



GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

REMOTE LEARNING ACTIVITY BOOK

(RELAB)

SUBJECT: FITTING & MACHINING

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 to 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. Teachers 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.

FITTING & MACHINING - TOPICS

- 1. Safety – Generic**
- 2. Safety- Generic**
- 3. Tools – Generic**
- 4. Tools – Generic**
- 5. Machining- Specific**
- 6. Joining Methods - Generic**
- 7. Forces- Generic**
- 8. Maintenance – Generic**
- 9. Materials- Generic**
- 10. Systems and Control - Drive Systems**
- 11. Terminology- Machining**

FITTING AND MACHINING (HOMEWORK ACTIVITIES)

QUESTIONS

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?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
What is the group name of this type of signs: <i>Safety Signs</i>			
			
			
			
			

	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:

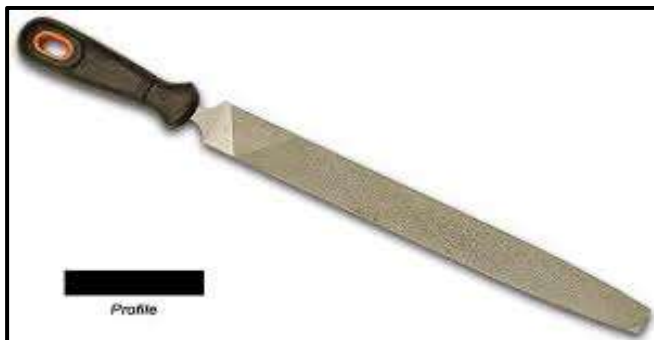
6.1.1.



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:

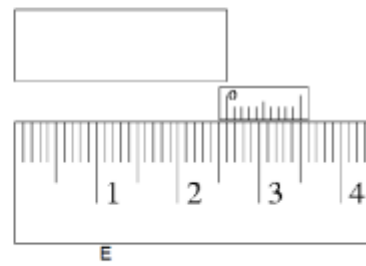
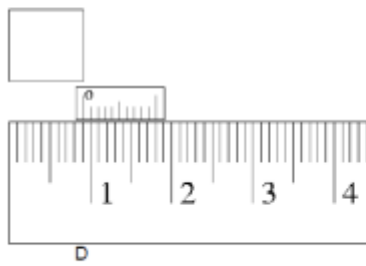
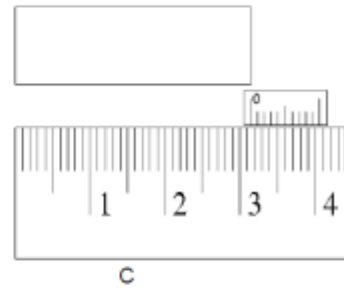
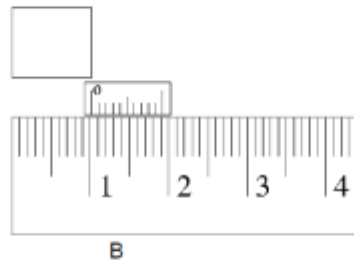
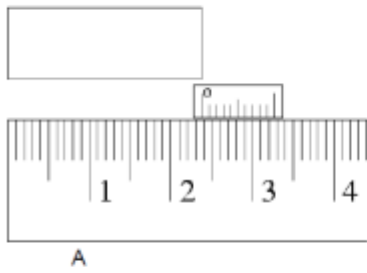


- 7.1.1. Name four safety precautions to follow when working with a lathe or a milling machine.
- 7.1.2. Name five safety precautions to observe when working with a grinding wheel.
- 7.1.3. Name five steps to follow when installing a grinding wheel.
- 7.1.4. Name three safety precautions you must observe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

TERMINOLOGY

1.1 Determine the following Vernier calliper readings:

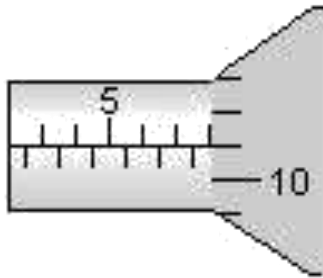
Reading of Vernier scales:



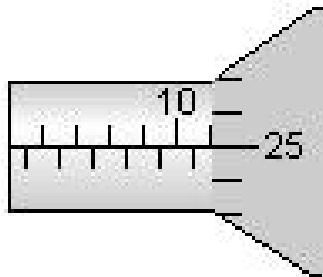
1.2. Determine the following micrometer readings:

Note that for the following test, the coarse scale is in 0.5mm intervals (top and bottom marks) and the fine scale is in 0.01mm intervals.

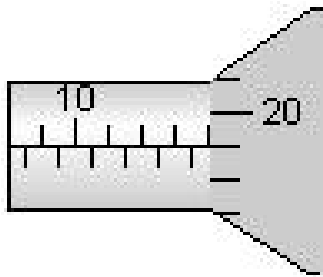
1.2.1.



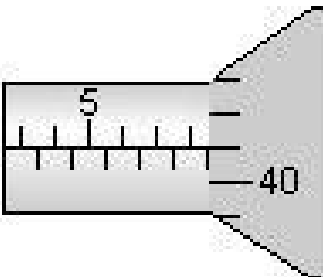
1.2.2.



1.2.3.



1.2.4.



Lathes

2.1 Name at least eight safety features when working with a centre lathe machine.

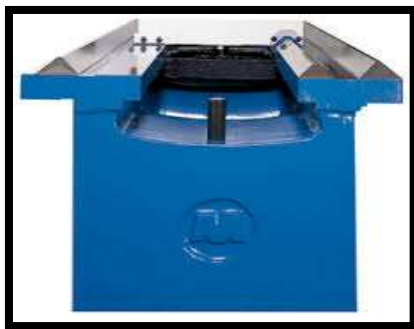
2.2 Name three classifications of lathes and examples where you would find them.

2.3 Describe how a lathe machine works.

2.4 Name three parts of a lathe bed.

2.5 Identify the types of beds by referring to each of the pictures below.

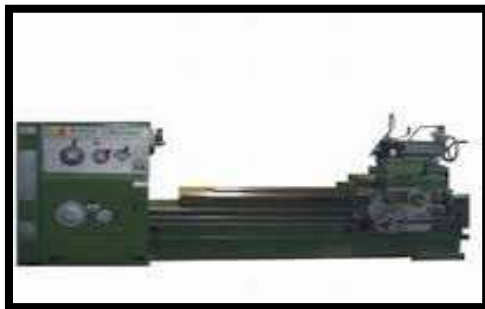
2.5.1



2.5.2



2.5.3



3. Practical activity

Identify the following parts on a workshop lathe and describe their functions.

(Do not switch on the lathe without permission from teacher.)

The headstock

- a) Spindle
- b) Feed reverse lever
- c) Speed control levers

The bed

- d) The ways
- e) The gap

The carriage

- f) The cross slide
- g) The compound rest
- h) Saddle
- i) Apron
- j) Power feed lever
- k) Power feed control
- l) Leadscrew engager
- m) Thread dial
- n) Carriage hand wheel

The tail stock

- o) Spindle and spindle clamping lever
- p) Centre
- q) Tailstock clamp

The quick-change gearbox

- r) The lead screw
- s) The size of the lathe

Shift the levers to obtain the lowest and highest cutting speeds.

4. Cutting fluid
 - 4.1. Describe cutting fluid.
 - 4.2. Name the advantages of cutting fluid in lathe or milling machines.
 - 4.3. Describe the application of cutting fluid
 - 4.4. How would you maintain cutting fluid?

5. Lathe operations
 - 5.1. Name five operations that can be executed on the centre lathe.
 - 5.2. Explain the two properties that a high-Quality cutting tool must have.
 - 5.3. Name the groups in which centre-lathe tools are divided.
 - 5.4. Discuss the components that form the wedge of the cutting tool.
 - 5.5. Make a neat sketch to briefly explain the angles ground on a single-point lathe cutting tool.

6. Cutting tools
 - 6.1. Name the benefits of using sharp cutting tools.
 - 6.2. Why must the cutting edge of a newly ground cutting-tool be honed?
 - 6.3. Which things affect the efficiency of the cutting edge on a cutting tool?
 - 6.4. List and illustrate the three most frequently used chip breakers.

7. Finishing
 - 7.1. List the uses of the centre gauge.
 - 7.2. State possible reasons for chattering during turning operations on a centre lathe?
 - 7.3. Name the methods of drilling holes on the centre lathe.
 - 7.4. What are the reasons for undercutting the work piece when roughing it out?
 - 7.5. Which factors should a machinist be aware of to ensure a good finish on a work piece?

8. Turning

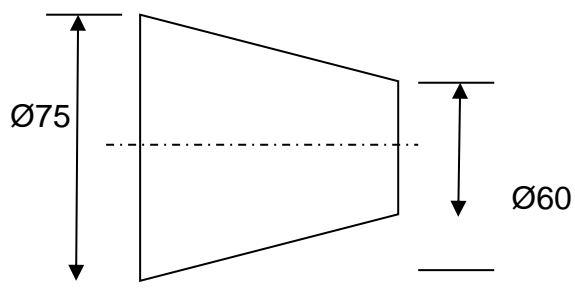
8.1. Define facing.

8.2. Name three forces acting on a cutting tool while turning?

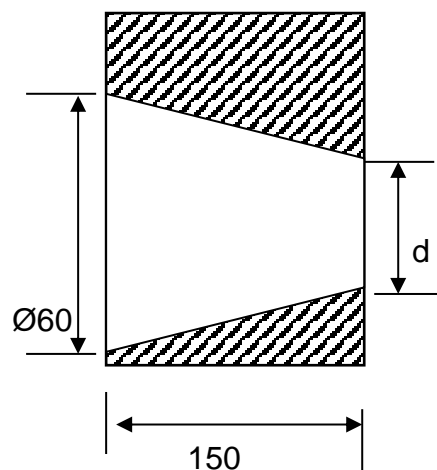
8.3. Explain how you would prepare to do parallel turning.

9. Taper calculations

9.1. A taper 150 mm long, has to be turned on the end of a 75mm diameter shaft. If the diameter of the small end of the taper is 60mm, calculate the angle to which the compound slide must be set in order to cut this taper.



9.1. An internal taper 150 mm long, has to be bored in a bush. The large diameter of the bush hole is 60 mm. calculate the small diameter of the taper hole if the included angle is 8° .



10. Compound-slide method

- 10.1. What type of tapers can be cut with the compound method?
- 10.2. Describe the compound rest's base.
- 10.3. Describe how you would go about cutting an external taper with the compound-slide method.

11. Tailstock-offset method

- 11.1. When will you consider using the Tailstock offset method of cutting tapers?
- 11.2. Name three methods of offsetting the tailstock for cutting a taper.
- 11.3. What are the advantages of using taper attachments?
- 11.4. Describe you would cut a taper by using a telescopic taper attachment.

12. Screw thread

- 12.1. Name several application screw thread have.
- 12.2. What are the two main functions of screw thread?
- 12.3. Draw a neat labelled sketch of the screw thread.
- 12.4. Explain the following terms:
 - a) Pitch
 - b) Lead
 - c) Crest
 - d) Root
 - e) Flank
 - f) Angle of thread
 - g) Depth
 - h) Nominal diameter
 - i) Major diameter
 - j) Minor diameter
 - k) External threads

13. Assessment Task

Test on understanding the screw thread

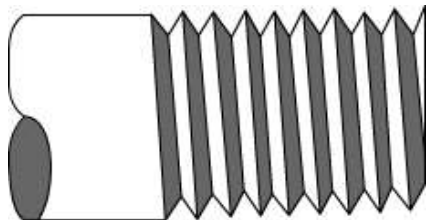
13.1. Fill in the missing words (meshes, spiral, linear, rotary, round).

A screw is a _____ steel bar with a _____ groove cut into it. When a screw is turned in a hole or in a nut that also has a thread, then the _____ motion of the screw is changed to _____ motion as the one thread _____ into the other.

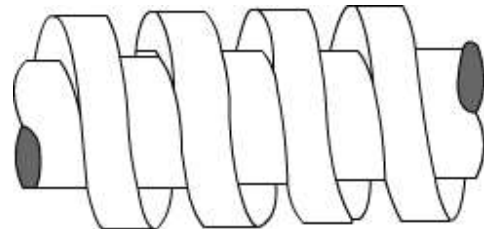
[10 marks]

13.2. Look at the two types of screw thread below and name them. [4 marks]

13.2.1.



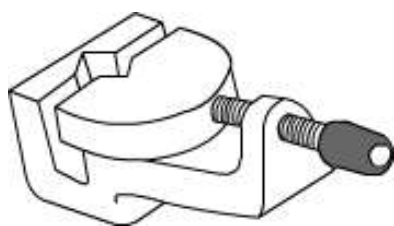
13.2.2.



13.3. Name the tools shown below.

[6 marks]

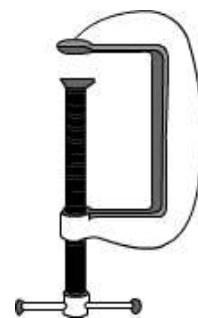
13.3.1.



13.3.2.



13.3.3.



[20 marks]

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.

- 11.1. What is an engineer's square made of?
- 11.2. 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.

4. Thabo and Siswe are fitter- and turners at ABC Engineering. They were given the task to manufacture taper keys for a firm with a number of shafts on order. Determine the sizes for the taper keys to be manufactured for the following shafts:
- a) 80mm shaft
 - b) 100mm shaft
 - c) 95mm shaft
 - d) 120mm shaft
 - e) 55mm shaft

FORCES

Activity

- 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.

FORCES

Parallelogram of forces

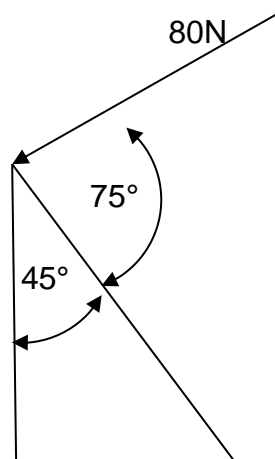
Use a scale of 1 cm = 10 N to solve the following exercises.

- 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.

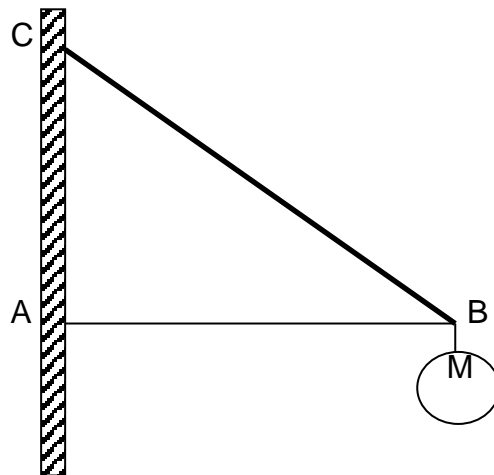
Triangular forces

Use a suitable scale to solve the following exercises.

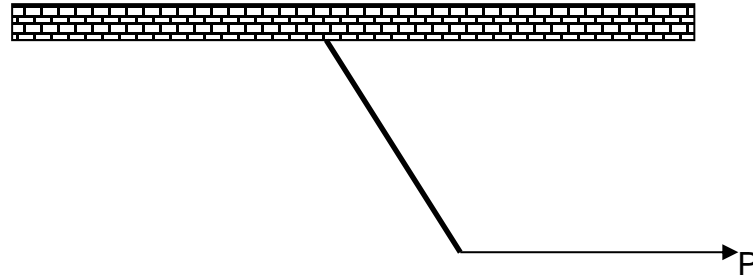
- 2.1. The diagram represents the lines of action of three forces which are in equilibrium. One of the forces is 80 N. Determine the other two forces.



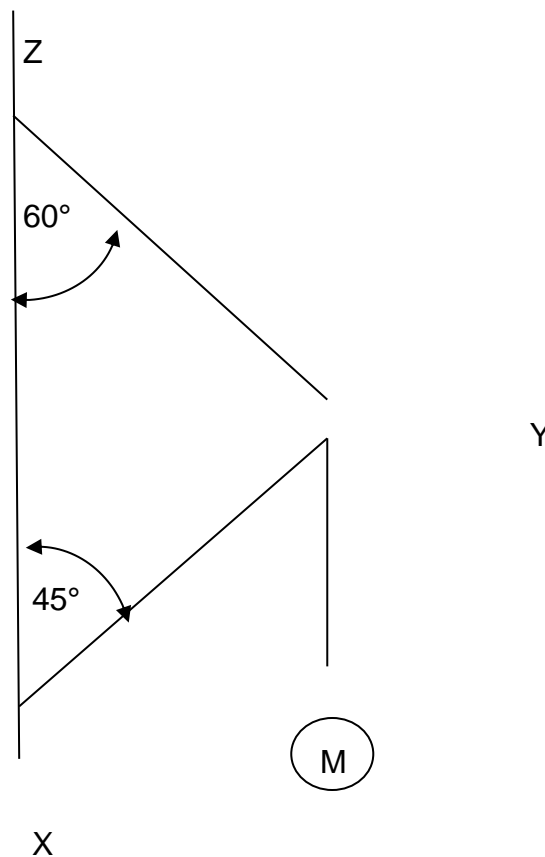
- 2.2. Two ropes with lengths of 2 m and 4 m are attached to a body with a mass of 800 kg. The free ends of the ropes are attached to two points which are 5 m apart in the same horizontal line. Determine the tensions in the ropes.
- 2.3. A rod pushes vertically downwards on a pin with a force of 80 N 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 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. 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.

Activity

Maintenance - Oil

- 1) The primary purpose of motor oil is:
- 2) What happens if an engine is run low on oil?
- 3) What is the SAE rating?
- 4) What does the term "viscosity" mean?
- 5) Who establishes the viscosity standards?
- 6) What is a multi-grade oil?
- 7) What does the "W" stand for?
- 8) What viscosity oils are generally recommended for today's new cars?
- 9) What does API stand for?
- 10) What does "Service" oil mean?
- 11) What are the active ingredients in motor oil called?
- 12) What do the following additives used in motor oil do?
 - a. Pour point depressants
 - b. Viscosity index improvers
 - c. friction modifiers
- 13) What determines how often oil should be changed?
- 14) How do driving conditions affect engine oil?
- 15) How can you identify high quality oil?
- 16) What is "Synthetic" oil?
- 17) What are some of the advantages of synthetic oil?
- 18) When would synthetic oil be used?
- 19) How often must synthetic oil be changed?
- 20) What must the viscosity be of cutting fluid?

Cutting Fluid

- 21) What is cutting fluid?
- 22) What are the advantages of cutting fluid?
- 23) Describe how you should maintain cutting fluid.

Friction

- 24) Describe friction.
- 25) How can we reduce friction?
- 26) Describe the following:
 - a) Static friction
 - b) Sliding friction
 - c) Rolling friction
 - d) Fluid friction

Maintenance

27. Describe the following types of maintenance:
 - a) Preventive maintenance
 - b) Predictive maintenance
 - c) Reliability centred maintenance
28. What are the factors that affect the efficiency of preventative maintenance?
29. Describe the difference between preventative maintenance and predictive maintenance.
30. What is the outcome analysis for reliability centred maintenance?
31. Explain excessive wear.
32. What can the result be of a car engine overheating?
33. What is the most common problem in a car's braking system and name the symptoms that can be observed?

TOPIC: MATERIALS

ACTIVITY 1: QUESTIONS

1.1 *What is an alloy*

1.2 *Of which metal is bauxite a source?*

1.3 *Into which three categories can the properties of metals be divided?*

1.4 *What are the characteristics of a tough metal?*

1.5 *What are the three basic materials used in extracting iron from iron ore?*

1.6 *What is the basic source of iron and steel?*

1.7 *Name three different methods of producing steel.*

1.8 *What effect does carbon content have on plain carbon steels?*

1.9 *Why are alloying elements added to steel?*

1.10 *Describe the following properties of carbon steels:*

(a) *Brittleness*

(b) *Ductility*

(c) *Elasticity*

ACTIVITY 2: QUESTIONS

2.1 Describe how cast iron is produced in a blast furnace.

2.2 Describe

(a) Grey cast iron

(b) White cast iron

2.3 Name five uses for cast iron.

ACTIVITY 3: QUESTIONS

3.1 Describe Stainless steel.

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

ACTIVITY 4: QUESTIONS

4.1 Give the uses and properties of the following in table format:

- a) Copper.
- b) Tin
- c) Lead
- d) Zinc
- e) Aluminium

ACTIVITY 5: QUESTIONS

5.1 Describe Bronze.

5.2 Name five different types of bronze.

5.3 Name the uses for bronze.

5.4 Describe Brass

5.5 Name the uses for brass.

5.6 What additives are in *white metal*?

5.7 Name two uses for white metal.

5.8 What is *Duralumin*?

TOPIC: SYSTEMS AND CONTROL

ACTIVITY 1: QUESTIONS

1.1 Copy figure 1 and draw an arrow on your diagram to the direction of rotation of Gear B if Gear A is the driver.

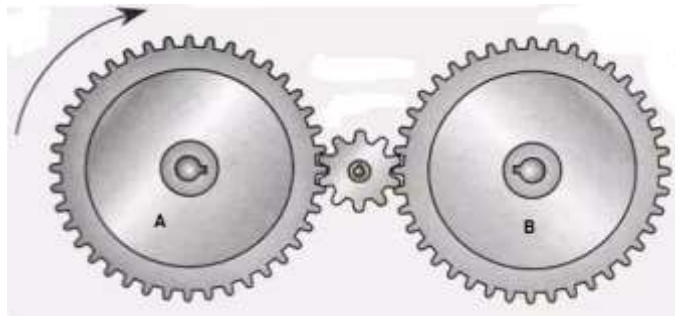


Figure 1

1.2 Copy figure 2 and draw an arrow on your diagram to the direction of rotation of Gear B if Gear A is the driver.

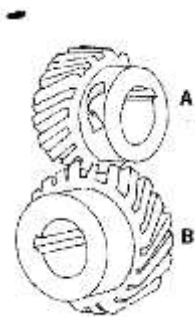


Figure 2

1.3 Copy figure 3 and draw an arrow on Pulley A to indicate the direction of rotation if Pulley B is the driver.

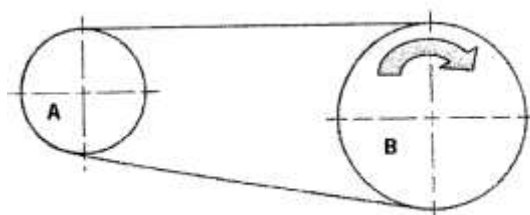


Figure 3

1.4 Describe the functions of flat belts and V-belts.

1.5 What is the purpose of multi-groove pulleys?

1.6 Name three groups of gears and give an example of each group.

ACTIVITY 2: QUESTIONS

2.1 Gear A, with 40 teeth, rotates at 12 r/sec and drives gear B, rotating at 2 r/sec. calculate the number of teeth on gear B.

2.2 The rotational frequency of a driving gear with 40 teeth is 2 r/sec. The driving gear engages a driven gear with 70 teeth. Calculate the rotational frequency of the driven gear.

2.3 A driving gear with 48 teeth engages a driven gear with 72 teeth. The driven gear rotates at 400 r/min. calculate the speed of the driving gear in revolutions per minute.

2.4 A driver gear has 30 teeth, rotates at 2000 r/min and engages with a driven gear rotating at 500 r/min. Calculate the number of teeth on the driven gear.

2.5 Two gears mesh. There are 170 teeth on the first gear and 290 teeth on the second gear. If the second gear rotates at 3,7 r/sec, calculate the rotational frequency of the first gear in rev/sec.

ACTIVITY 3: QUESTIONS

3.1 An electric motor rotates at a speed of 1200 r/min, and drives a 1500 mm diameter pulley on the machine spindle by means of a driving belt at of 230 r/min. What is the size of the pulley mounted on the motor spindle? (Hint: this is a simple drive).

3.2 A flat belt drive consists of a 200 mm diameter driving pulley and a 100 mm diameter driven pulley. Determine the speed of the driven pulley if the driver rotates at 750 r/min

3.3 An electrical motor with a driver pulley of 127 mm diameter turns at 24 r/sec. The motor drives a pulley of 381 mm diameter by means of a flat belt. Calculate:

- a. The rotational frequency of the driven pulley.
- b. Convert the rotational frequency of the driven pulley into r/min.

3.4 A drill press is driven by an electric motor. The speed of the motor is 1400 r/min. The pulley on the motor has a diameter of 50 mm and that of the pulley on the drill spindle a diameter of 125 mm, calculate the rotational frequency of the drill.

3.5 A power saw's motor has a pulley 125 mm in diameter that turns at 1100 r/min. The speed at which the driven pulley drives the saw blade is 1375 r/min, calculate the diameter of the driven pulley.

ACTIVITY 4: QUESTIONS

4.1 A 280mm diameter roller drives a conveyer belt that carries coal to a power station. The motor on the roller turns at 1450rpm. Determine the belt speed of the conveyer belt.

4.2 A motor with a 125mm pulley is linked to an alternator on a vehicle turns at 3000rpm. Determine the Vee-belt's speed in this situation.

4.3 The belt speed on a motor is 4m/s. The pulley on the motor turns at 1775rpm. Determine the size of the pulley on the motor.

4.4 A motor is coupled to a conveyer belt in a factory. The size of the pulley is 350mm and it turns at a speed of 750rpm. Determine the speed of the conveyer belt.

4.5 A fitter is busy fixing a bearing that fits into a 600mm diameter roller in an engineering plant. Determine the rpm of the pulley if the belt runs at 3,4m/s

ACTIVITY 5: QUESTIONS

5.1 Name some applications for screw thread.

5.2 Draw a neat sketch of a V-thread and label the different terminology.

5.3 Referring to the different types of thread, describe the following threads:

- a) Unified threads
- b) Metric threads

5.4 Give the advantages and disadvantages of square thread.

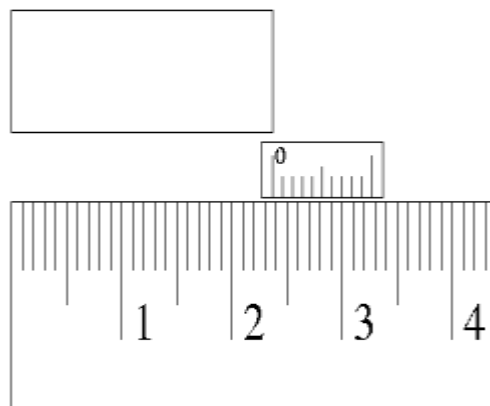
5.5 What is the difference between Acme thread and square thread?

5.6 Make a neat labelled sketch of an Acme thread.

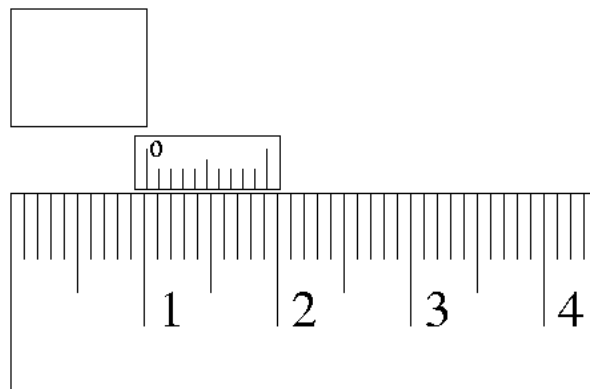
TOPIC: TERMINOLOGY**ACTIVITY 1: QUESTIONS**

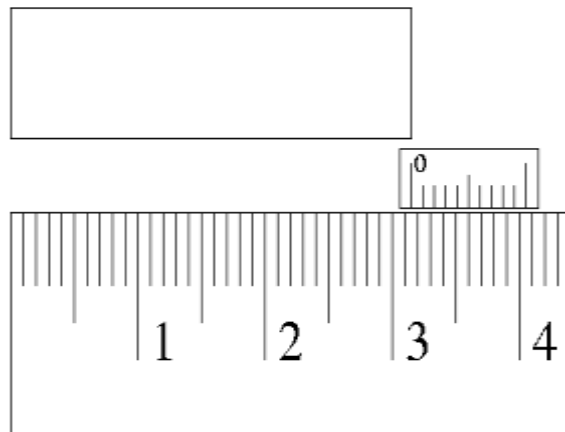
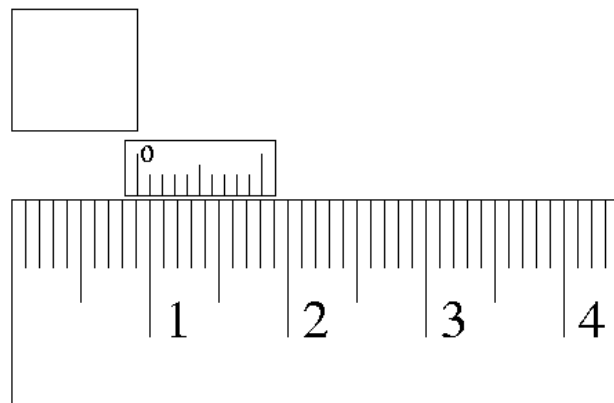
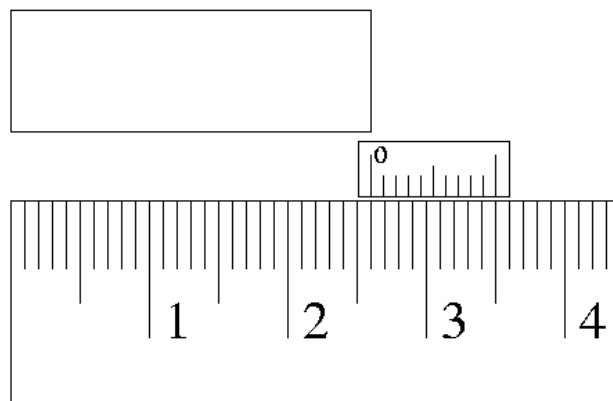
Give the reading of the following vernier calipers

1.1



1.2



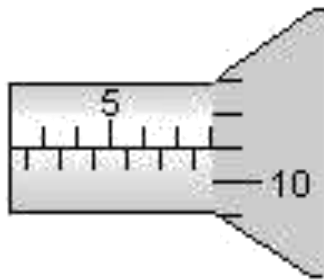
1.3**1.4****1.5**

ACTIVITY 2: QUESTIONS

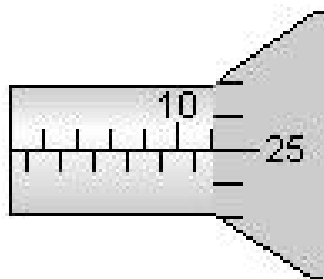
Note that for the following test, the coarse scale is in 0.5mm intervals (top and bottom marks) and the fine scale is in 0.01mm intervals.

Give the reading of the following outside micrometres

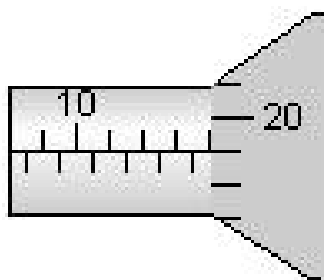
2.1



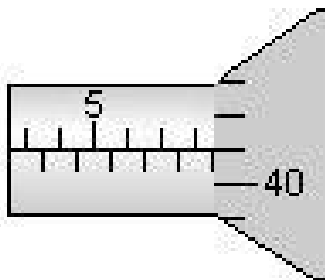
2.2



2.3



2.4



ACTIVITY 3: QUESTIONS

3.1 Name at least eight safety features when working with a centre lathe machine.

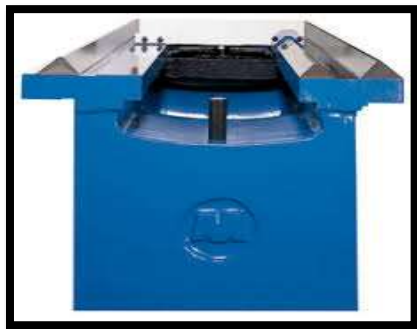
3.2 Name three classifications of lathes and examples where you would find them.

3.3 Describe how a lathe machine works.

3.4 Name three parts of a lathe bed.

3.5 Identify the types of beds by referring to each of the pictures below.

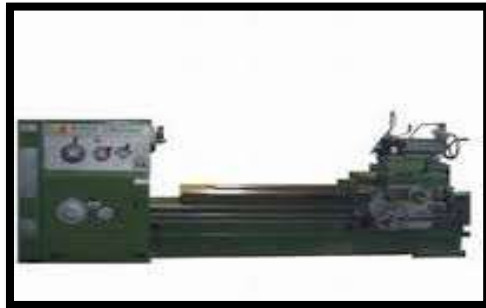
3.5.1



3.5.2



3.5.3



ACTIVITY 4: QUESTIONS

- 4.1 Describe cutting fluid.
- 4.2 Name the advantages of cutting fluid in lathe or milling machines.
- 4.3 Describe the application of cutting fluid
- 4.4 How would you maintain cutting fluid?

ACTIVITY 5: QUESTIONS

- 5.1 One is boring also called?
- 5.2 Boring must achieve the things, what are they?
- 5.3 What is a general rule when boring?
- 5.4 Name the variety of types boring bars are made off.
- 5.5 What recommendations should be followed to obtain the best possible stability when boring?

ACTIVITY 6: QUESTIONS

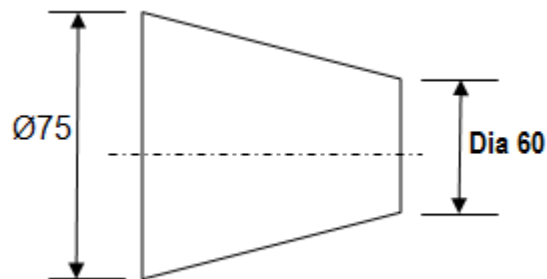
6.1 What is facing?

6.2 Name three forces acting on a cutting tool while turning?

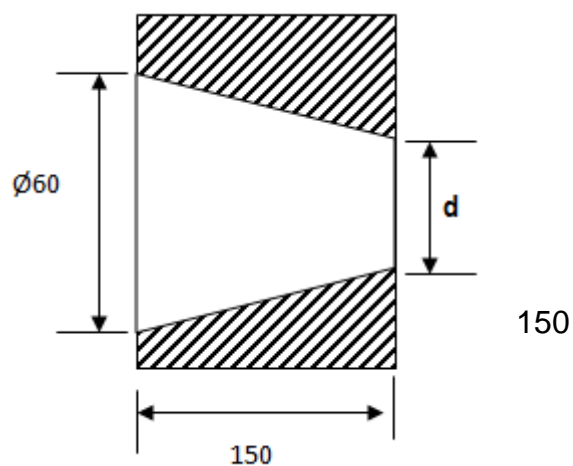
6.3 Explain how you would prepare to do parallel turning.

ACTIVITY 7: QUESTIONS

7.1 A taper 150 mm long, has to be turned on the end of a 75mm diameter shaft. If the diameter of the small end of the taper is 60mm, calculate the angle to which the compound slide must be set in order to cut this taper.



7.2 An internal taper 150 mm long, has to be bored in a bush. The large diameter of the bush hole is 60 mm. calculate the small diameter of the taper hole if the included angle is 8° .



ACTIVITY 8: QUESTIONS

- 8.1 What type of tapers can be cut with the compound method?
- 8.2 Describe the compound rest's base.
- 8.3 Describe how you would go about cutting an external taper with the compound method.

ACTIVITY 9: QUESTIONS

- 9.1 When will you consider using the Tailstock offset method of cutting tapers?
- 9.2 Name three methods of offsetting the tailstock for cutting a taper.
- 9.3 What are the advantages of using taper attachments?
- 9.4 Describe you would cut a taper by using a telescopic taper attachment.

ACTIVITY 10: QUESTIONS

- 10.1 Name several application screw thread have.
- 10.2 What are the two main functions of screw thread?
- 10.3 Draw a neat labelled sketch of the screw thread.
- 10.4 Explain the following terms:
 - l) Pitch
 - m) Lead
 - n) Crest
 - o) Root
 - p) Flank
 - q) Angle of thread
 - r) Depth
 - s) Nominal diameter

- t) Major diameter
- u) Minor diameter
- v) External threads

ACTIVITY 11: QUESTIONS

11.1 Fill in the missing words (meshes, spiral, linear, rotary, round).

A screw is a _____ steel bar with a _____ groove cut into it. When a screw is turned in a hole or in a nut that also has a thread, then the _____ motion of the screw is changed to _____ motion as the one thread _____ into the other.

[10

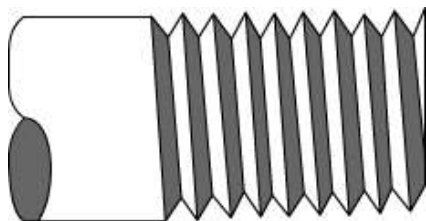
marks]

11.2 Look at the two types of screw thread below and name them.

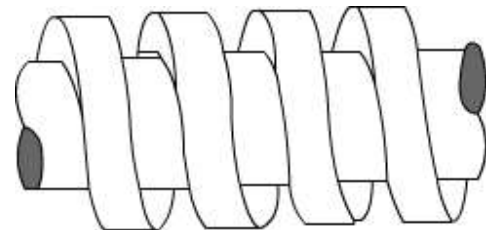
[4

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11.2.1



11.2.2

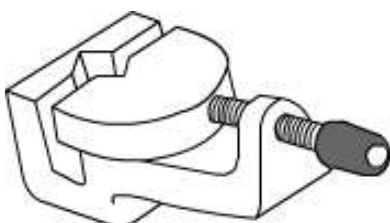


11.3 Name the tools shown below.

[6

marks]

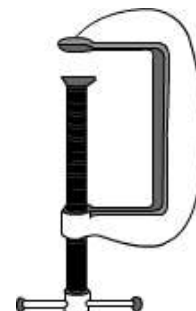
11.3.1



11.3.2



11.3.3



[20 marks]

