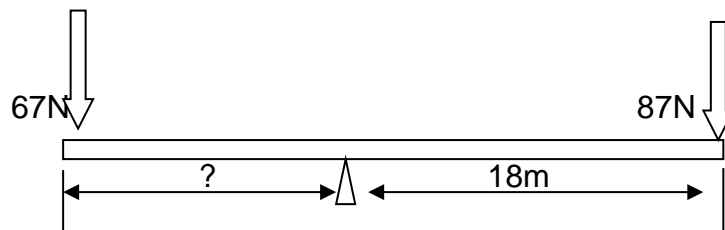
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4.4

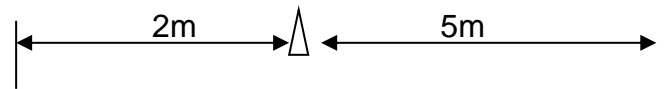


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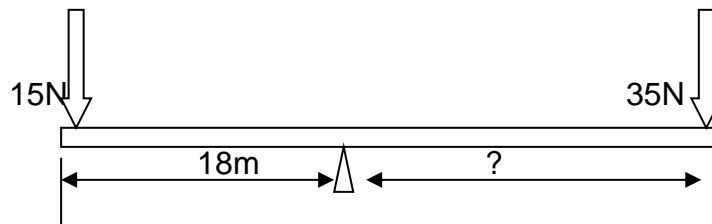


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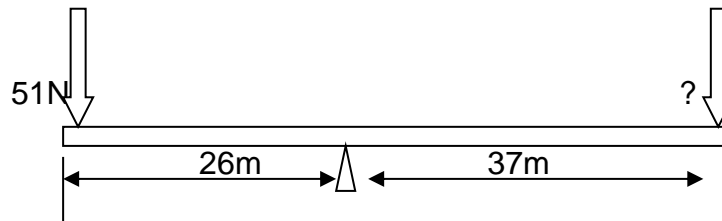




4.7



4.8



Stress

- 5.1 Describe what you understand to be tensile, compressive and shear stress.
Use illustrations to assist you in your description.
- 5.2 Explain how you would demonstrate shear stress.
- 5.3 A 5 x 15 mm rectangular bar is subjected to a tensile load of 15 kN.
Calculate the compressive stress in the bar.
- 5.4 Calculate the compressive stress in a \varnothing 15 mm round bar if it is subjected to a compressive load of 30 kN

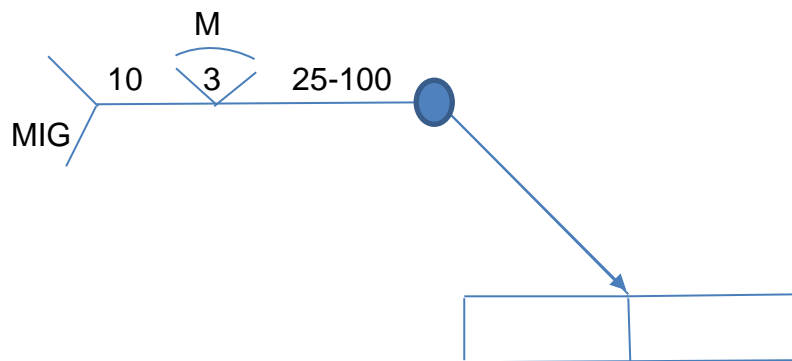
Terminology- Welding Symbols and Joints

Activity 1

Topic: Elements of a welding symbol

1.1 State the seven elements of a welding symbol. (7)

1.2 Identify all the element of a welding symbol below.



(10)

Activity 2

Topic: Welding Symbols

2.1 Complete the table below

WELD SYMBOLS	
TYPE	SYMBOL
FILLET	
SQUARE BUTT	
BEAD	
FUSION SPOT	
STUD	
SPOT	
SEAM	
FOIL SEAM	
FLUSH	
PROJECTION	

(9)

Activity 3

Topic: Welding joints

3.1 Name and illustrate the five main types of welding joints (10)

Activity 4

Topic: Oxy- acetylene welding

4.1 Gas welding is a fusion process, where the welding flame melts the joint to be welded and mixes the two surfaces together. Explain how does one perform the following techniques when fusion welding.

4.1.1 Leftward gas welding.

4.1.2 Rightward gas welding. (8)

Activity 1:**Maintenance (Generic)**

1. Describe the following types of maintenance:
 - a) Preventive maintenance
 - b) Predictive maintenance
 - c) Reliability centred maintenance.
2. What are the factors that affect the efficiency of preventative maintenance?
3. Describe the difference between preventative maintenance and predictive maintenance?
4. What is the outcome analysis for reliability centred maintenance?
5. Explain excessive wear.
6. What can the result be of a car engine overheating?
7. What is the most common problem in a car's braking system and name the symptoms that can be observed?

Activity 2: Terminology- Developments

- a) Parallel-line development
- b) Radial-line development

1. Development

The development of surface of an object means the unrolling and unfolding of all surfaces of the object on a plane. If the surface of a solid is laid out on a plain surface, the shape thus obtained is called the development of that shape. In other words, the development of a solid is the shape of a plain sheet that by proper folding could be converted into the shape of the concerned solid.

2. Importance of development

Knowledge of development is very useful in sheet metal work, construction of storage vessels, chemical vessels, boilers and chimneys. Such vessels are manufactured from plates that are cut according to these developments and then properly bend into desired shapes. The joints are then welded or riveted.

3. Principle of development

Every line on the development should show the true length of the corresponding line on the surface which is developed.

4. Method of development

- a) Parallel-line method
It is used for developing prisms and single curved surfaces like cylinders, in which all the edges/generators of lateral surfaces are parallel in each other.
- b) Radial-line method
It is employed for pyramids and single curved surfaces like cones in which the apex is taken as centre and the slant edge or generator as radius of its development.

Practical Activity

Draw the development of a cone of diameter 38mm and inclined height of 50mm.

Activity 3 – Developments

- c) Parallel-line development
- d) Radial-line development

5. Method of development

- c) Parallel-line method
It is used for developing prisms and single curved surfaces like cylinders, in which all the edges/generation of lateral surfaces are parallel in each other.
- d) Radial-line method
It is employed for pyramids and single curved surfaces like cones in which the apex is taken as centre and the slant edge or generator as radius of its development.

Practical Activity:

Draw the development of the section cylinder using the Parallel-line method.

Diameter = 50mm

Height = 70mm

Activity 4 :- Developments

- a) Parallel-line development
- b) Radial-line development

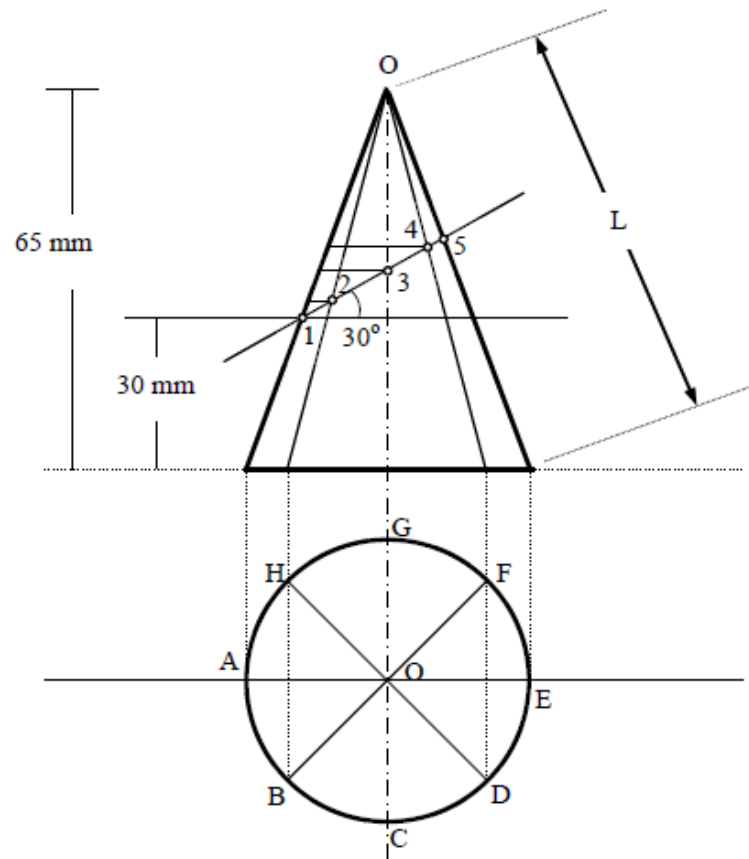
6. Method of development

- e) Parallel-line method
It is used for developing prisms and single curved surfaces like cylinders, in which all the edges/generation of lateral surfaces are parallel in each other.
- f) Radial-line method
It is employed for pyramids and single curved surfaces like cones in which the apex is taken as centre and the slant edge or generator as radius of its development.

Practical Activity:

Draw the development of a cone :

A cone of base 50mm diameter and height 65mm rests with its base on H.P. A section plane perpendicular to V.P and inclined at 30° to H.P bisects the axis of the cone. Draw the development of the lateral surface of the truncated cone.



Activity 5: Developments

Development of a right cone

7. Method of development

g) Parallel-line method

It is used for developing prisms and single curved surfaces like cylinders, in which all the edges/generation of lateral surfaces are parallel in each other.

h) Radial-line method

It is employed for pyramids and single curved surfaces like cones in which the apex is taken as centre and the slant edge or generator as radius of its development

Activity 6: Developments

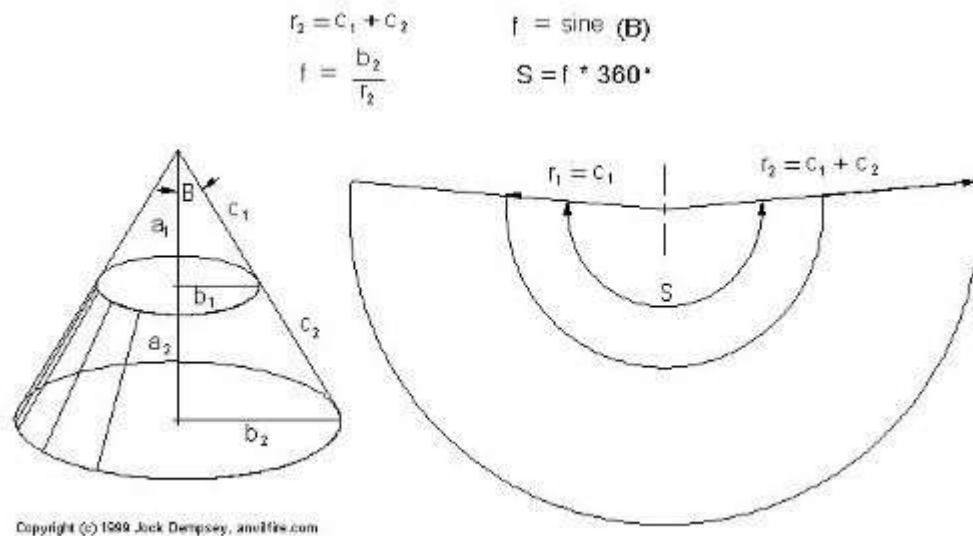
Development of a right cone

8. Method of development

- i) Parallel-line method
It is used for developing prisms and single curved surfaces like cylinders, in which all the edges/generation of lateral surfaces are parallel in each other.
- j) Radial-line method
It is employed for pyramids and single curved surfaces like cones in which the apex is taken as centre and the slant edge or generator as radius of its development.

Practical Activity

Develop the pyramid to scale using the information provided below.



Activity 7: Developments

Development of an elbow joint

- a) Parallel-line method
It is used for developing prisms and single curved surfaces like cylinders, in which all the edges/generation of lateral surfaces are parallel in each other.
- b) Radial-line method
It is employed for pyramids and single curved surfaces like cones in which the apex is taken as centre and the slant edge or generator as radius of its development.

Practical Activity

Draw the development of an elbow joint of two cylinders of equal diameter intersecting at 90 degrees. Cylinder diameter of 30mm. The small height is 25mm and large height is 75mm.



Activity 8: Developments

Development of a 90° Segmental bend – 1 Full, 2 Half Segments

9. Activity One Method of development

k) Parallel-line method

It is used for developing prisms and single curved surfaces like cylinders, in which all the edges/generation of lateral surfaces are parallel in each other.

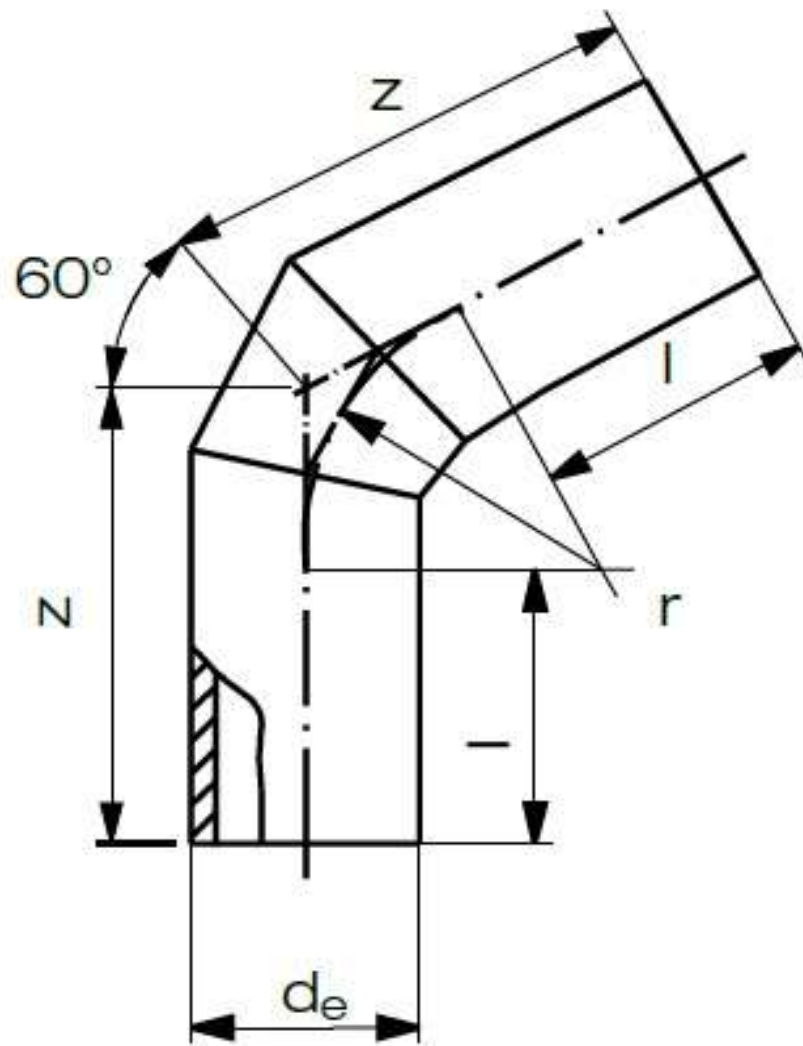
l) Radial-line method

It is employed for pyramids and single curved surfaces like cones in which the apex is taken as centre and the slant edge or generator as radius of its development.

Practical Activity

Draw the development of a 90° Segmental bend – 1 Full, 2 Half Segments. Cylinder diameter of 30mm. The small height is 25mm and large height is 75mm.



**Dimensions:**

- d_e - 30mm
- N - 75mm
- I - 50mm
- Z - 75mm

Activity 9 :Materials

It is important to have an understanding to the properties of steel and what role it plays in society and in engineering. There three categories of metals, Ferrous , Non Ferrous and Alloys. Refer to your textbook and other sources to answer the following questions.

1. What is an alloy
2. Of which metal is bauxite a source?
3. Into which three categories can the properties of metals be divided?
4. What are the characteristics of a tough metal?
5. What are the three basic materials used in extracting iron form iron ore?
6. What is the basic source of iron and steel?
7. Name three different methods of producing steel.
8. What effect does carbon content have on plain carbon steels?
9. Why are alloying elements added to steel?
10. Describe the following properties of carbon steels:
 - (a) Brittleness
 - (b) Ductility
 - (c) Elasticity

Activity 10 : Materials

- Cast iron is exactly what it says – it has been casted.
 - Good examples? Three legged pots, older vehicle's cylinder heads, engine blocks
-
1. Describe how cast iron is produced in a blast furnace.
 2. Describe
 - (a) Grey cast iron
 - (b) White cast iron
 3. Name five uses for cast iron.

Activity 11 : Materials

Steel alloys are a combination of two of metals that produces different characteristics and working properties used for specific purposes.

1. Describe Stainless steel.
2. Name at least five different areas where stainless steel is being used with at least 2 uses in each area.

Activity 12: Materials

This activity will help you to understand and relate to the principals of non-ferrous elements and what role it plays in society and in engineering. Learn about the different types of Ferrous Metals.

1. List the uses and properties of the following in table format:
 - a) Copper.
 - b) Tin
 - c) Lead
 - d) Zinc
 - e) Aluminium

Activity 13: Materials

- We know what ferrous mean by now, and we know does “non-ferrous” applies
- We are going to look into more non-ferrous elements that are widely used in the industry

Answer the following questions:

1. Describe Bronze.
2. Name five different types of bronze.
3. Name the uses for bronze.
4. Describe Brass
5. Name the uses for brass.
6. What additives are in *white metal*?
7. Name two uses for white metal.
8. What is *Duralumin*?

Activity 14: Materials

Activities Outcome:

- Learners apply and integrate theoretical knowledge in practice.
- Learners to display knowledge through the application of safe procedures and adherence to the specific safety measures when using basic tools and equipment.
- Learner to do research and record their findings in an appropriate academic format.

ENGINEERING MATERIALS

A - Non ferrous metals:

- Copper, tin, lead, zinc, and aluminium

B - Non ferrous alloys:

- Yellow copper, bronze, phosphor bronze, white metal, duralumin, solder and silver solder

PRACTICAL TASK:

- Select 10 different engineering materials from group A and B mentioned above?
- Collect a sample of each and display the material on a suitable board that is not bigger than an A2, size?
- Give two examples of each where this engineering material can be used in the manufacturing ?

NOTE:

- Allocate marks according to number of correct answers given in task
- You can make use of marking guide below
- Materials collected by learner must match his selection – e.g. if he/she selected white cast iron his sample must be white cast iron
- Answers on uses must be correct in order for learner to achieve the marks, do not just award a mark the answer must be correct
- The properties and use can be displayed on the board or on separate pages (Teacher give guidance)

The task will be assessed using the following Criteria:

GRADE: 10		YEAR: 2021		SCHOOL:			
DATE STARTED:				DATE COMPLETED:			
MECHANICAL TECHNOLOGY				EDUCATOR:			
PROJECT: PAT TASK 3				NUMBER OF LEARNERS:			
Page 1 of							
Engineering Materials							
NAMES OF LEARNERS	FACETS	ENGINEERING MATERIAL COLLECTION CORRECT MATERIALS ON DISPLAY	USE OF ENGINEERING MATERIAL	OVERALL LAY-OUT OF DISPLAY OF ENGINEERING MATERIALS ON SUITABLE BOARD	NEATNESS OF PRESENTATION	TIME MANGEMENT – PAT HANDED IN IN TIME	TOTAL
		Marks	(10 X 2) 20	(10 X 2) 20	4	4	2
1							
2							
3							
4							
5							
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SIGNATURE OF EDUCATOR:							
SIGNATURE OF HEAD OF DEPARTMENT:							
SIGNATURE OF PRINCIPAL:							