GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

REMOTE LEARNING ACTIVITY BOOK

(RELAB)

SUBJECT: WELDING & METALWORK

GRADE: 10

TEACHER GUIDE

(Expected Answers)

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 utiisation 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**

EXPECTED ANSWERS

SAFETY

Question 1 and 2

Below is a rubric to assess the essay question on HIV and Aids.

Level of Achievement	General Approach	Comprehension
Exemplary **(10 pts)**	•Addresses the question. •States a relevant, justifiable answer. •Presents arguments in a logical order. •Uses acceptable style and grammar (no errors).	•Demonstrates an accurate and complete understanding of the question. •Backs conclusions with data and warrants. •Uses 2 or more ideas, examples and/or arguments that support the answer.
Adequate **(6 pts)**	•Does not address the question explicitly, although does so tangentially. •States a relevant and justifiable answer. •Presents arguments in a logical order. •Uses acceptable style and grammar (one error).	•Demonstrates accurate but only adequate understanding of question because does not back conclusions with warrants and data. •Uses only one idea to support the answer. •Less thorough than above.
Needs Improvement **(3 pts)**	•Does not address the question. •States no relevant answers. •Indicates misconceptions. •Is not clearly or logically organized. •Fails to use acceptable style and grammar (two or more errors).	•Does not demonstrate accurate understanding of the question. •Does not provide evidence to support their answer to the question.
Not Answered well. Poor attempt (1 pts)		

Question 3

Should there be an emergency, that mean somebody got hurt or seriously hurt, that immediate attention can be given to the wound before professional help can be obtained.

Question 4

- Adhesive Plaster Strips
- Bandage
- Cotton Wool
- CPR Resuscitation Barrier Device
- First Aid Dressing
- Gauze Swabs
- Gloves
- Gloves
- Scissors (General)
- Splints
- Tweezers (Metal)
- Wound Cleaner
- Any other that may not appear in this memorandum

SAFETY

Activity 5.1 - Multiple-choice questions

5.1.1. d

5.1.2. a b c

5.1.3. b c

5.1.4. d

5.1.5 a

5.1.6. a

5.1.7. c

5.1.8. b

5.1.9. d

5.1.10. a

5.1.11. b

Activity 5.2 – True or False

5.2.1. True

5.2.2. True

5.2.3. False

5.2.4. True

5.2.5. True

5.2.6. False

5.2.7. True

5.2.8. False

5.2.9. True

5.2.10. False

Activity 5.3.

5.3.1 The Occupational Health and Safety Act aims to provide for the health and safety of persons at work and for the health and safety of persons in connection with the activities of persons at work and to establish an advisory council for occupational health and safety.

5.3.2 Any five of the following:

- the right to life
- freedom from torture and degraded treatment
- freedom from slavery and forced labour
- the right to liberty
- the right to a fair trial
- the right not to be punished for something that wasn't a crime when you did it
- the right to respect for private and family life
- freedom of thought, conscience and religion
- freedom of expression
- freedom of assembly and association

- the right to marry or form a civil partnership and start a family
- the right not to be discriminated against in respect of these rights and freedoms
- the right to own property
- the right to an education
- the right to participate in free elections

5.3.3. Any of the following:

- emails
- internet access
- telephone calls
- data
- images

5.3.4. FIVE responsibilities of the employer:-

- Provide and maintain systems of work, plant and machinery that are safe and without risks to health.
- Take steps to eliminate or reduce any danger or potential hazard to the safety or health of employees.
- Make arrangements to ensure the safety and absence of risks to the health of employees in connection with the production, processing, use, handling, storage or transport of articles or substances.
- Provide training and supervision as may be necessary to ensure the health and safety at work of the employees.
- Ensure that work is performed and that plant or machinery is used under the general supervision of a person trained to understand the hazards associated with it and who has the authority to ensure that precautionary measures taken by the employer are implemented.

FIVE responsibilities of the employee:

- Ensure the health and safety of themselves and of other persons who may be affected by their acts.
- As regards any duty or responsibility imposed on the employer or any other person by this Act, co-operate with such employer or person to enable that duty or responsibility to be performed or complied with.

- Carry out any official order given to them, and obey the health and safety rules and procedures laid down by the employer or by anyone authorised by their employer, in the interest of health or safety.
- If any situation which is unsafe or unhealthy comes to their attention, report such situation to their employer or to the health and safety representative as soon as possible.
- If they are involved in any incident which may affect their health or which has caused an injury to them, report such incident to their employer or to anyone authorised by the employer, or to their health and safety representative, as soon as possible.

5.3.5. Good housekeeping in a workshop simply means an orderly arrangement of tools, equipment, operations, storage facilities and materials. To put it in simpler words, housekeeping can be defined as everything in its place and a place for everything.

5.3.6.

- Equipment and materials are stored in their proper places
- The first aid kit is easily accessible and contains the necessary medical items.
- Fire extinguishers are maintained and in good working order.
- Warning signs are visible and easily understood.
- Areas containing machinery are demarcated and clean
- Walking path are clearly indicated and obstacle free
- Places where mortar, plaster or cement is mixed are thoroughly cleaned after use.
- Poisonous materials are safely stored and used.
- Sharp objects are used with caution.
- Games and jokes are prohibited in the workplace.
- Smoking and drinking are prohibited in the workplace.
- Any materials or liquids that are spilled are immediately cleaned
- Any damaged or broken tools or machinery are immediately repaired.

5.3.7.

- Physical hazards are the most common hazards and are present in most workplaces at some time. Examples include: frayed electrical cords, unguarded machinery, exposed moving parts, constant loud noise, vibrations, working from ladders, scaffolding or heights, spills, tripping hazards.
- Ergonomic hazards occur when the type of work you do, your body position and/or your working conditions put a strain on your body. They are difficult to identify because you don't immediately recognize the harm they are doing to your health. Examples include: poor lighting, improperly adjusted workstations and chairs, frequent lifting, repetitive or awkward movements.
- Chemical hazards are present when you are exposed to any chemical preparation (solid, liquid or gas) in the workplace. Examples include: cleaning products and solvents, vapours and fumes, carbon monoxide or other gases, gasoline or other flammable materials.
- Biological hazards come from working with people, animals or infectious plant material. Examples include: blood or other bodily fluids, bacteria and viruses, insect bites, animal and bird droppings.

5.3.8.

- Plan the arrangement of the machines and worktables to ensure enough space to manoeuvre.
- Calculate the number of machines and workshop accessories.
- Calculate the number of workers (people) in the workshop.
- Are there enough electrical circuits to supply your power needs.
- Plan and design the storage place.

5.3.9. An accident is an unfortunate incident that happens unexpectedly and unintentionally, typically resulting in damage or injury.

5.3.10.

- Defective tools, equipment or supplies.
- Inadequate supports or guards.
- Congestion in the workplace.
- Inadequate warning systems.
- Fire and explosion hazards.
- Poor housekeeping.
- Hazardous atmospheric condition.
- Excessive noise.
- Poor ventilation.
- Rough and slippery floors
- Insufficient light in a workshop
- Badly planned workshop

5.3.11.

- Operating without qualification or authorization.
- Failure to tag out/lockout.
- Operating equipment at unsafe speed.
- Failure to warn.
- Bypass or removal of safety devices.
- Using defective equipment.
- Use of tools for other than their intended purpose.
- Working in hazardous locations without adequate protection or warning.
- Improper repair of equipment.
- Horseplay.
- Wearing unsafe clothing.
- Taking an unsafe position.

5.3.12.

COLOUR	**MEANING OR PURPOSE**	**INSTRUCTION & INFORMATION**
RED	Prohibition/Danger alarm	Dangerous behavior; stop; shutdown; emergency cut-out devices; evacuate
YELLOW or **AMBER**	Warning	Be careful; take precautions; examine
BLUE	Mandatory	Specific behavior or action e.g. wear personal protective equipment
GREEN	Emergency escape; first aid. No danger	Doors; exits; escape routes equipment and facilities Return to normal
RED(fire-fighting signs)	Firefighting equipment	Identification & location

5.3.13.

	SIGN	DESCRIPTION	COLOUR
What the group name of this type of signs: ***Information Signs***		First aid equipment	White on green background
		Eye wash	White on green background
		Emergency telephone	White on green background
		Escape Route Right	White on green background
		Eye wash	White on green background

	SIGN	DESCRIPTION	COLOUR
What is the group name of this type of signs: ***Safety***		Electric shock hazard	Black border with a yellow centre and a black symbol inside
		Warning of fire hazard	Black border with a yellow centre and a black symbol inside

	SIGN	DESCRIPTION	COLOUR
		Warning of slippery surface	Black border with a yellow centre and a black symbol inside
		Ionizing radiation hazard	Black border with a yellow centre and a black symbol inside
		Suspected loads hazard	Black border with a yellow centre and a black symbol inside

	SIGN	DESCRIPTION	COLOUR
What is the group name of this type of signs: **Prohibition Signs**		Proceeding beyond this sign is prohibited	White on red background
		Loose clothing, ties, jewelry and unconfined long hair prohibited	Red sign with black symbol
		Use of compressed air to dust body prohibited	Red sign with black symbol

	SIGN	DESCRIPTION	COLOUR
		Thoroughfare for pedestrians prohibited	Red sign with black symbol
		Drinking of this water prohibited	Red sign with black symbol

	SIGN	DESCRIPTION	COLOUR
What is the group name of this type of signs: ***Fire Safety Signs***		Location of fire blanket	Red on white background
		Location of fire- fighting equipment	Red on white background
		Fire extinguisher	Red on white background
		Fire hose	Red on white background

	SIGN	DESCRIPTION	COLOUR
		Fire hydrant	Red on white background

	SIGN	DESCRIPTION	COLOUR
What is the group name of this type of signs: ***Regulatory Signs***		Eye protection	White on blue background
		Respiratory protection	White on blue background
		Hearing protection	White on blue background
		Hand protection	Hand protection
		Keep area clean	White on blue background

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 the main switch must be placed on an electrical machine?

The main switch (Double Pole Single Throw Switch - DPST) is on an electrical machine it must be on the front panel of the 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 the main switch of a domestic installation must be placed?

The main switch (Double Pole Single Throw Switch - DPST) of a domestic installation must be placed at the point of the entry of the main power supply.

5.4.3. Briefly describe what is meant by critical and non-critical emergencies.

- Non Critical Emergencies – It is a condition not in a state of crisis or emergency
- Critical Emergencies – It is a situation in a state of crisis or emergency

5.4.4.

- Class C: electrical fires - Class C fires are contained using Carbon Dioxide (CO2) fire extinguishers and Dry Chemical fire extinguishers

5.4.5.

- Faulty electricity
- Heated surfaces.
- Lightning
- Friction
- Static electricity

5.4.5.

- Class A: wood, paper, etc.
- Class B: flammable liquids such as petrol, oil and paraffin.
- Class C: electrical fires.
- Class D: flammable metals such as magnesium, lithium, etc.

ACTIVITY 5.5

5.5.1.

(a) Struck by lightning
(b) Mixing water with electricity
(c) Touching a high voltage source such as a high tension wires fell during storm
(d) Touching a low voltage, current source such as an electric socket or worn or bare electrical wire.

5.5.2.

(a) Look first, do not touch the victim.
(b) Turn the source of electricity at the control panel or fuse box
(c) Pull the victim away from the source by means of non-conductive material such as dry wood if the victim is under immediate danger.
(d) Do not remove the victim unless the he is under immediate danger.
(e) Check for signs of circulation. If absent begin cardiopulmonary resuscitation (CPR) immediately.
(f) Prevent shock by lying the victim down with his feet slightly higher than the head.
(g) Cover the victim with a blanket to maintain body heat.
(h) Call for help.

5.5.3.

- On hearing the evacuation alarm, immediately prepare to leave the building. Secure confidential materials and valuables, collect personal belongings, shut down experiments, and switch off computers, electrical appliances, equipment and machinery.
- If the evacuation alarm sounds, or if instructed to do so, leave the building by the nearest and safest exit route. All doors should be closed (but not locked) on leaving.
- If possible take hand held personal belongings (such as handbags and briefcases) with you when you leave. Do not return to collect belongings.
- Assist any person with a disability to leave the building. Do not attempt to carry people down stairs.

- Walk quickly and calmly to the designated assembly area for your building.
- DO NOT USE THE LIFTS
- Remain at the assembly area (in groups) until instructed to leave by Rescue Services personnel.
- Do not re-enter the building until informed that it is safe to do so by Rescue Services personnel. Do not enter a building in alarm

5.5.4.

Ventilation is one of the most important engineering controls available to the industrial hygienist for improving or maintaining the quality of the air in the occupational work environment.

5.5.5.

- Always wear an apron when working with ferric chloride because it will stain your clothes on contact.
- Protective glasses are essential, as any chemical that comes into contact with your eyes may possibly lead to blindness. Also wear protective glasses during the drilling process.
- Use gloves when doing the etching. The chemical will stain the skin and can cause skin irritations.
- Work in a well-ventilated room.
- Store all used ferric chloride in a big plastic container, with a lid, that can be disposed of by a special waste removal company when full.
- Never work in metal containers; rather use plastic or ceramic. Ferric chloride attacks most metals.

6.1.

6.1.1.

- When using any tool, always wear safety glasses for eye protection.
- Screwdrivers should only be used for their intended purpose—driving or removing screws. Screwdrivers should never be used for prying, punching, chiselling, scoring or scraping.
- While both slotted and cross-slotted screwdrivers will fit many fastener sizes, it is best to use screwdrivers of the proper sizes that fit snugly into the slot or recessed portion of the fastener head.
- Plastic handles should be made of fire and heat resistant materials. If properly designed, they give excellent grip. Rubber or vinyl is often used as a non-slip or insulating cover on plastic handles.
- Typical screwdriver handles will not insulate the user from electric current.
- It is time to discard the tool when the handle of a screwdriver becomes worn or breaks, if the tip is damaged or if the shaft is bent.
- Always keep the screwdriver shank in line with the screw shank. This will avoid damaging the screw slot and pushing the screw out of line.
- Never use pliers for added turning leverage on the shank of a screwdriver. However, a wrench may be used on square-shank drivers.
- Screwdriver slippage can cause injury. Never hold the piece you’re working on in your hand while driving or loosening screws or bolts. Place it on a work surface and use a vice or a clamp to hold the material, whenever possible.
- Never carry a screwdriver in your pocket. The tip of the screwdriver is so sharp and hard that will hurt your body.

6.1.2.

- Always inspect the hammer before use. Loose hammer heads or nails stuck in the claw might fly off and cause injury.
- If a hammer head is loose on the handle, immediately take it to the instructor.
- Never use a hammer to anything but unhardened nails and nail sets; use a ball-peen hammer for still chisels and punches
- Never strike two hammers together. The faces are very hard and a blow might cause a chip to break off and fly out at a high speed.
- Knuckles can be injured if you “choke up” too far on a hammer when striking a blow.
- Unless the blow is truck squarely the hammer ma bounce off the work and cause injury.
- Place a hammer on the bench carefully; a falling hammer can cause serious injury.

6.1.3.

- Never use a file without a handle. Painful injuries may result.
- Use a file card to clean the file, NOT your hand. The chip can penetrate your skin and cause a painful infection.
- Files are very brittle and should never be used as a pry.
- Use a piece of cloth to wipe the surface being filed. Short burrs are formed in filing and can cause serious cuts.
- Never hammer on or with a file, it may shatter and ships fly in all directions.

6.1.4.

- All work being cut must be clamped properly to the table.
- Maintain a margin of safety, keeping your hands and fingers at a safe distance from the blade.
- Always concentrate on your work; becoming distracted can cause injuries.

6.1.5.

- Read and follow the manufacturer’s instructions and warning labels.
- Wear personal protective equipment that is appropriate for the hazards you may be exposed to while performing the required task.
- Ensure the work area is clear of debris.
- Ensure there is adequate lighting in the work area.
- Oil pliers and wire cutters regularly. A drop of oil on the hinge will make the tool easier to use. Pull on pliers; do not push away from you when applying pressure. If the tool slips unexpectedly, you may lose your balance or hit your hand against something.
- Cut material at right angles.
- Do not expose pliers or wire cutters to excessive heat.
- Do not hammer on pliers or wire cutters to cut wires or bolts.

6.1.6.

- Use utility pliers to grip round, square, flat and hexagonal objects.
- Ensure that toothed jaws are clean and sharp.
- Greasy or worn jaws can result in compromised safety.
- Such tools also require increased force to hold the workpiece. Inspect the tool for damage prior to each use.
- Ensure the tool is in good working condition.
- Do not expose pliers or wire cutters to excessive heat.
- Do not use pliers on nuts and bolts; use a wrench.

6.1.7.

- Steel rules are precision measuring instruments.
- Don’t use your steel rule as a scraper, screwdriver or pry bar.
- Don’t drop it or bang it around.
- Keep your steel rule very lightly oiled.
- Inspect your steel rule periodically.
- Be sure that it is not bent or dented.

- Check that the corners are square and sharp.
- Be sure there are no burrs anywhere on the steel rule. If you find any of these problems, replace your steel rule.

6.1.8.

- Take special care with these sharp pointed tools.
- Never use one of these tools in place of the other.
- Each tool has a specific duty, be sure to use the proper tool for the proper activity.

6.2.

- Choose the correctly sharpened drill for the type of work you need to do and the material you are about to drill.
- Do not leave the key in the chuck when you are not at the machine
- Never leave the machine running if unattended
- Clamp the workpiece securely to the table and do not hold it by hand
- Never attempt to stop the workpiece by hand if it slips from the clamp
- A drill should run at the correct speed for the job
- Do not force the drill into the workpiece – this may cause broken or splintered drills and may cause injury
- Use a brush or wooden rod to remove chips from the drill – and not your fingers, waste or rags
- When reaching around a revolving drill, be careful that your clothes do not get caught in the drill or chuck

7.1.1.

- Make sure that all guards are in place.
- Do not use a machine or come close to its moving parts while wearing loose clothing such as ties, unbuttoned sleeves, etc. and keep any cleaning material such as waste and rags away from rotating parts.
- See that there is no oil or grease which can cause slipping on the floor around the machine.
- Spanners or keys must never be left on rotary parts. Always disconnect, remove or stand clear of hand wheels, levers or chuck keys before setting machine or feeds in motion. Never apply a wrench to revolving work or parts.

- Select the correct tool for the job.
- Work pieces and holding devices must always be clamped safely and firmly. Pay special attention when fitting spanners and keys as a loose fit may cause slips, resulting in injury to your arm or hand.
- Do not use your hands to remove cuttings while the machine is in motion. Use a wire hook or a brush.
- Never adjust or attempt to adjust the cutting tool while the machine is running.
- Do not lean on the machine at any time. This is very dangerous habit which one does without thinking and can result in serious injury.
- Do not attempt to stop the machine by placing your hand on the chuck while the machine is slowing down.
- Give attention to cutting-fluid control before switching the machine on.

7.1.2.

- Never use the machine unless the guards are correctly fitted.
- See that there is no oil or grease which can cause slipping on the floor around the machine.
- Check that the tool rest is not more than 3 mm from the grinding wheel.
- When setting the machine in motion, never stand in front of the wheel. Before the grinding operation takes place, let it run idle for a few seconds.
- When the wheel is running out of balance, trim it with an emery-wheel dresser.
- Never grind on the side of a straight wheel, use one the face.
- Use various wheels for the purpose for which they are made.
- Do not grind soft materials such as lead, copper, aluminium, etc., on wheels which are not made for such work.
- Never jab grinding matter onto the wheel, but approach it with care.
- Never force grind, so that it stops the motor or slows it excessively.
- Never adjust the tool rest while the machine is running.
- Work pieces and holding devices must always be clamped on safely and firmly
- Never let the wheel stand in cutting fluid, as this may cause it to become out of balance.

7.1.3.

- Select the correct type of wheel for the job.
- Inspect the wheel for cracks and tap it to apply the “ring test”.
- Make sure that the wheel’s speed does not exceed the manufacturer’s recommendation.
- Never force the wheel onto the spindle.
- Use smooth paper washers on each side of the wheel.

- Use true and correctly recessed flanges of the same size and at least one third the diameter of the wheel.
- Gently tighten the grinding wheel with a spanner only enough to hold the wheel firmly.
- Replace guards correctly.
- Stand aside and set the machine in motion. Let the machine idle before you dress the wheel, using an emery-wheel dresser.
- Finally stop the machine and reset the tool rest within 2 mm of the wheel surface.
- Ensure that the tool rest is parallel to the wheel surface.

7.1.4.

- A fixed guard which prevents hands or fingers reaching through, over, under or around the guard into the point of operation.
- A self-adjusting guard which automatically adjusts itself to the thickness of the material being worked and which prevent hands or fingers reaching through, over, under or around the guard into the point of operation.
- See that there is a supporting guard on the machine that will hold the plate down while it is being bent.
- Another safety device is the automatic sweep-away or push-away that pushes any part of the operator's body out of the danger zone when the working stroke starts.
- Today there are electronic presence-sensing devices which stop the working stroke if the device senses any foreign object in the danger zone.

7.1.5.

- See that all the guards are in place.
- See that no oil, grease or obstacles are around the machine.
- Select the correct blade for the material to be cut.
- When changing blades, ensure that the machine is switched off at the main switch.
- When removing or replacing the blade, do it gently. Quick movements, such as pulling the blade off, may result in a severe cut on your hand.
- Do not adjust guides while the machine is running.
- All material must be clamped properly before cutting is started.

- Long pieces off material must be supported at the end.
- Always stop the machine if you leave it unattended.

TERMINOLOGY Welding

ACTIVITY 1

1.1. Arc:

An electrical breakdown of a gas that produces an ongoing plasma discharge, resulting from a current through a nonconductive media such as air.

1.2 Arc Length

The distance between the electrode and molten pool of th parent metal

1.3 Leg length

Distance between the root and the toe of a fillet

1.4 Included angle

Angle between the fusion faces of the joint

1.5 Parent metal

Metal that parts are to be welded on

1.6 Root run

First run made in the root of the material in a multirun weld.

1.7 Run

The weld that is deposited in the gap between the metal pieces.

1.8 Toe of weld

Boundary between the weld face and the metal

1.9 Weld bead

Metal that is deposited on the surface during the welding process

1.10 Tack weld

Small weld used to hold pieces of metal together before the final weld is done

ACTIVITY 2

2.1 Durability

Size and mass

Accuracy

2.2 Wood

Cardboard

Steel

Hardboard

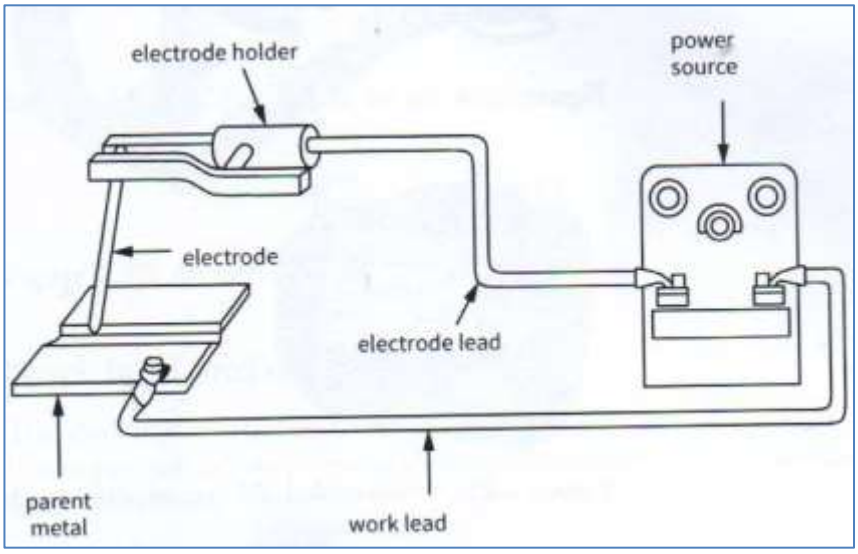
2.3 Practicality of use

Mass production of items

Accuracy

ACTIVITY 3

3.1



3.2 Electrode lead is used to hold the electrode that is being used while welding. The work lead is used to earth the machine to the material that is being welded

ACTIVITY 4

41.

- Electrode lead and holder
- Work lead and earth clamp
- Welding helmet
- Chipping hammer
- Wire brush
- Welding electrodes
- Personal protective equipment

4.2

- Overalls
- Leather apron
- Hood
- Safety boots
- Spats
- Leather gloves

ACTIVITY 5

5.1.2 Regulation of the flow of gas from the cylinder to the torch

5.1.2 To stop any feedback through the hoses or flames that may cause an explosion in the bottles.

5.2 Back feeding is the result of a drop in pressure on the one hose and results in mixing of gas it is stopped by using flashback arresters.

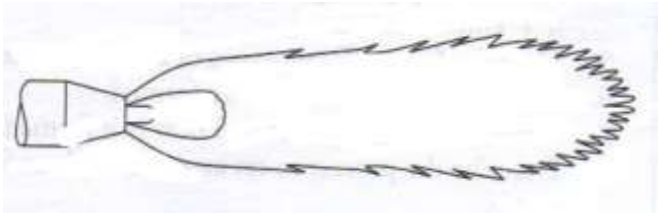
5.3 Oxygen cylinder is black and the larger of the two
Acetylene is maroon and the smaller of the two.

5.4 1. Cylinders

2. Attach Regulators
3. Attach flashback arrestor
4. Attach hoses
5. Attach blowtorch
6. Attach nozzle
7. Check for leaks

ACTIVITY 6

6.1



Carburising flame (Acecetylene is in excess)

Neutral flame (Oxygen and acetylene are the same)

Oxydising flame (Oxygen is excess)

TOOLS

1.1. An open-ended spanner can be used for general work where it is impossible to use a ring spanner. It is also used when tightening a bolt to avoid the opening stretching and the spanner slipping.

1.2. Ratchets

Various extensions (short and long)

In places where you cannot get your hands.

Sockets

In places where you cannot get a spanner

Universal joint

In places where you cannot turn a spanner, but if you work at an angle, you can turn the bolt or nut.

2.1. Diagonal pliers

2.2. In hard to reach places where your hand or fingers cannot reach.

3.1.1. Head, shaft and handle.

3.1.2. Shaft must be well-seasoned, straight-grained wood; absorb shock; length of handle should suite size.

3.1.3. The striking face is used for driving, blows and the pein for riveting.

3.1.4. The hole or eye, into which the shaft fits, is tapered. This allows the end of the shaft to expand when a wedge is driven into the shaft. The wedge is made of steel or hard wood.

3.1.5. It is used on finished surfaces which should not be damaged.

4. Four sides will be in contact with the screw. The chances of the screwdriver slipping are very small.

5. With the fastening and loosening of Allen cap screws or in conjunction with sockets.

6.1. Fixed type (frame cannot be adjusted and takes only one length of blade) and adjustable type (frame can adjust and takes blades of various lengths)

6.2. There are two main type of blades – high speed steel blades (used on harder metals) and medium carbon steel blades (used on softer metals such as copper)

6.3. The length is measured between the outside edges of the holes in the blade.

6.4. The teeth are set to saw a wider cut than the blade itself, and this prevents it from binding in the saw-cut and breaking. Blades can be set alternatively or in a wavy pattern. Alternate teeth are set slightly outward to the left and right. This method is used on blades with fine teeth.

7. Files are designed for the different types of filing operations and are graded and classified according to their length, section, cut and degree of coarseness.

8. This file has a second series of parallel teeth cut in the opposite direction. The first set is cut at about 45° and the other set is cut at about 70° to 80° to the axis of the file.

9.1. The flat chisel

The flat chisel, also known as the cold chisel, is the most commonly used for general dressing, chipping and cutting. The cutting edge should be slightly convex as this prevents damage to the outer corners and gives a longer life.

Cross cut chisel:

This chisel is used for cutting grooves, slots, recesses and keyways.

Round nose chisel

The straight type is used for drawing over drill centres, in drilling and cutting oil grooves along flat or convex surfaces such as slides, bearings, etc. The curved type is used for cutting oil grooves along the curved surface of a bearing.

Diamond point chisel

The diamond point chisel is used mainly for finishing off and cleaning out corners, and for cutting ‘V’ grooves

9.2. When chipping, watch the cutting edge and not the head of the chisel.
Place a suitable guard in front of the work to protect others from injury.
Wear goggles to protect your eyes.
Dress the head of the chisel when it becomes mushroomed or ragged, as the chips that may break off are liable to cause serious injury to yourself or anyone else nearby.

9.3. The cutting edge should be slightly convex as this prevents damage to the outer corners and gives a longer life

10.1. Single-cut files, double-cut files and rasps

10.2. There are rough, bastard, second-cut and smooth files

10.3. Uses for files

a) They are used for general purposes
b) They are used for filing corners, slots and square holes.
c) They are used for opening out holes and for filing round corners
d) They are used for filing corners less than 90° and for filing concave surfaces.
e) They have three 60° corners and are used for sharpening saw-teeth and to file corners less than 90°.

10.4. Always ensure that the file tang fits tightly into the handle, as a file with a loose handle is liable to cause serious injury.

11.1. The stock made of steel and the blade is hardened and tempered.

11.2. For correct checking of squareness, the stock should be held firmly against the true side of the job. The blade is lowered onto the face which is to be checked. This should be done against a bright light.

12.1. The square and blade can be used for:

- Checking and marking-off of external and internal right angles
- as a depth gauge
- checking and marking-off of 45° angles
- the square head may be used alone as a spirit lever

12.2. The protractor head alone can be used to determine the incline of a work piece as follows;

- Release the protractor head on the work piece
- Release the two protractor locknuts
- Turn the protractor until the bubble indicates level
- Tighten the two locknuts and test the level again
- On the protractor, read off the incline in degrees at which the work piece is placed

12.3. Determining of centre on round work piece with a combination set.
When the centre head is fitted to the blade, the side of the blade is exactly in the centre of the V formed by two legs. The purpose of the centre head is to determine the middle point on the face of a round work piece.

13.1 A steel tape is used to measure long lengths.

13.2 The case is made of leather or plastic.

14.1. A rule is made of spring steel, cast steel or stainless steel, the latter being the best as it does not rust.

14.2. Take care so that the edges do not get knocked about, particularly the end where the graduations begin.

15.1. A scriber is used to draw lines on materials.

15.2. A scriber is made of tool steel and is available in various sizes.

16.1. (a) 60 degrees (b) 90 degrees

16.2. The punch is used to mark or “pop” scribed lines to make them prominent. The punch can also be used to indicate the centre of a circle.

16.3. This punch is made of tool steel.

JOINING METHODS

1.1. The table in the learner’s book can be used to refer to the relevant formula needed to complete the task. Since a double row lap joint with a chain arrangement is specified, the following formula must be applied.

Bolt diameter =6,05 x $\sqrt{t}$

=6,05 x $\sqrt{25}$

=30,25 mm

(Note that bolt diameter is always rounded up or down to the nearest metric bolt size).

The bolt diameter is therefore 30 mm or M30

Pitch (P) =3 x D (bolt diameter)

=3 x 30

=90 mm

Distance between centre lines

(C) = 0,8 x P (**chain arrangement**)

=0,8 x P

=0,8 x 90mm

=72 mm

Margin (M)=$1\frac{1}{2}$ D

=$1\frac{1}{2}$ D x 30

=45 mm

1.2. The following diagram depicts a scale 1:2 re-presentation of how the joint would be marked out:

2.1. A semi-permanent joining application is a method of joining materials together in a secure manner, which can also be taken apart at a later stage if necessary.

2.2. Head style, drive configuration body, point style and finish.

2.3. Studs are often used to attach the cylinder head of a motor engine to the engine block.

2.4. Friction locking devices:
Washers
Serrated washers
Positive locking devices
Slotted nuts
Crown nuts
Tab washers
Lock plates

2.5. Locking devices prevent any unwanted rotation due to shock, movement and vibration of machine parts.

2.6. As can be seen in the diagram below, the rivet shank is cut so that it protrudes from the joint by 1,5 times its own diameter. Once heated, its head is formed by a dolly and set under the pressure of a pneumatic or manual riveter. On cooling, the river contracts and pulls the two plates together.

2.7. The following are three commonly used rivets:
Standard open types are used for general riveting purposes. Sealed types are used for pressure and water tight joints. Grooved types are used where greater grip is required in soft materials. Peel-type rivets are used for brittle material such as glass-fibre.

2.8. Hardened and ground down pins are used to align and locate machine parts such as castings. Taper pins are used to attach wheels and pulleys to shafts. Clevis pins are used to connect yokes and eye members. Cotter pins (split pins) are used in conjunction with other fasteners such as slotted nuts.

3.1. Keys are used in keyways to ensure positive rotation between pulleys, sprockets and wheels to parts such as engines and gearboxes.

3.2. The small head is used to aid removal of the key.

4.

a) $W = \frac{D}{4}$

$W = \frac{80}{4}$

= 20mm

$T = \frac{D}{6}$

$T = \frac{80}{6}$

= 13,33mm

L = 1,5 x D

= 1,5 x 80

= 120mm

$t\ (taper) = T - \left(\frac{L}{100}\right)$

$t\ (taper) = 13{,}33 - \left(\frac{80}{100}\right)$

$t\ (taper) = 13{,}33 - 0{,}8$

$t\ (taper) = 12{,}53mm$

b) $W = \frac{D}{4}$

$W = \frac{100}{4}$

= 25mm

$T = \frac{D}{6}$

$T = \frac{100}{6}$

= 16,66mm

L = 1,5 x D

= 1,5 x 100

= 150mm

$t\ (taper) = T - \left(\frac{L}{100}\right)$

$t\ (taper) = 16{,}66 - \left(\frac{150}{100}\right)$

$t\ (taper) = 16{,}66 - 1{,}5$

$t\ (taper) = 15{,}16mm$

c) $W = \frac{D}{4}$

$W = \frac{95}{4}$

= 23,75mm

$T = \frac{D}{6}$

$T = \frac{95}{6}$

= 15,83mm

L = 1,5 x D

= 1,5 x 95

= 142,5mm

$t\ (taper) = T - \left(\frac{L}{100}\right)$

$t\ (taper) = 15{,}83 - \left(\frac{142{,}5}{100}\right)$

$t\ (taper) = 15{,}83 - 1{,}425$

$t\ (taper) = 14{,}405mm$

d) $W = \frac{D}{4}$

$$W = \frac{120}{4}$$

= 30mm

$$T = \frac{D}{6}$$

$$T = \frac{120}{6}$$

= 20mm

L = 1,5 x D

= 1,5 x 120

= 180mm

$$t\ (taper) = T - \left(\frac{L}{100}\right)$$

$$t\ (taper) = 20 - \left(\frac{180}{100}\right)$$

$$t\ (taper) = 20 - 1{,}8$$

$$t\ (taper) = 18{,}20mm$$

e) $W = \frac{D}{4}$

$W = \frac{55}{4}$

= 13,75mm

$T = \frac{D}{6}$

$T = \frac{55}{6}$

= 9,17mm

L = 1,5 x D

= 1,5 x 55

= 82,5mm

$t\ (taper) = T - \left(\frac{L}{100}\right)$

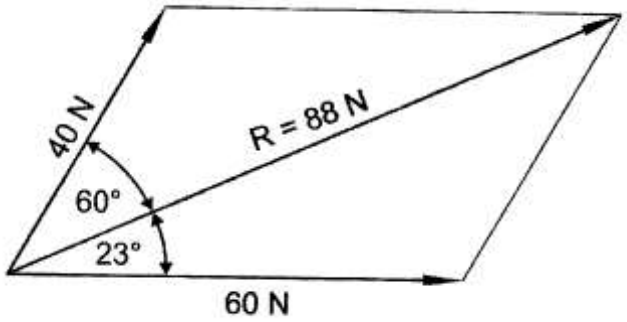
$t\ (taper) = 9{,}17 - \left(\frac{82.5}{100}\right)$

$t\ (taper) = 9{,}17 - 0{,}825$

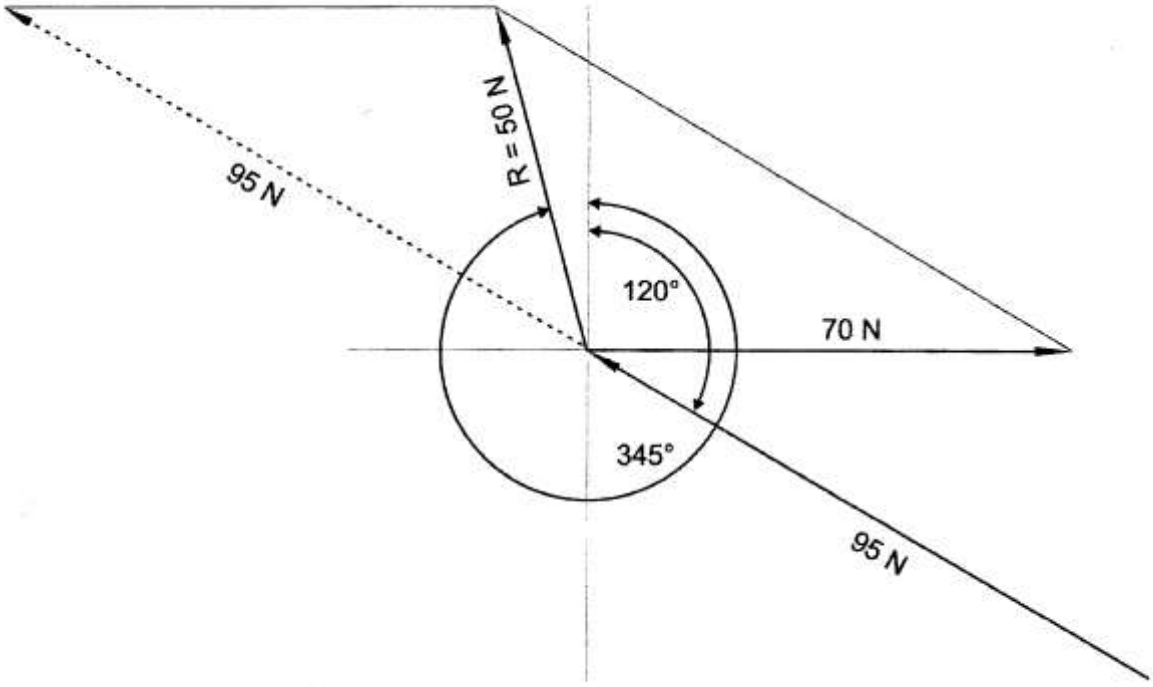
$t\ (taper) = 8{,}36mm$

FORCES

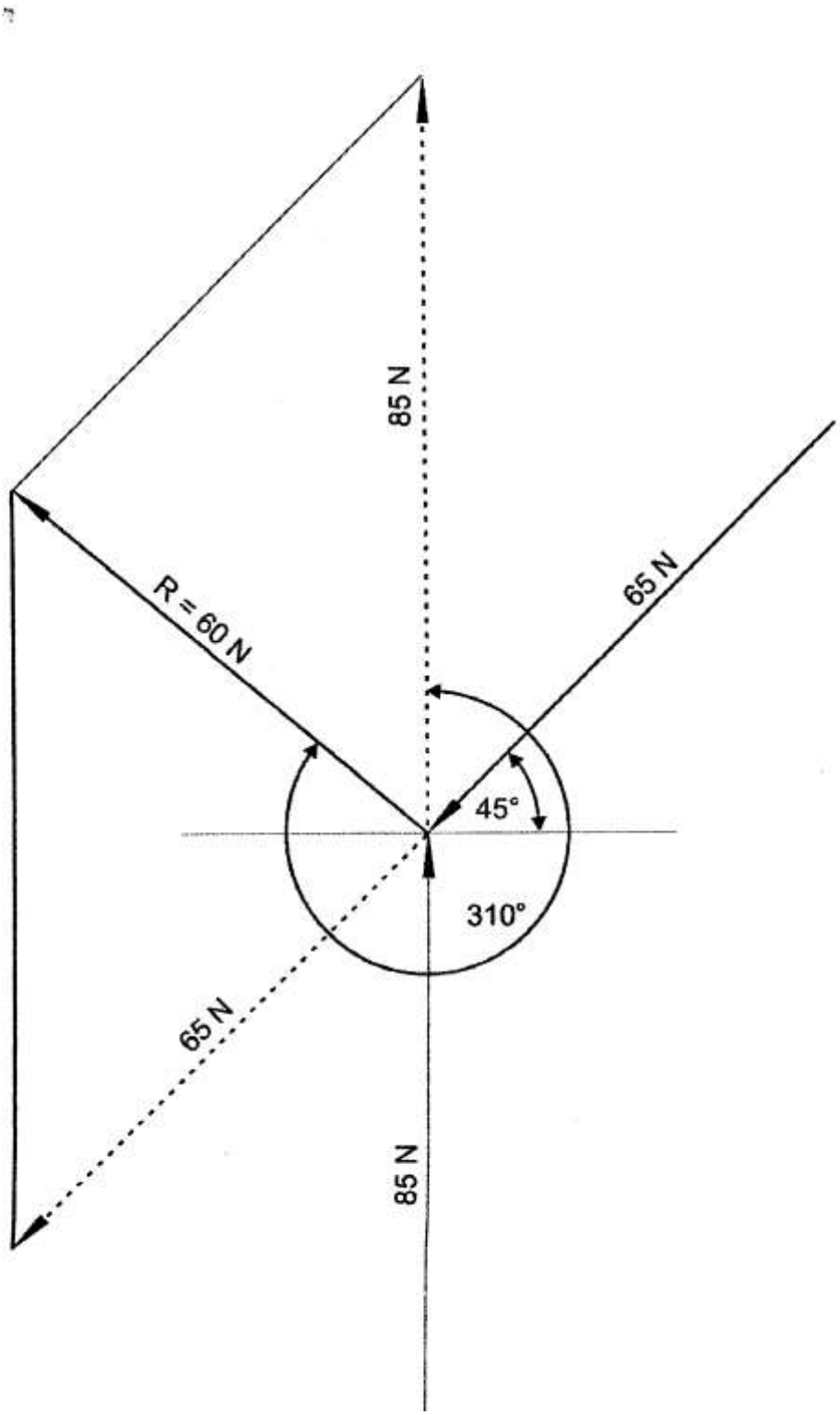
1.1. The resultant of the force on the nail is 88n in a direction of 23° north of east



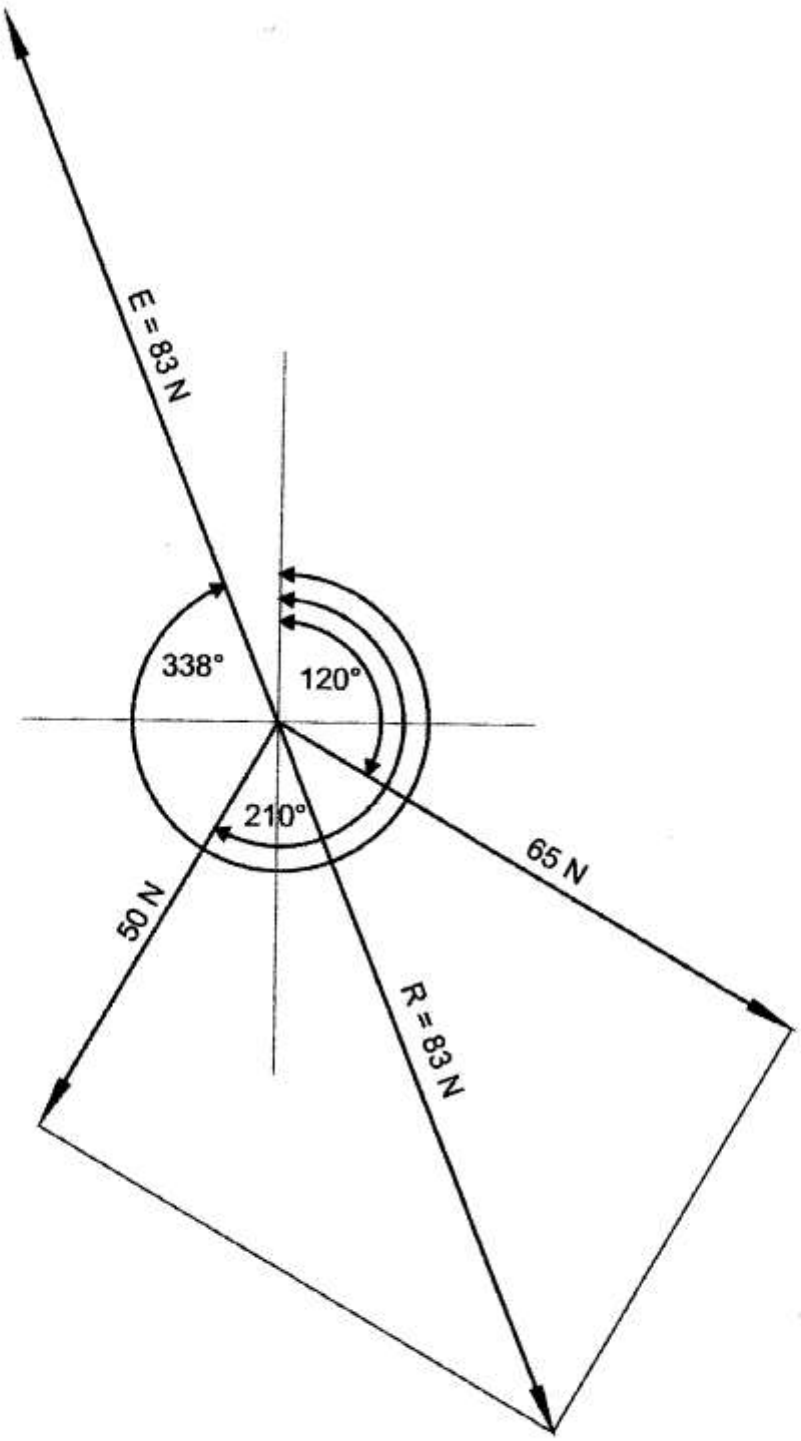
1.2. The resultant force on the pin is 50N on a bearing of 345°



1.3. The resultant force on the pin is 60N on a bearing of 310°

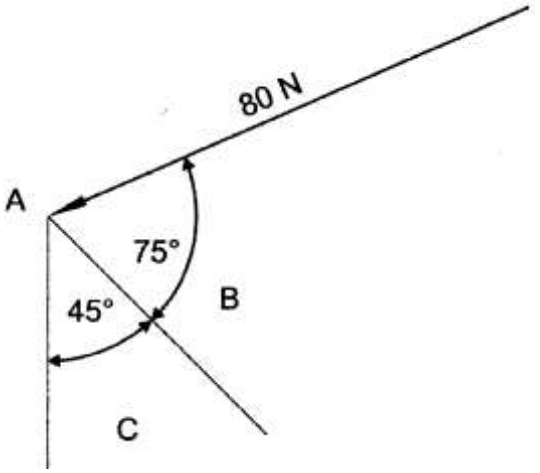


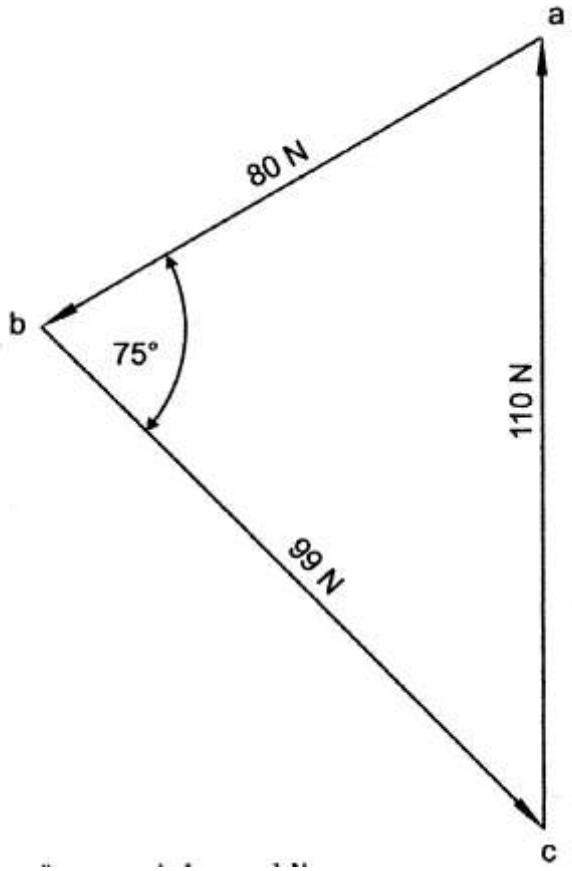
1.4. The equilibrant force has a magnitude of 83N on a bearing of 338°



Triangular forces

2.1. The scale of the space and force diagram is 1mm = 1N

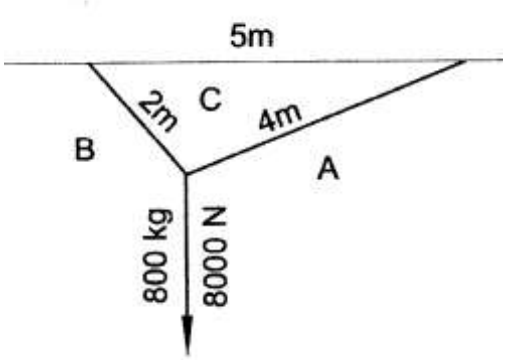


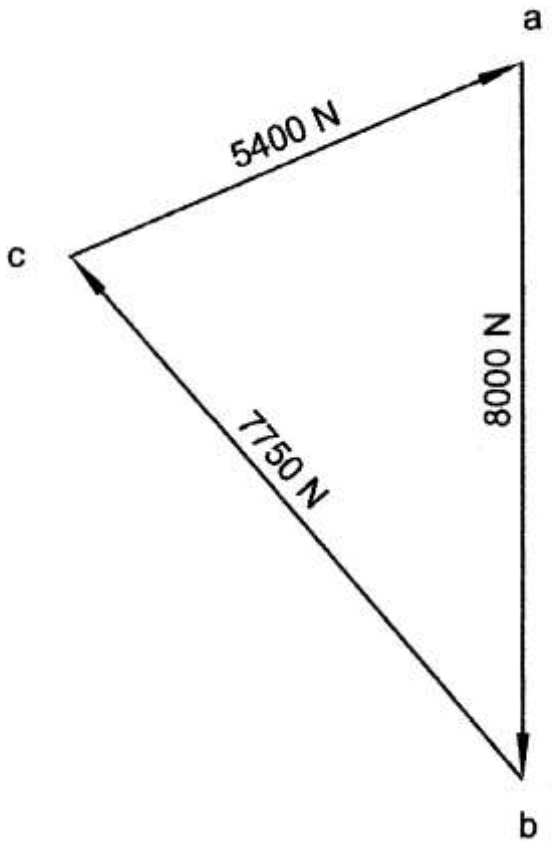


The force in rope **bc** has a magnitude of 99N on a bearing of 135°.
The force in rope **ca** has a magnitude of 110N on bearing of 0°.

2.2. The scale for the space diagram is 1cm = 1m

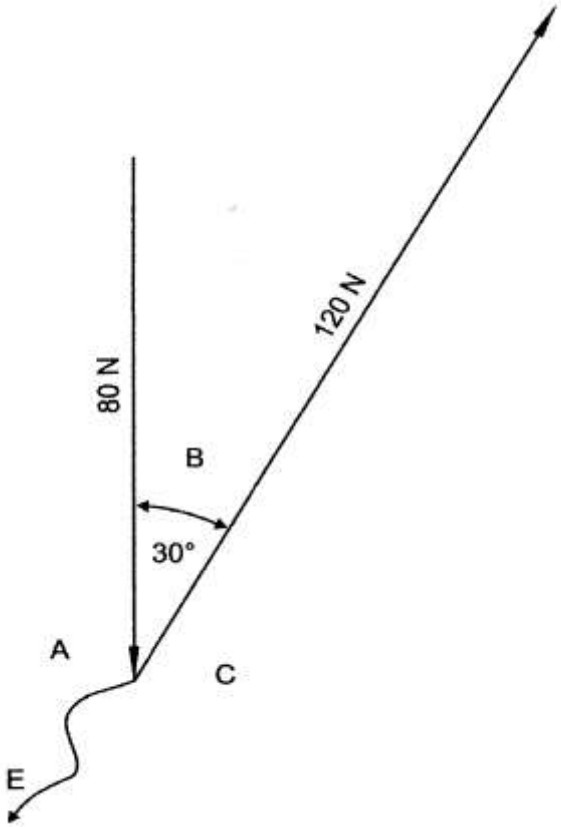
The scale for the force diagram is 1mm = 100N

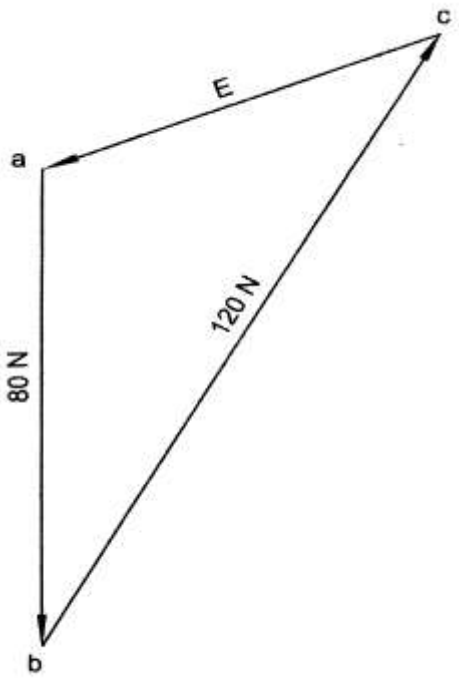




The tension (pulling force) in rope **bc** has a magnitude of 7750N.
The tension in rope **ca** has a magnitude of 5400N.

2.3. The scale of the space and force diagram is 1mm = 1N

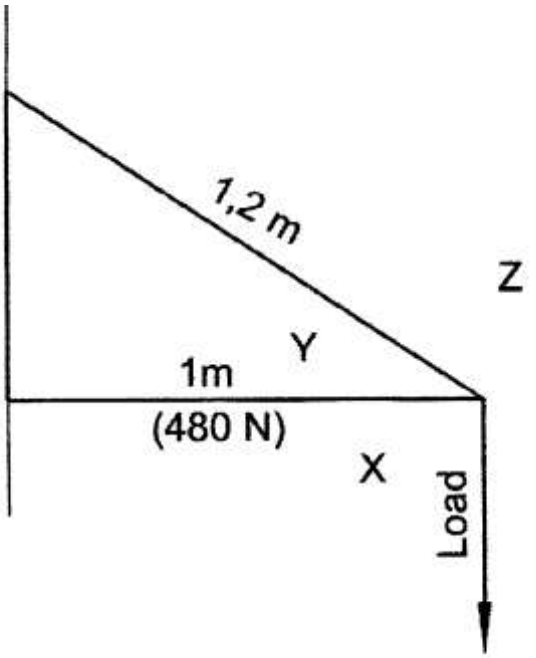


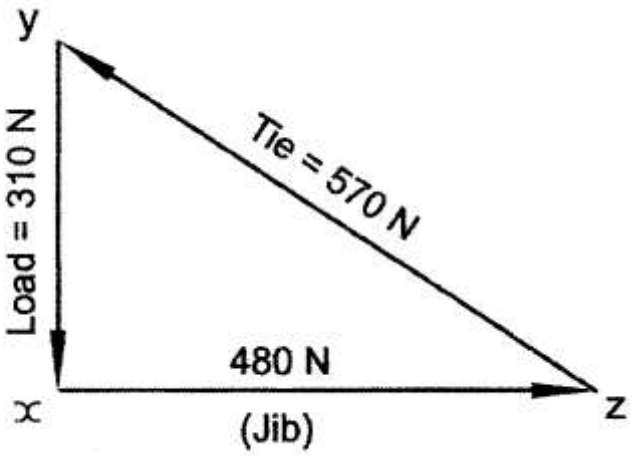


The equilibrant is determined to be 65N on a bearing of 249°. Because the resultant has the same magnitude, but opposite direction to the equilibrant, it has a magnitude of 65N on a bearing of 69°

2.4. The space diagram has a scale of 50mm = 1m

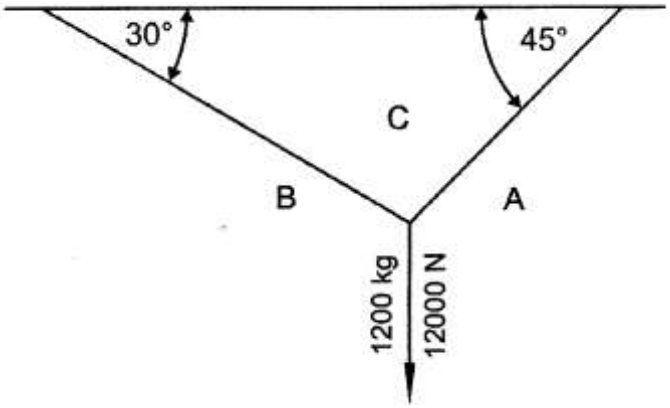
The force diagram has a scale of 1mm = 10N

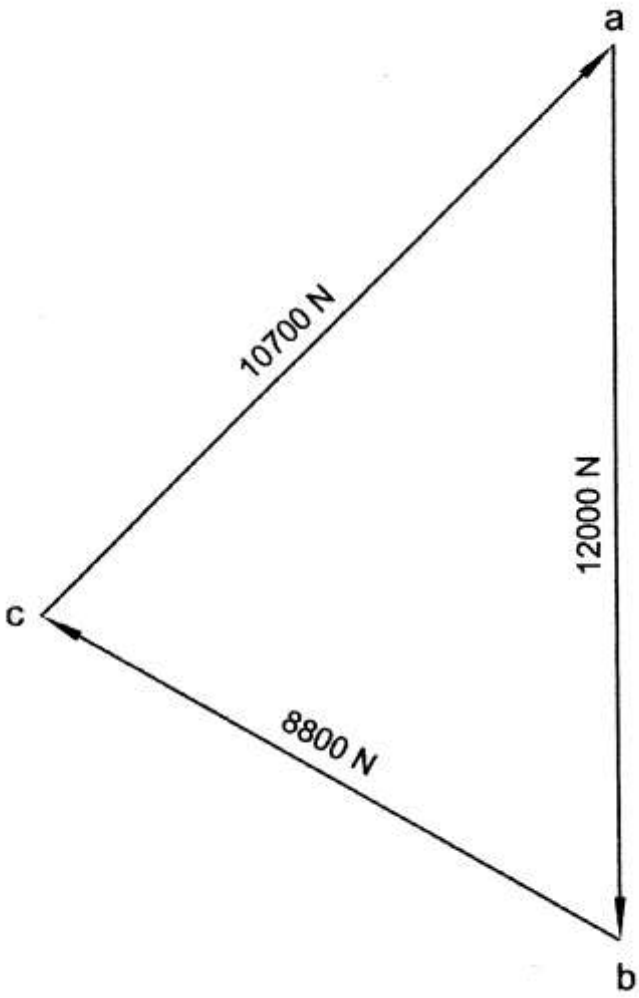




The tension in the tie was determined to be 570N. The load was determined to be 310N. Since the mass was asked for, and not the load, a calculation must be performed to convert force to mass. To calculate mass from load, divide by 9,81 or 10(rounded off). Thus $310N \div 10 = 31kg$

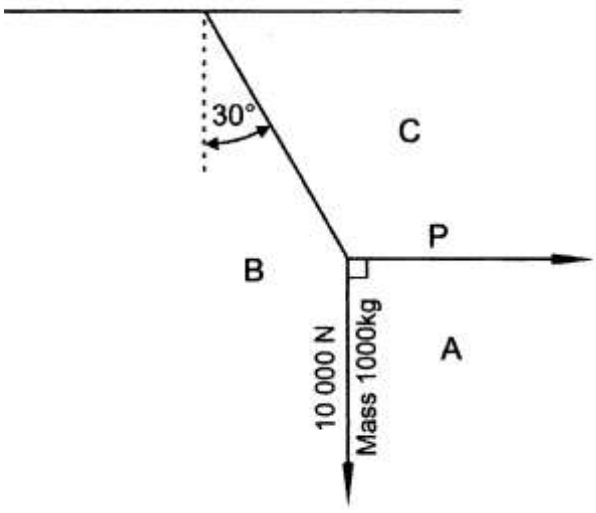
2.5. The space diagram must be constructed by using a protractor
The force diagram scale is 1mm = 100N

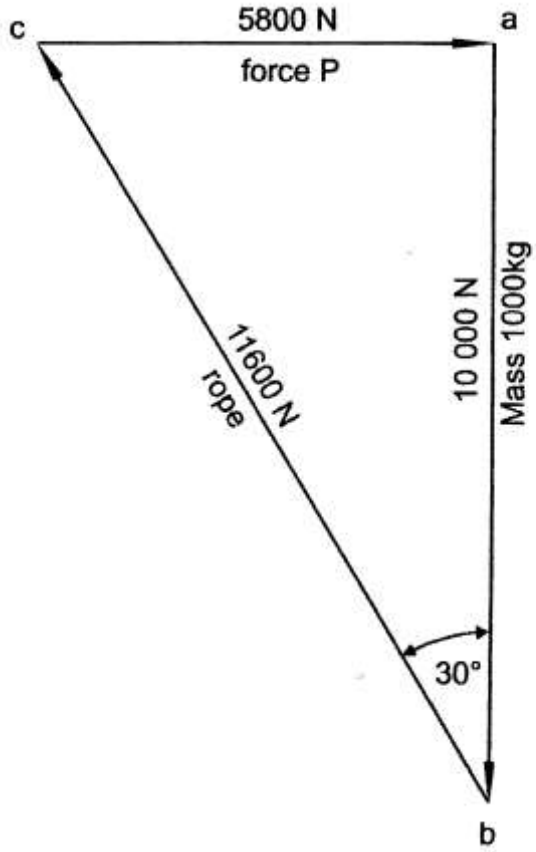




The tensions in rope **bc** and **ca** are 8800N and 10700N respectively

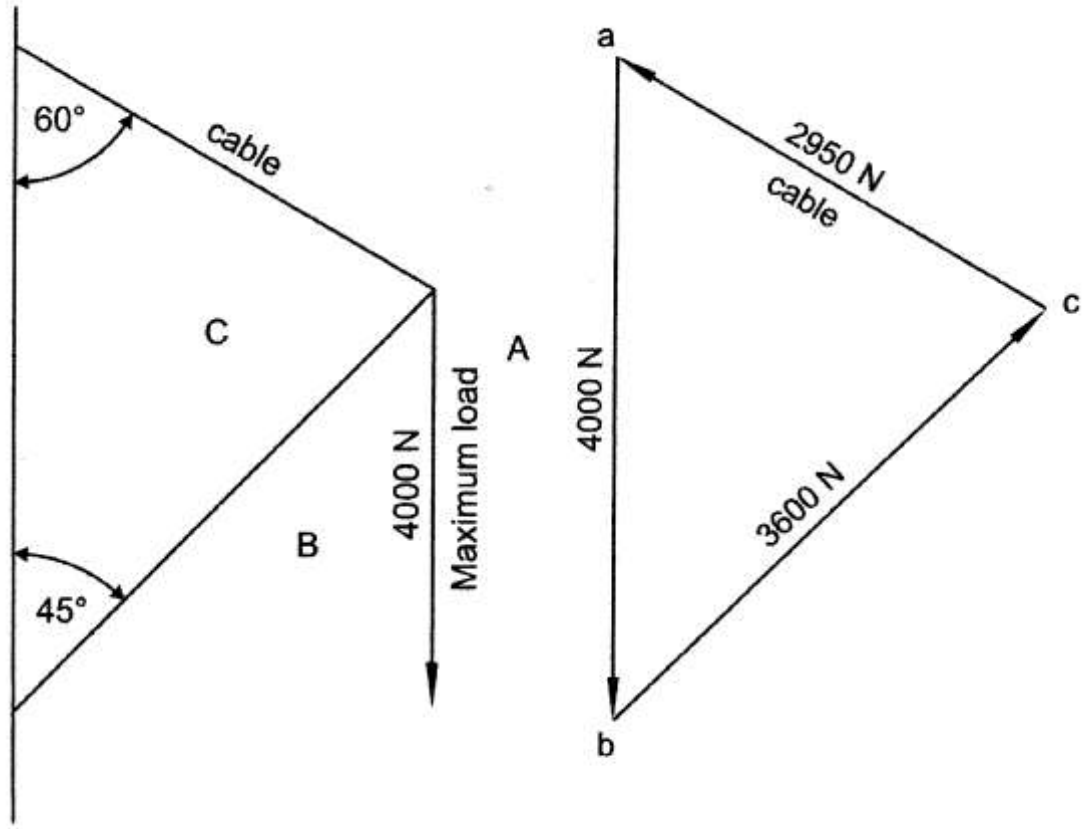
2.6. The scale of the force diagram is 1mm = 100N





The magnitude of the horizontal force P is 5800N. The tension in the rope is measured to be 11600N.

2.7. The scale of the force diagram is 1mm = 50N

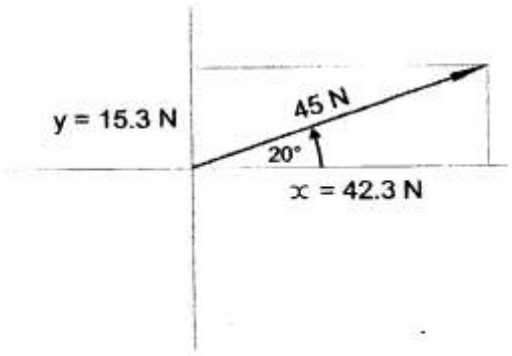


The magnitude of the tensile force in the cable is 2950 N.

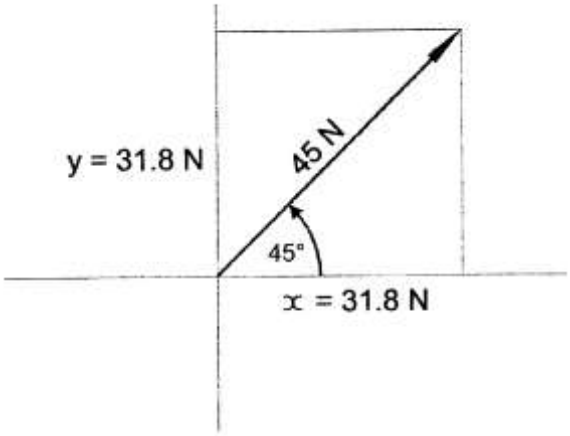
Horizontal and vertical components of a single force

3.1.

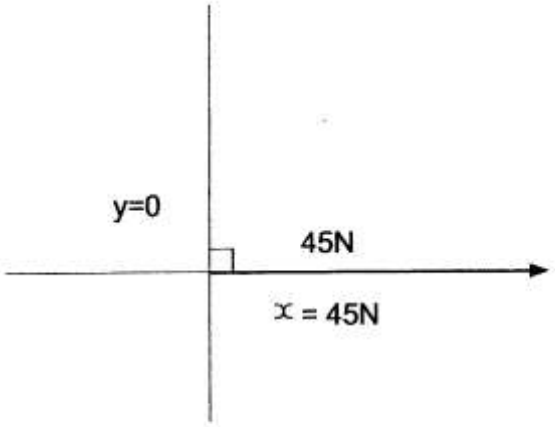
(a)



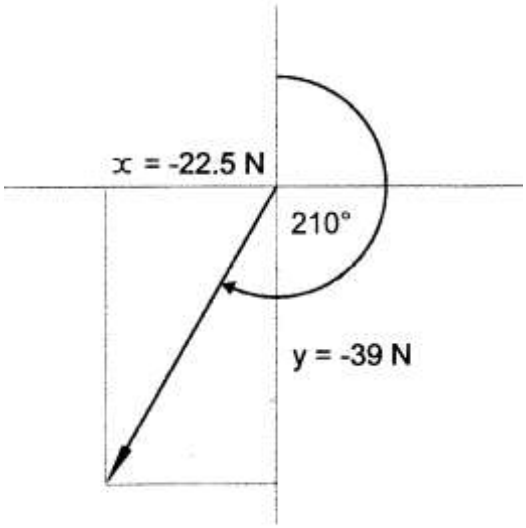
(b)



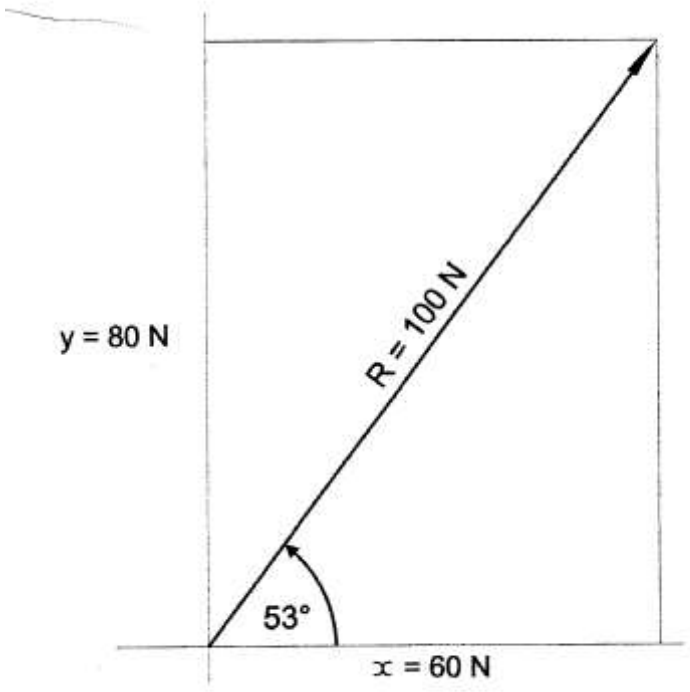
(c)



(d)



3.2. The scale is 1mm = 1N



The magnitude of the force is 100N in the direction of 53° north of east

Moments of force

4.1. L = R

5N x 2m = 3,7m x ?

$= \frac{5\ x\ 2}{3,7}$

= 2,7N

4.2. L = R

5N x 2m = ? x 12N

$= \frac{5\ x\ 2}{12}$

= 0,8m

4.3. L = R

? x 6,8m = 8,3m x 125N

$= \frac{8,3\ x\ 125}{6,8}$

= 152,57N

4.4. L = R

55,6N x 13m = 53,7m x ?

$= \frac{55,6\ x\ 13}{53,7}$

= 13,46N

4.5. L = R

67 x ? = 18m x 87N

$= \frac{18\ x\ 87}{67}$

= 23,37m

4.6. L = R

6N x 2m = 5m x ?

$= \frac{6\ x\ 2}{67}$

= 2,4N

4.7. L = R

15N x 18m = ? x 35N

$= \frac{15\ x\ 18}{35}$

= 7,71m

4.8. L = R

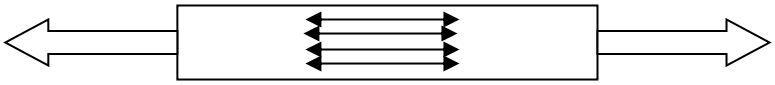
51N x 26m = 37m x ?

$= \frac{51\ x\ 26}{37}$

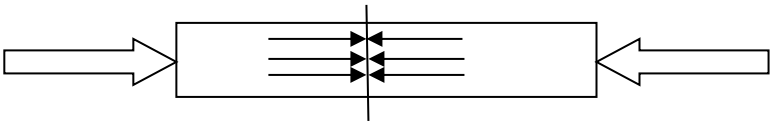
= 35,84N

Stress

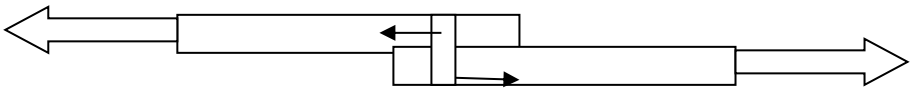
5.1. **Tensile stress** occurs over the full length of a bar which is subjected to a pulling force



Compressive stress occurs over the full length of a bar which is subjected to a pushing force



Shearing stress of this nature exist on a section of a body if, on opposite faces of the section, equal and opposite parallel forces exist.



5.2. Shear stress

- Cut two pieces of plastic waste pipe.
- Slit one along its length.
- Grip and twist both pieces and compare. The slitted piece will twist easily and show the shear forces that are created.

5.3.

$$Stress = \frac{Load}{Area}$$

$$Stress = \frac{15\ x\ 10^3}{\frac{5\ x\ 15}{10^6}}$$

$$Stress = \frac{15\ x\ 10^3\ x\ 10^6}{5\ x\ 15}$$

$$Stress = \frac{15\ x\ 10^9}{75}$$

= 200 000 000Pa

= 200 Mpa

5.4.

$$Stress = \frac{Load}{Area}$$

$$Stress = \frac{30\ x\ 10^3}{\frac{\pi D^2}{4x10^6}}$$

$$Stress = \frac{15\ x\ 10^3\ x\ 4\ x\ 10^6}{\pi\ x\ 15^2}$$

$$Stress = \frac{60\ x\ 10^9}{235{,}5}$$

= 254 777 070,063Pa

= 254,78 Mpa

Activity 1: Expected Answers

Maintenance

1.
   a) It is a set of activities that are performed on plant equipment, machinery, and systems before the occurrence of a failure in order to protect them and to prevent or eliminate any degradation in their operating conditions.
   b) Predictive maintenance is a set of activities that detect changes in the physical condition of equipment (signs of failure) in order to carry out the appropriate maintenance work for maximising the service life of equipment without increasing the risk of failure.
   c) A process used to determine what must be done to ensure that any physical asset continues to do what its users want it to do in its present operating context

2. The need for an adequate number of staff in the maintenance department in order to perform this type of maintenance.
   The right choice of production equipment and machinery that is suitable for the working environment and that can tolerate the workload of this environment.
   The required staff qualifications and skills, which can be gained through training.
   The support and commitment from executive management to the PM programme.
   The proper planning and scheduling of PM programme.
   The ability to properly apply the PM programme.

3. The **main difference** between preventive maintenance and predictive maintenance is that predictive maintenance uses monitoring the condition of machines or equipment to determine the actual mean time to failure whereas preventive maintenance depends on industrial average life statistics.

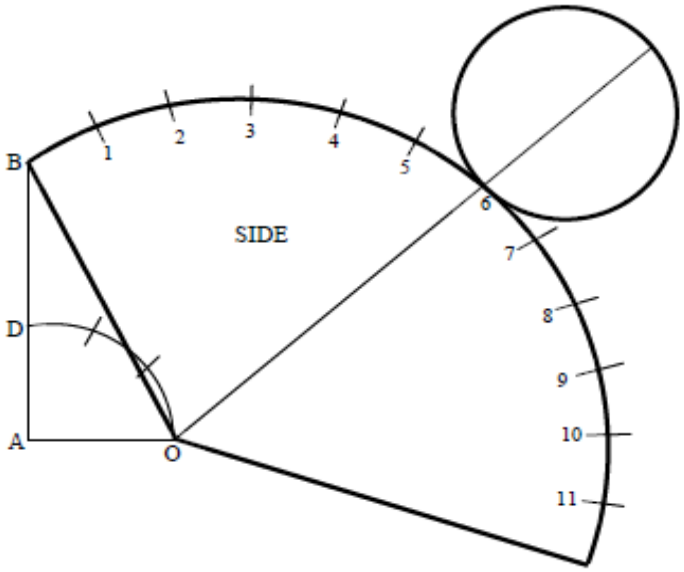
4. Revised maintenance schedules and practices
   Revised Operating procedures

Recommended Engineering Changes
Database of maintenance requirements
Useful to provide documentation for decisions
Analysis team members gain a deeper understanding of the asset

5. Excessive engine wear is very often caused by improper vehicle operation and subsequent momentary poor lubrication (momentary oil flow discontinuation).

   Momentary poor lubrication may follow during cold engine excessive load, excessive engine load at low RPM, and high RPM (temperature increase causes oil thinning), as well as “aggressive driving”, old pump oil or clogging of oil passages.
6. The pistons start to swell and eventually engine seizure.
7. The most common problems that occur in the master cylinder is wear in the piston bore and piston seal failure. The classic symptom of a failing master cylinder is a brake pedal that slowly sinks while pressure is held against the pedal. The cure is to replace the master cylinder.

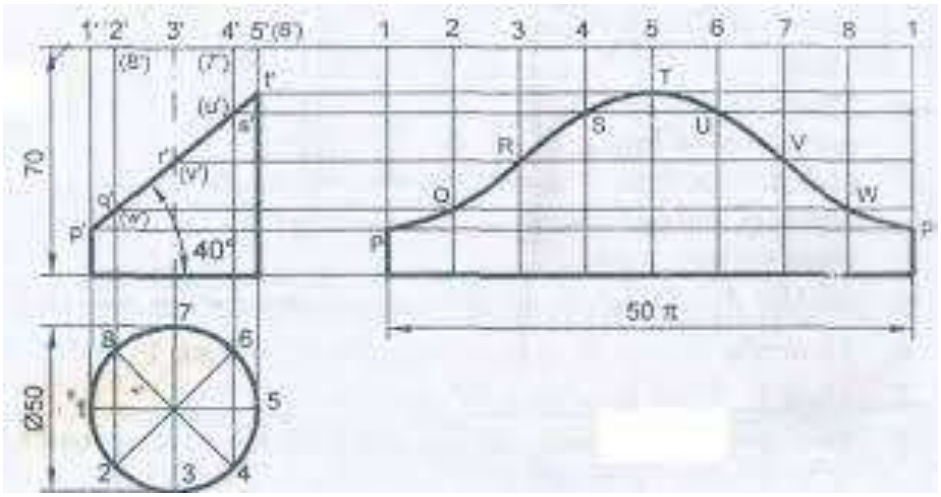
Activity 2: Expected Answer:



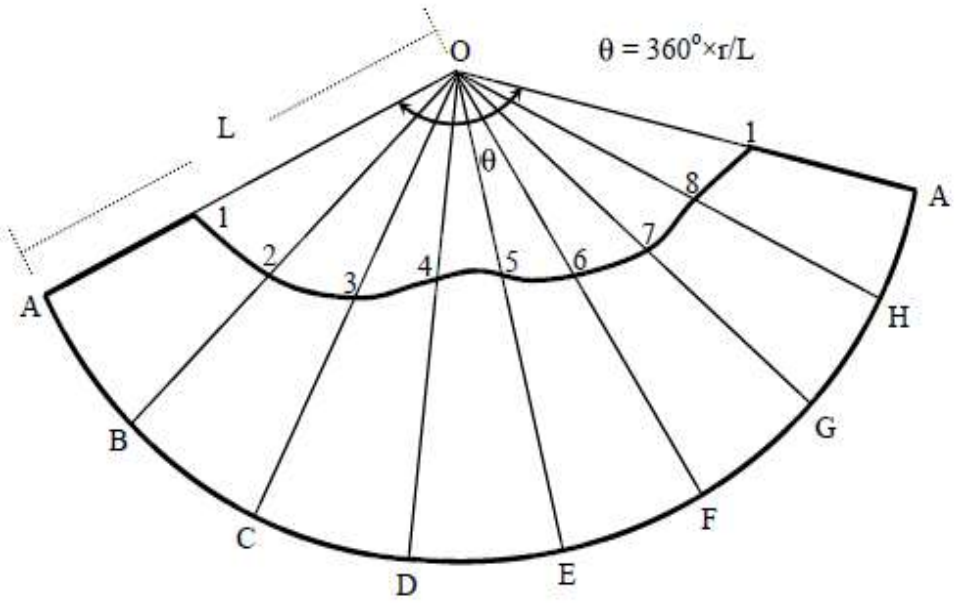
AO= Radius of the base = 20mm

BO= Inclined height of cone = 50mm

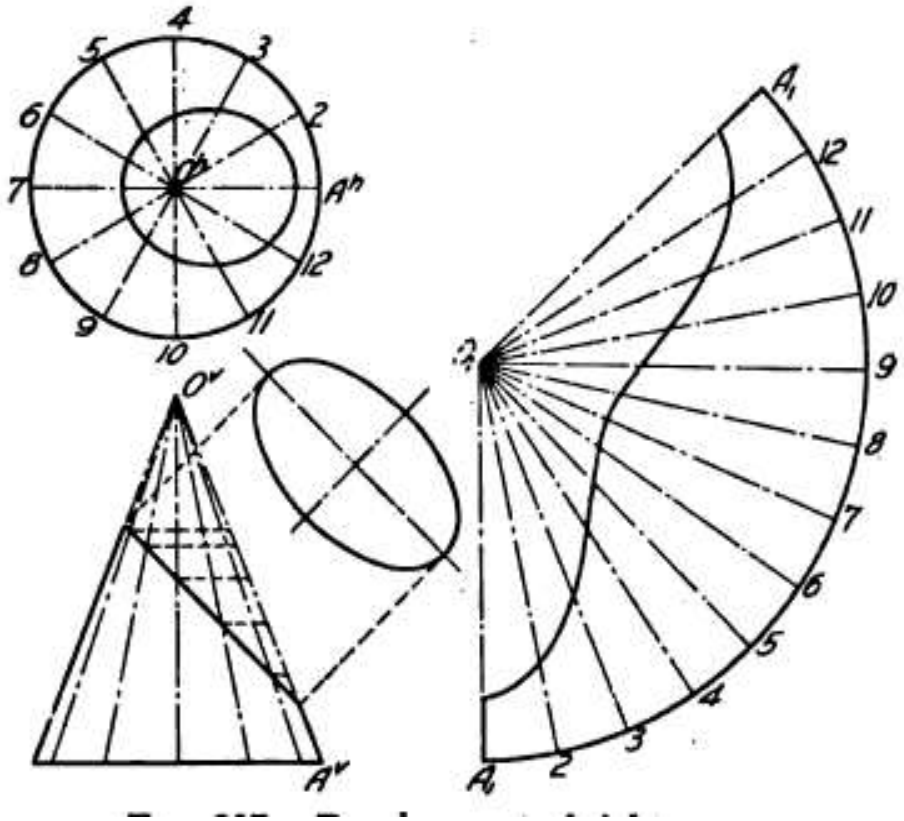
Activity 3: Expected Answer:



Activity 4: Expected Answer:



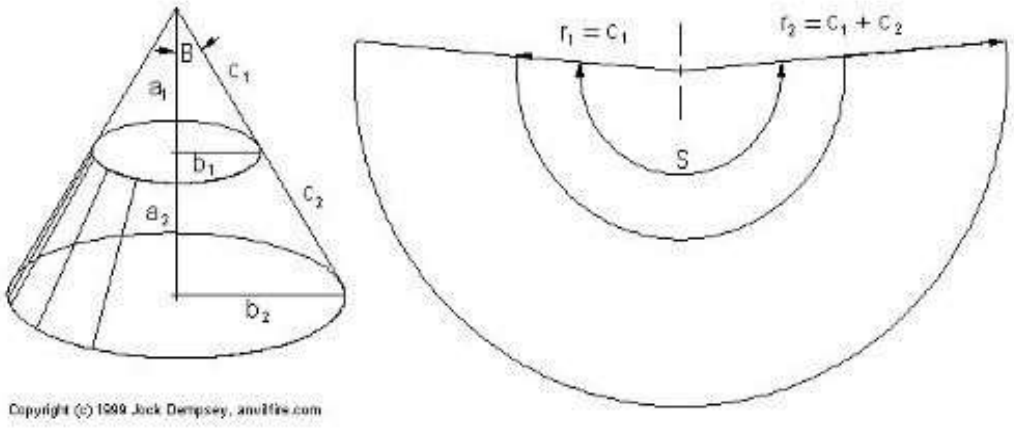
Activity 5: Expected Answer:



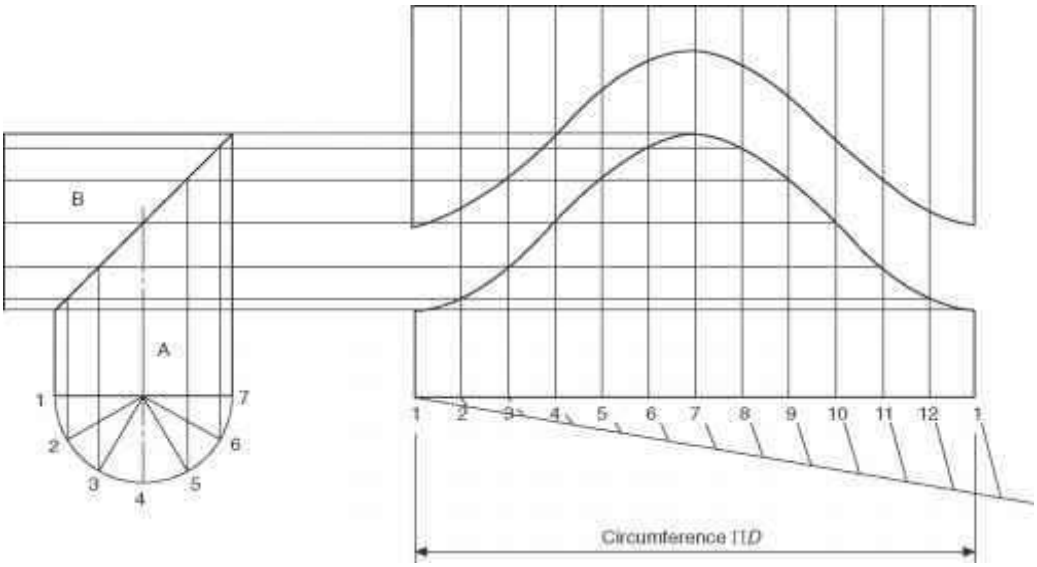
Activity 6: Expected Answer:

$r_2 = c_1 + c_2$ f = sine (B)

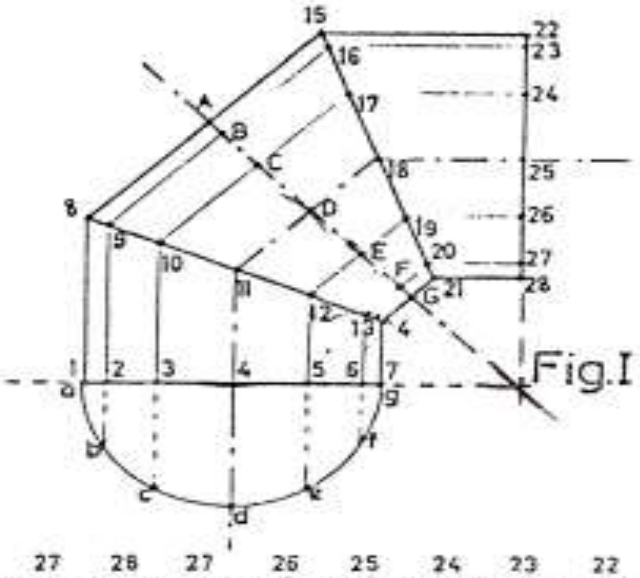
$f = \frac{b_2}{r_2}$ S = f * 360°

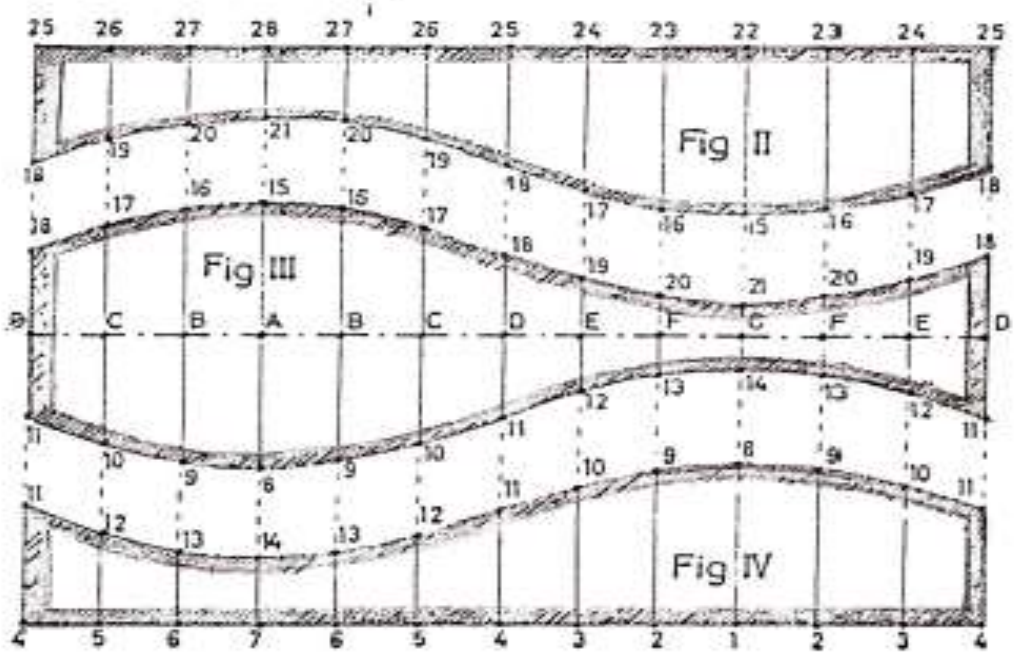


Activity 7: Expected answer



Activity 8: Expected answer





Activity 9: Expected Answers

1. Alloy steel is that which contains elements in addition to carbon and iron
2. Aluminium
3. Chemical; mechanical; physical
4. A tough metal possesses very high strength. It also has capacity to deform permanently and resist rupture.
5. Coke, limestone or dolomite; air
6. Iron ore
7. Open heath furnace process; electric (arc) furnace process, basic oxygen furnace process.
8. Carbon causes big changes in the nature of the metal, and also determines the hardness of the metal
9. Alloys are added to steel to:
    - Improve mechanical properties to permit higher tempering temperature while maintaining high strength and improving ductility.
    - Improve mechanical properties at low or elevated temperature.
    - Increase strength and toughness
    - Increase resistance high temperatures
    - Secure grater hardness for wear resistance
    - Provide high-impact resistance
    - Secure better mach inability
10. (a) when metal fractures with little or no deformity

    (b) Material's ability to change shape or to be drawn into wire form

    (c) Materials ability to absorb forces and flex in different directions and return to its original shape when the load is removed.

Activity 10: Expected Answers

- The blast furnace is charged before smelting begins.
  - In charging, the blast furnace is filled with coke, limestone, and iron ore and then ignited.
  - Air is heated to 675 °C by smaller furnaces called stoves and is forced in through the bottom of the blast furnace.
  - The blast of hot air intensifies the burning of the charge material.
  - The temperature at the bottom of the furnace rises to well above the melting point of iron, which is 1 535 °C.
  - This high temperature causes chemical reactions to occur, during which pure iron is released from the iron ore.
  - The molten iron drops to the bottom of the blast furnace.
  - The molten limestone traps the impurities from the iron ore and coke.
  - The mixture, called slag, floats on the top of the molten iron.
  - The slag is then drawn off through a hole in the furnace called a slag tap hole.
  - The molten iron is drawn off near the bottom of the furnace and is either used immediately for making steel or stored as pig iron.

1.

(a) has a gray fracture surface. Silicon content of (2-3 wt %) promotes graphite precipitation rather than cementite.

(b) has a characteristic of white, crystalline fracture surface: Large amounts of cementite are formed during casting, giving a hard brittle material.

2. - historic markers and plaques
- hardware: hinges, latches
- columns, balusters
- stairs
- structural connectors in buildings and monuments

- decorative features
- fences
- tools and utensils
- ordnance
- stoves and firebacks
- piping.

Activity 11: Expected Answers

1. Characterized by their corrosion resistance, high strength and ductility, and high chromium content. Stainless as a film of chromium oxide protects the metal from corrosion.

2. **Domestic** – cutlery, sinks, saucepans, washing machine drums, microwave oven liners, razor blades

   Architectural/Civil Engineering – cladding, handrails, door and window fittings, street furniture, structural sections, reinforcement bar, lighting columns, lintels, masonry supports

   Transport – exhaust systems, car trim/grilles, road tankers, ship containers, ships chemical tankers, refuse vehicles

   Chemical/Pharmaceutical – pressure vessels, process piping.

   Oil and Gas – platform accommodation, cable trays, subsea pipelines.

   Medical – Surgical instruments, surgical implants, MRI scanners.

   Food and Drink – Catering equipment, brewing, distilling, food processing.

   Water – Water and sewage treatment, water tubing, hot water tanks.

   General – springs, fasteners (bolts, nuts and washers), wire.

Activity 12: Expected Answers

Metal	Property	Uses
Copper	*Red in colour and is tough, ductile and malleable.*	*Electrical tubing, soldering, irons, electrical wires*
Tin	*Silvery shiny, soft and malleable, poor conductor of electricity.*	*Basis of white metal bearings, canning industry, protective layer for copper wires*
Lead	*Soft, bluish in colour, tough but low tensile strength, malleable, ductile, low melting point*	*Soft solder, plumbing, roof sheeting, bullets, cables, battery plates*
Zinc	*Bluish white in colour and high gloss, hard, brittle malleable*	*Galvanising on sheets, water tanks and wire*
Aluminium	*Bluish in colour, hard and very light, resistant to corrosion, malleable and ductile*	*Cooking utensils, foil, electrical connectors, and long distance high-tension transmission lines*

Activity 13: Expected Answers

1. Bronze is an alloy of copper and any other metal. As with brasses, there are many formulas for bronzes, depending on the application.
2. Aluminum bronzes, tin bronzes, phosphor bronzes, nickel bronzes, and silicon bronzes are all examples of varying alloys.
3. Bronzes are used in applications such as bearings, some limited structural applications, decorative uses, and applications which require them not to spark when struck with another metal.
   This makes them useful in the transport and handling of items such as explosives, fuels, and flammable materials.
   Bronzes are often used in statues and can be seen to form the familiar green oxidized coating.
4. Brass is a metal alloy made of copper and zinc; the proportions of zinc and copper can be varied to create a range of brasses with varying properties. It is a substitutional alloy: atoms of the two constituents may replace each other within the same crystal structure.
5. Brass is used for decoration for its bright gold-like appearance;
   for applications where low friction is required such as:
   Locks, gears, bearings, doorknobs, ammunition casings and valves; for plumbing and electrical applications; and extensively in brass musical instruments such as horns and bells where a combination of high workability (historically with hand tools) and durability is desired. It is also used in zippers.
   Brass is often used in situations in which it is important that sparks not be struck, such as in fittings and tools around explosive gases.
6. White metals include antimony, bismuth, cadmium, lead, tin, and zinc. Of these, lead, tin, and zinc are of primary interest.
7. Ball bearings and engine bearings.
8. It’s light strong alloy of aluminum, copper, manganese, and

Duralumin is soft, ductile, and workable in the normal state; they may be rolled, forged, extruded, or drawn into a variety of shapes and products.
Its' light weight and high strength make them suitable for something that needs to be strong and light at the same time. That is why it is suitable for an airplane.

Activity 14: Expected Answers

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	50
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

SIGNATURE OF EDUCATOR:	
SIGNATURE OF HEAD OF DEPARTMENT:	
SIGNATURE OF PRINCIPAL:	