

Victorian Certificate of Education
2023

SUPERVISOR TO ATTACH PROCESSING LABEL HERE

STUDENT NUMBER

Letter

VCE VET ENGINEERING STUDIES
Written examination

Monday 6 November 2023

Reading time: 9.00 am to 9.15 am (15 minutes)

Writing time: 9.15 am to 10.45 am (1 hour 30 minutes)

QUESTION AND ANSWER BOOK

Structure of book

<i>Number of questions</i>	<i>Number of questions to be answered</i>	<i>Number of marks</i>
27	27	100

- Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners, rulers, one scientific calculator, a protractor, a set square and aids for curve sketching.
- Students are NOT permitted to bring into the examination room: blank sheets of paper and/or correction fluid/tape.

Materials supplied

- Question and answer book of 29 pages

Instructions

- Write your **student number** in the space provided above on this page.
- Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.
- All written responses must be in English.

Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination room.

Instructions

Answer **all** questions in the spaces provided.

All dimensions are in millimetres (mm) except where specified.

Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

Question 1 (4 marks)

The electric drill shown in Figure 1 will be used to drill some holes into a steel plate.



Source: yevgeniy11/Shutterstock.com

Figure 1

- a. List two safety checks that should be performed on the drill shown in Figure 1 before it is used.

2 marks

1. _____

2. _____

Figure 2 shows a piece of sheet metal that requires four holes drilled into it. The sheet metal is being held in an **unsafe manner** for drilling the holes.



Figure 2

- b.** State **one** safety risk when drilling the holes as shown in Figure 2. 1 mark

- c.** Describe a safe method to drill the four holes into the plate. 1 mark

Question 2 (2 marks)

- a.** Name two machines commonly found in an engineering workshop for which wearing gloves could be a safety risk. 1 mark

Machine 1 _____

Machine 2 _____

- b.** State **one** reason why gloves could be a safety risk if worn while operating these machines. 1 mark

Question 3 (4 marks)

- a. Complete the table below by writing the name of each tool shown.2 marks

	Tool	Name of tool
A.		
B.		
C.		
D.		

Source: arfa adam/Shutterstock.com (image C.)

- b. The table below shows four sketches of specific types of holes. Complete the table by listing the letter(s) of the tool or tools as shown above that are required to make each hole.2 marks

Hole	Letter(s)
	
	
	
	

Question 4 (2 marks)

A box is to be manually lifted from the ground and placed onto a shelf 5 m away. The box weighs approximately 30 kg.

Apart from PPE, list two safety measures that will reduce the risk of injury when manually lifting and placing the box onto the shelf.

1. _____
2. _____

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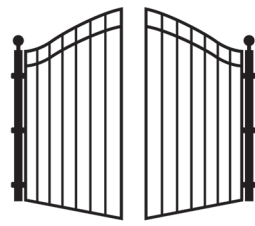
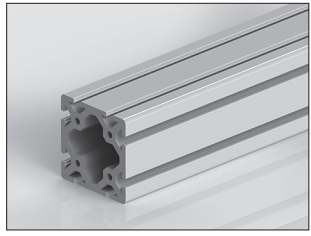
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Question 5 (2 marks)

The following table shows various items; each has been produced using one of the following processes:

- machining
- extrusion
- stamping
- fabrication

Complete the table by naming the most appropriate process to produce each item.

Item	Process
1000 flat washers 	
metal gate 	
aluminium post 	
plumb bob 	

Sources: Sangu_rabi/Shutterstock.com (second from top); Harvey Art/Shutterstock.com (third from top)

Question 6 (3 marks)

Explain the meaning of each of the following safety signs.



Question 7 (3 marks)

A chisel will be sharpened using the equipment shown in Figure 3.

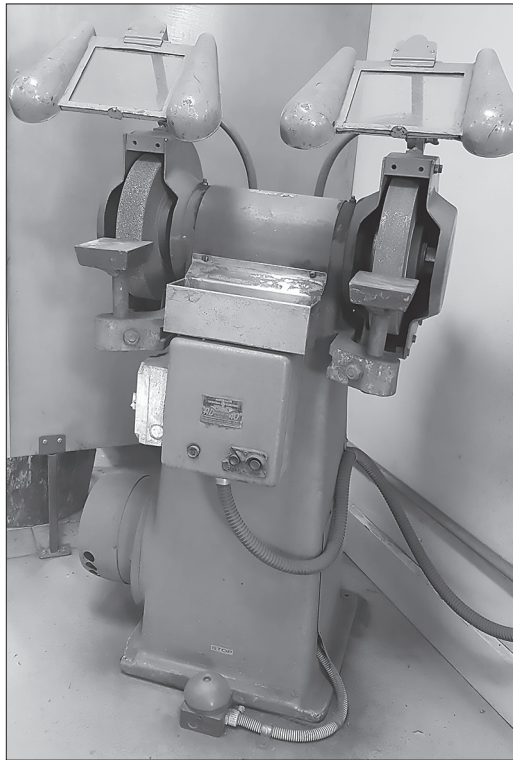


Figure 3

- a. What is the name of the equipment shown in Figure 3?

1 mark

- b. List two safety checks that need to be conducted on the equipment shown in Figure 3 before turning it on and using it.

2 marks

Safety check 1 _____

Safety check 2 _____

Question 8 (1 mark)

A job requires 75 mm long pieces to be cut from 3.2 m lengths of tubing. The saw blade used for the cutting is 2 mm thick.

Calculate how many 75 mm pieces can be cut from each length of tubing.

Question 9 (4 marks)

A new hacksaw blade will be fitted to a hacksaw frame to cut 1.5 mm thick sheet metal.

There are three blades to choose from that are labelled 14 TPI, 24 TPI and 32 TPI.

- a. What does 'TPI' stand for? 1 mark

- b. Which of the three hacksaw blades would be the most suitable to cut the 1.5 mm thick sheet metal? Give a reason for your answer. 1 mark

Hacksaw blade _____

Reason _____

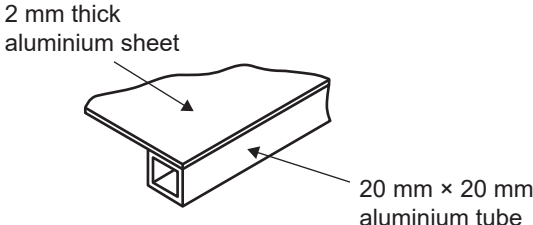
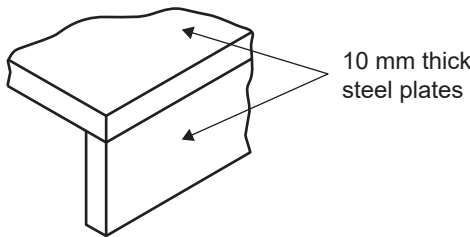
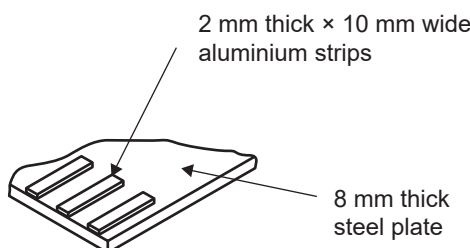
- c. List two things to check in relation to the fitting of the hacksaw blade to ensure that it cuts correctly. 2 marks

1. _____

2. _____

Question 10 (6 marks)

The table below shows three diagrams, each with a pair of materials that need to be joined together. Complete the table by stating two appropriate methods that could be used to join each pair of materials.

Materials to be joined	Joining methods
 2 mm thick aluminium sheet 20 mm × 20 mm aluminium tube	1.
	2.
 10 mm thick steel plates	1.
	2.
 2 mm thick × 10 mm wide aluminium strips 8 mm thick steel plate	1.
	2.

Question 11 (1 mark)

After facing a shaft on a lathe, the face was left with a dimple as shown in Figure 4.

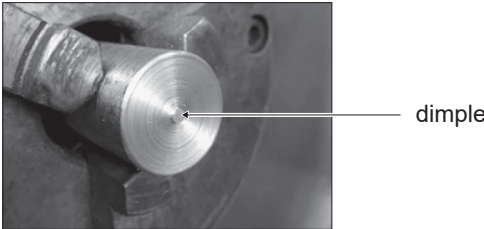


Figure 4

State the most common cause of this dimple.

Figure 5 shows a diagram of a component made from mild steel.

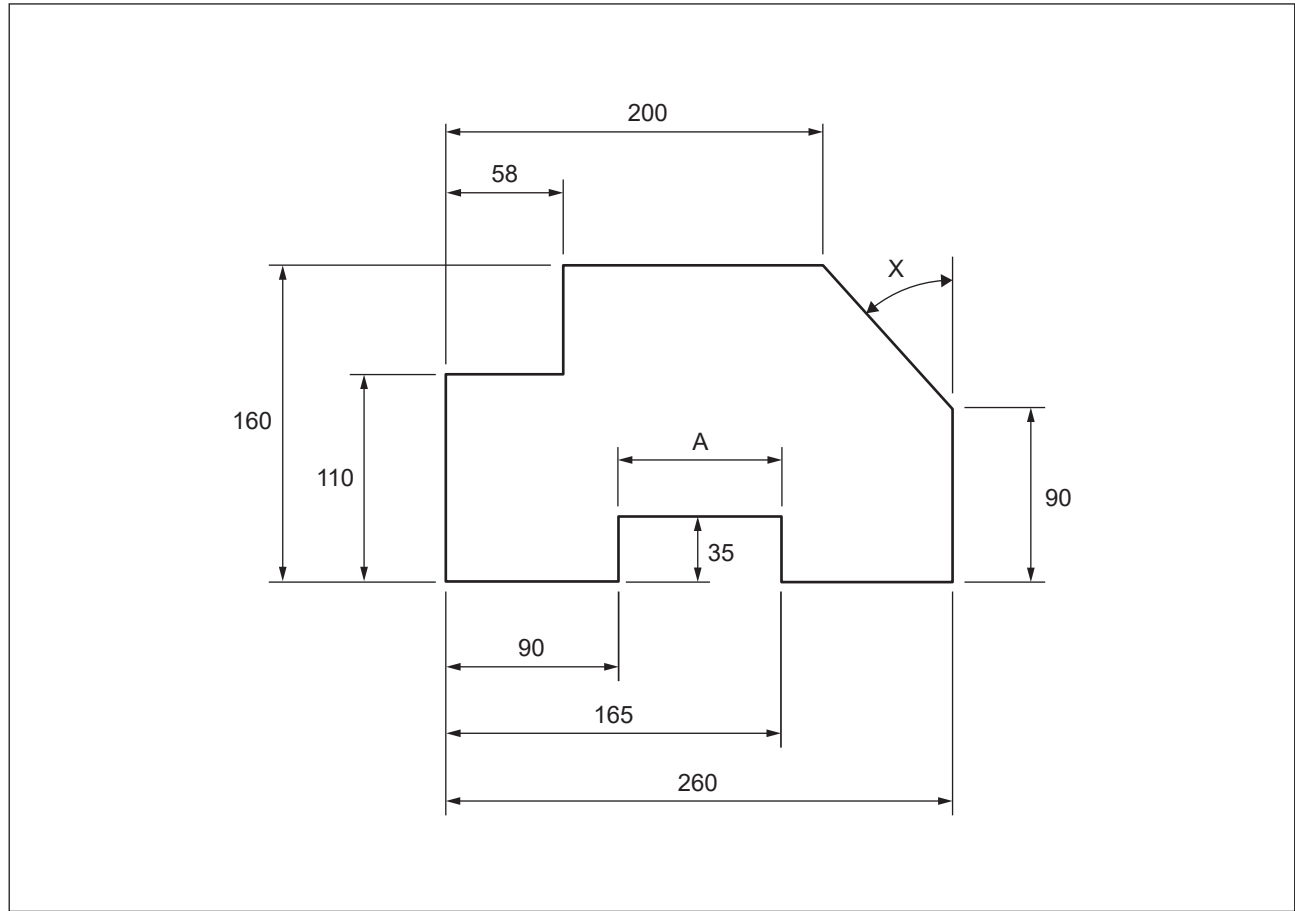


Figure 5

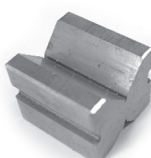
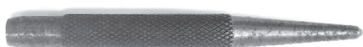
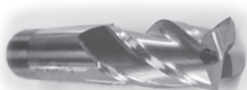
- a. Calculate the dimension A of the component shown in Figure 5. 1 mark

- b.** Calculate the angle X of the component shown in Figure 5. Show your working. 2 marks

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Question 13 (5 marks)

Complete the table below by naming the tool shown and identifying a common use for each tool.

Tool	Name	Common use
		
		
		
		
		

Question 14 (5 marks)

Figure 6 shows an isometric drawing of a machined component.

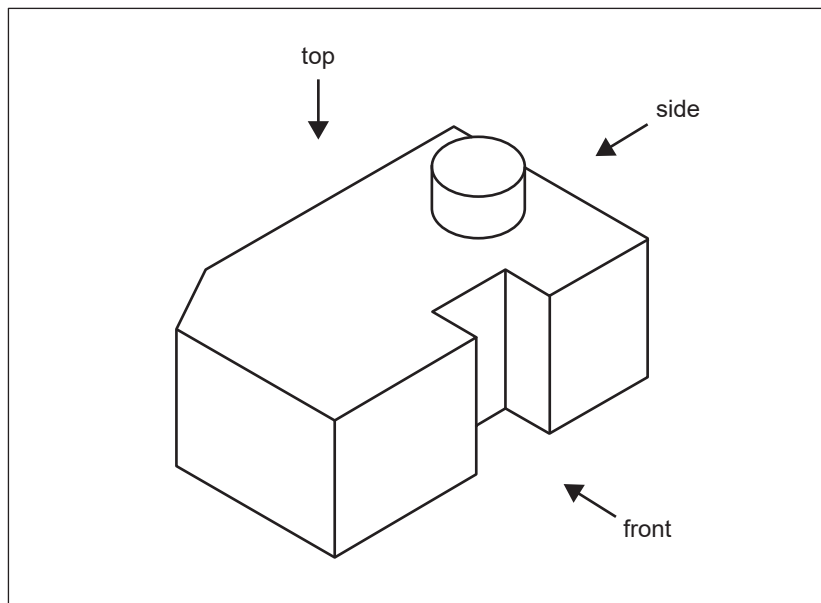
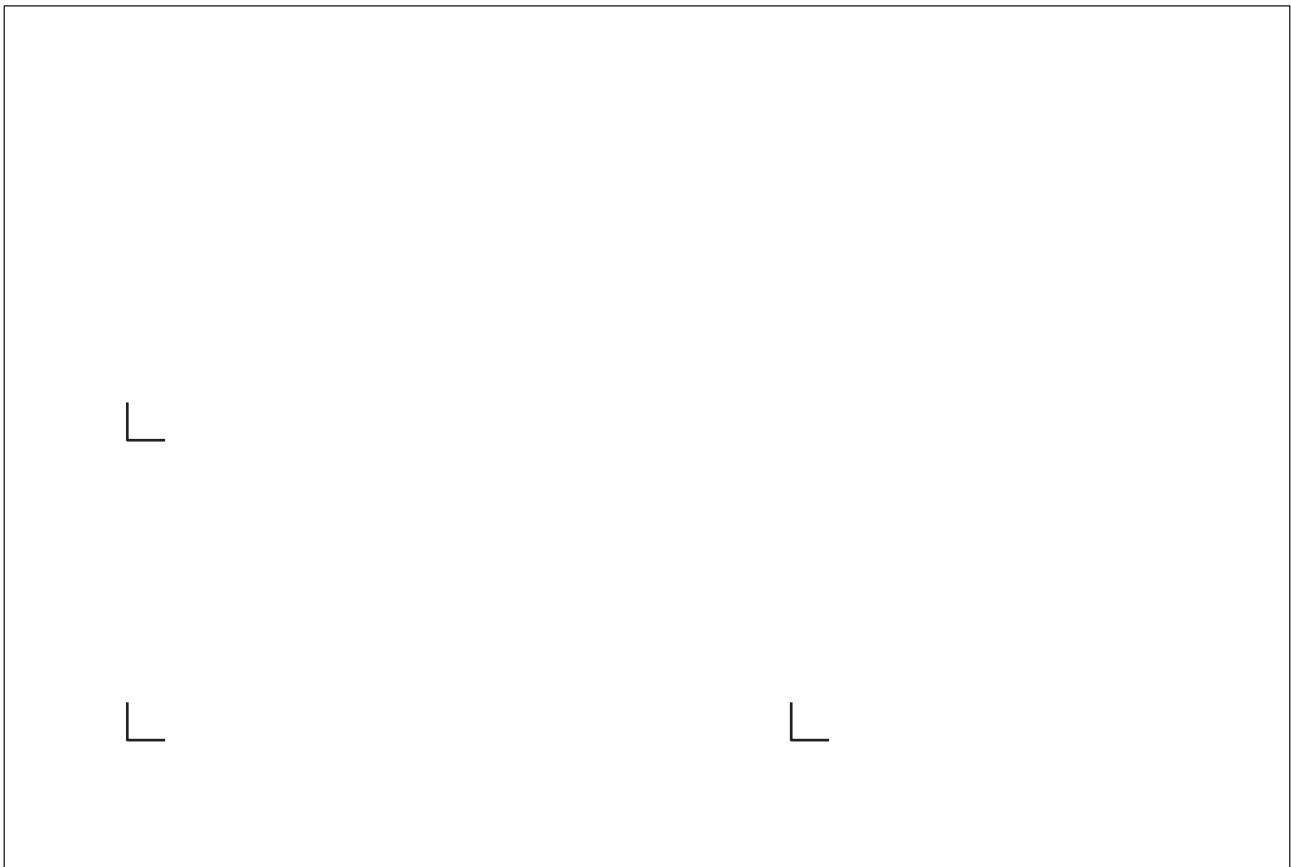


Figure 6

In the space provided below, draw the machined component shown in Figure 6 using third-angle projection.

Your drawing should show:

- three views (top, side and front)
- all hidden detail
- all centre lines.



TURN OVER

Question 15 (4 marks)

Figure 7 shows a sketch of a shaft which has not been dimensioned.

Using the following information, complete the drawing of the shaft shown in Figure 7 by sketching in the dimensions and centre lines.

- total length is 150 mm
- large diameter is 48 mm and 85 mm long
- small diameter is 30 mm
- the tapped hole is M12 $\times$ 1.75 and 45 mm deep

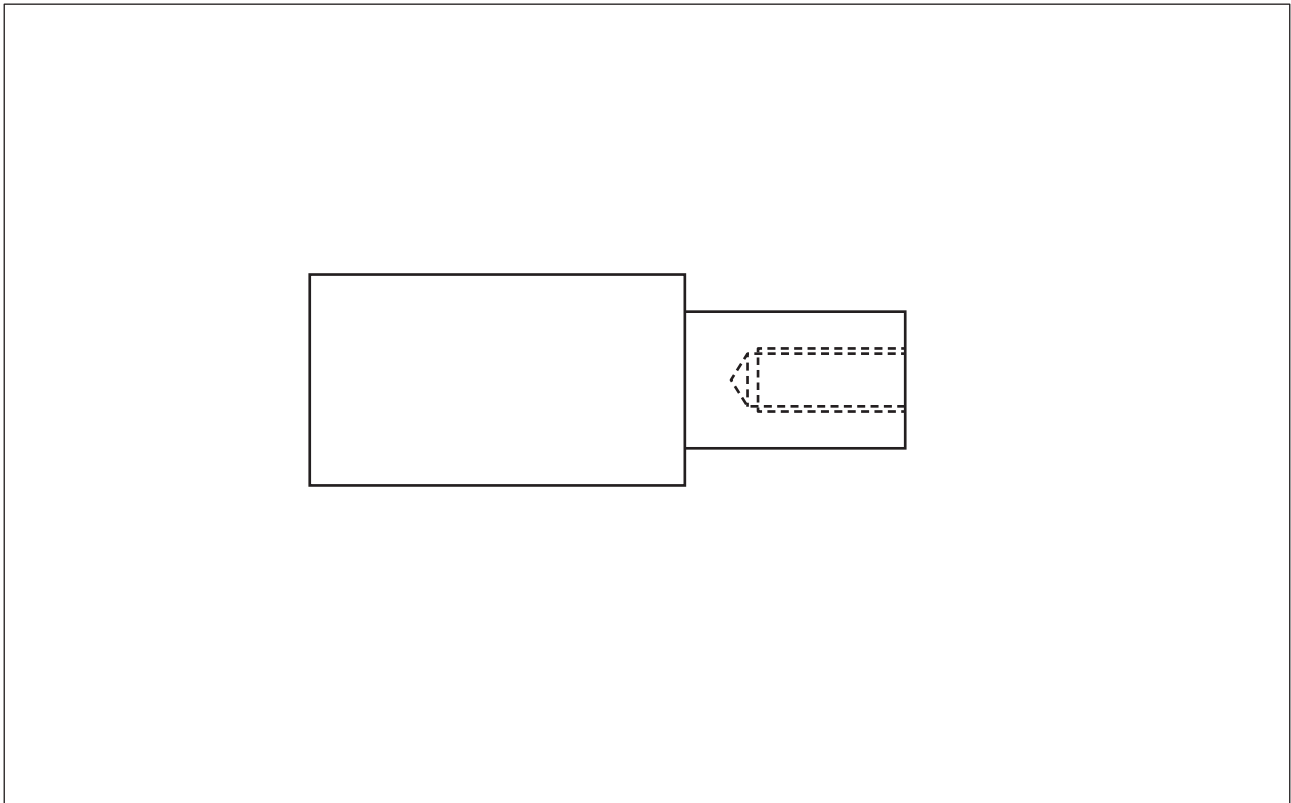
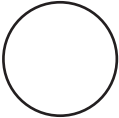


Figure 7

Question 16 (5 marks)

The table below shows the end views of five metal shapes commonly used in engineering workshops.

Complete the table by naming each of the five metal shapes.

Shape	Name
	
	
	
	
	

Question 17 (4 marks)

Figure 8 shows a piece of 1 mm thick sheet metal that will have Ø 110 mm discs cut out of it as shown.

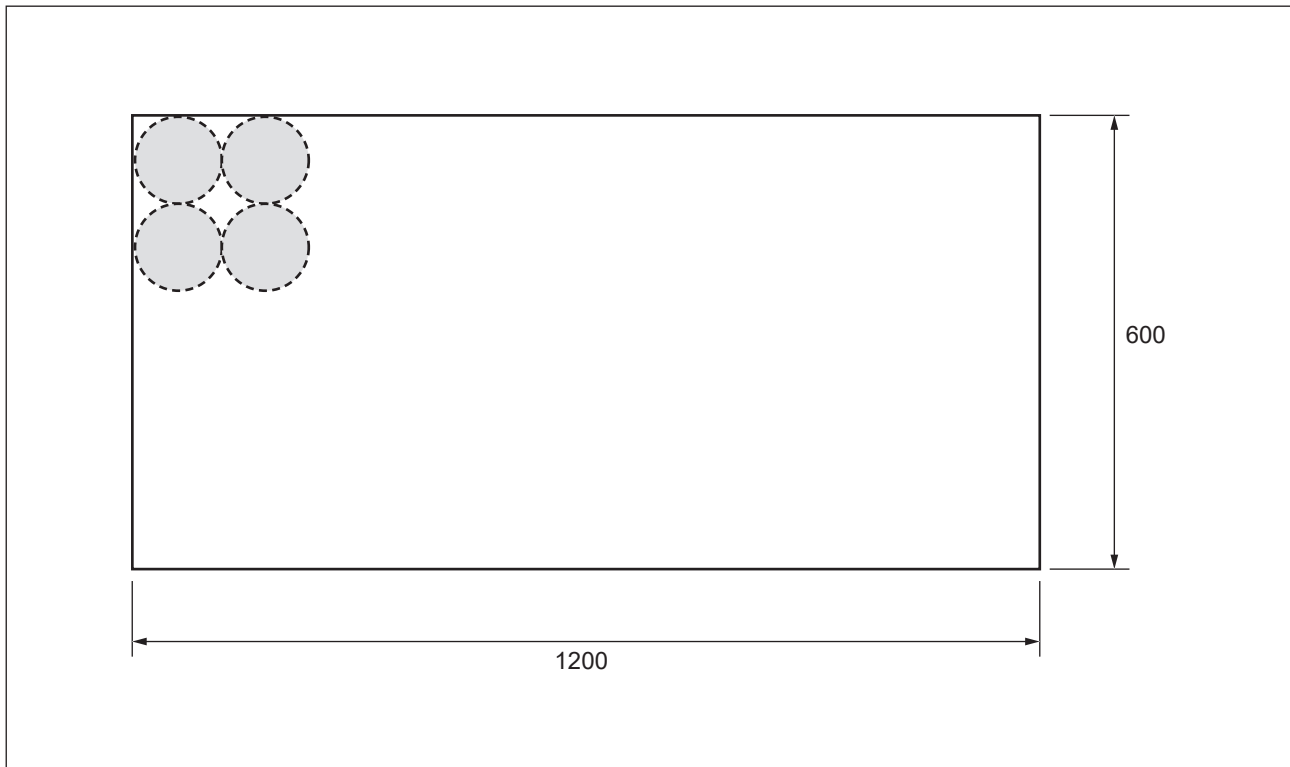


Figure 8

- a. Calculate the maximum number of Ø 110 mm discs that can be cut from the sheet metal. 1 mark

- b. Calculate the percentage of the sheet metal remaining once the maximum number of discs has been cut out. Ignore the thickness of the cut. Show your working. 3 marks

Question 18 (6 marks)

Figure 9 shows a lathe with six parts labelled A to F.

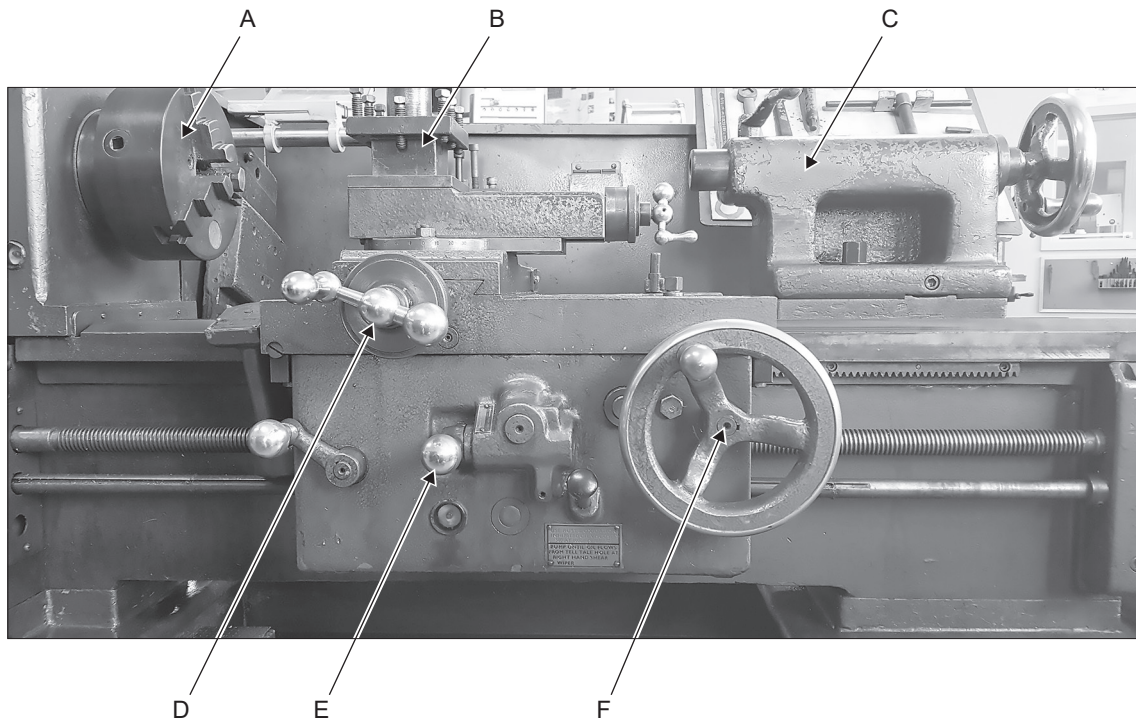


Figure 9

- a. Complete the table below by stating the name and main function of parts A, B and C shown in Figure 9.

3 marks

Part	Name	Main function
A		
B		
C		

- b. What is the function of each of the following parts?

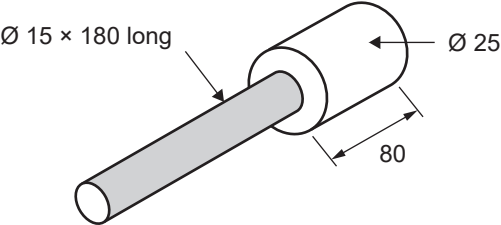
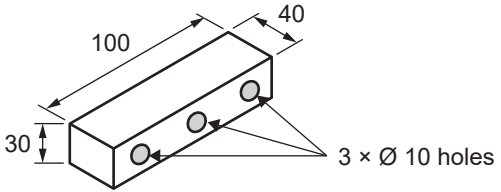
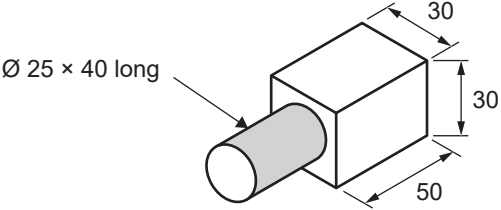
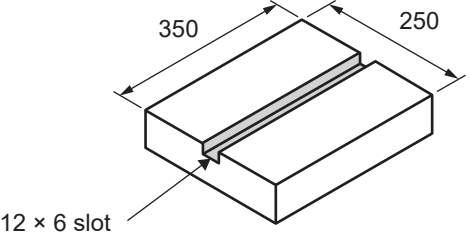
3 marks

Part	Function
D	
E	
F	

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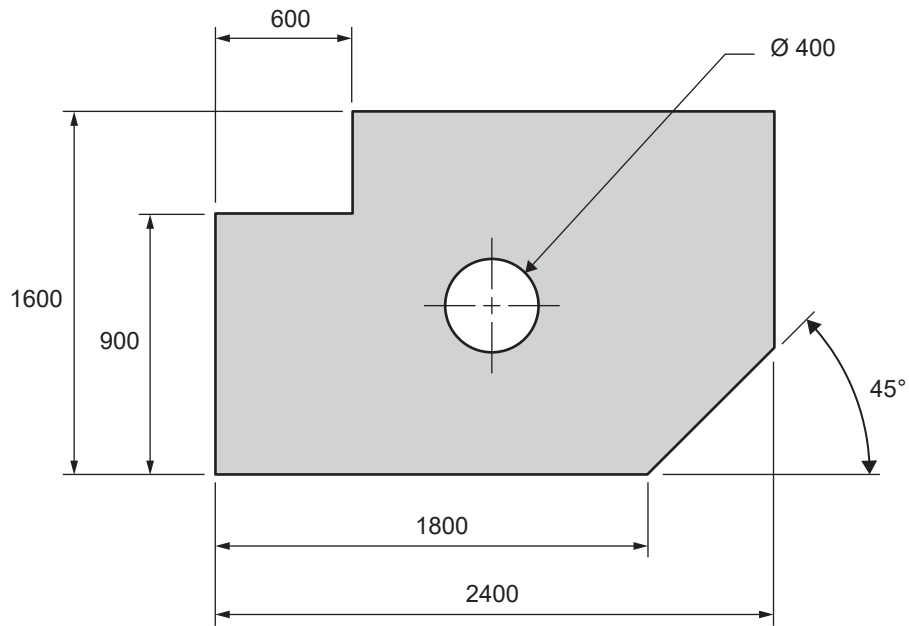
Question 19 (4 marks)

Complete the table below by naming the most suitable machine and work-holding method used to produce the **shaded** features indicated on each part.

Part	Machine	Work-holding method
		
		
		
		

Question 20 (4 marks)

Calculate the area, in m^2 , of the shaded part of the sheet metal shown in Figure 10. Show your working.

**Figure 10**

TURN OVER

Question 21 (3 marks)

Calculate the perimeter of the shape shown in Figure 11. Show your working.

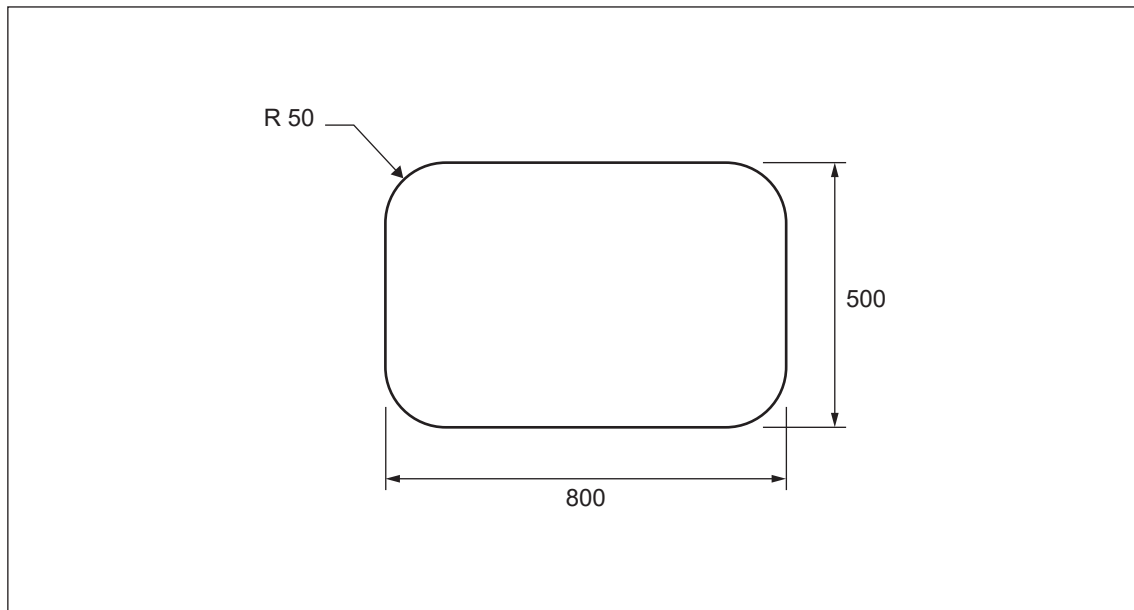


Figure 11

Question 22 (2 marks)

Calculate the centre distance, A, between the two holes shown in Figure 12. Show your working.

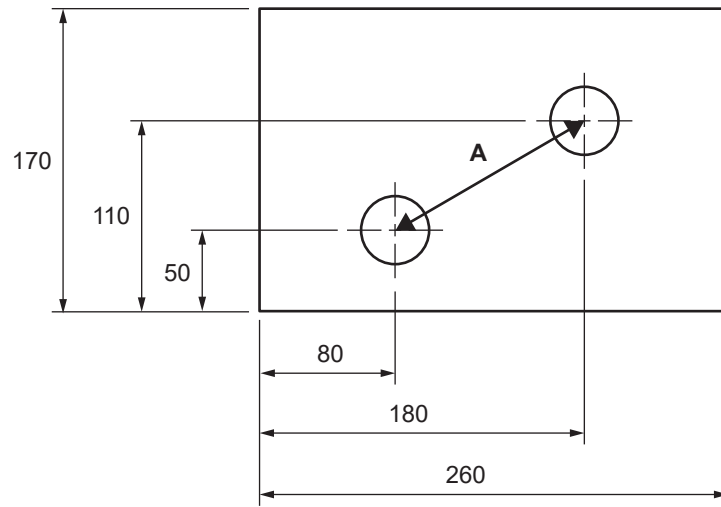


Figure 12

Question 23 (8 marks)

Figure 13 shows an end plate with two screws. Only basic dimensions of the plate are shown.

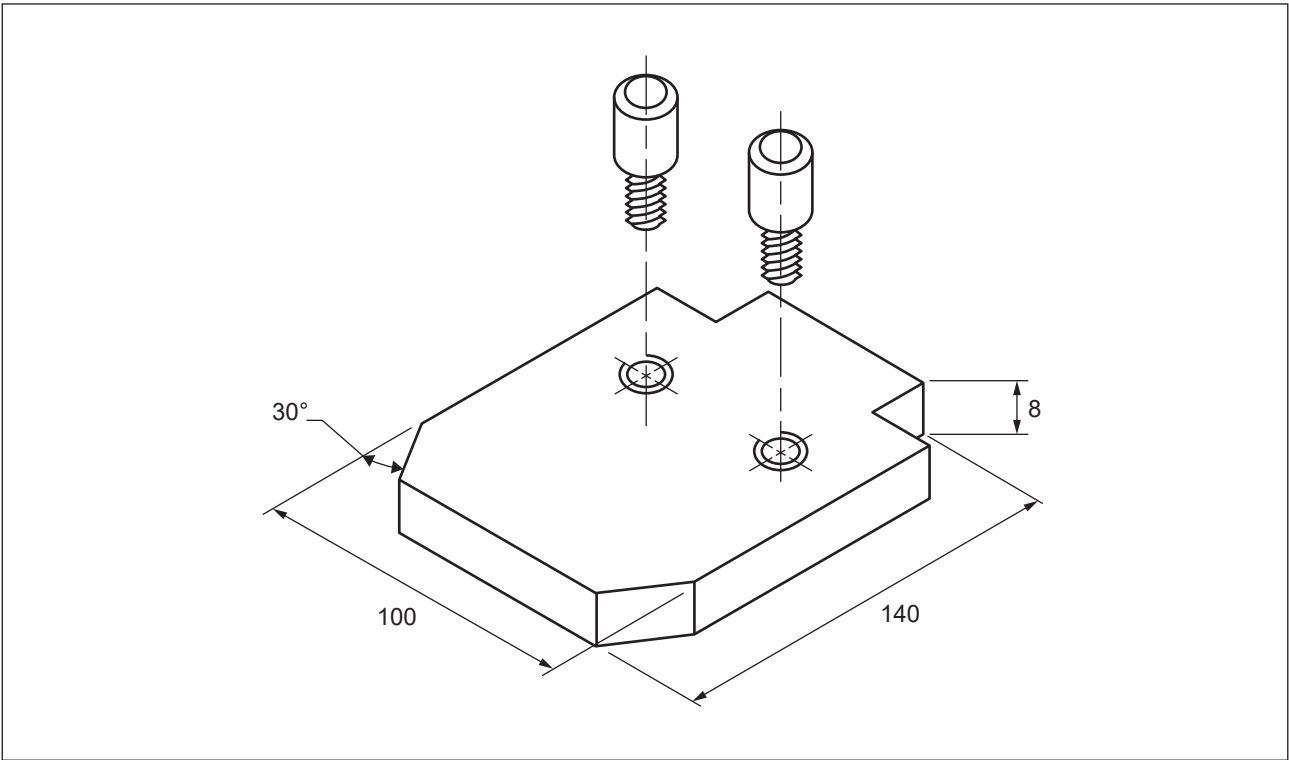


Figure 13

- a. The list below shows the operational steps to manufacture the end plate shown in Figure 13. The steps are **not** in the correct sequence.
- tap both holes
 - mill corners to size
 - de-burr
 - drill both holes
 - mark out
 - square off ends to 140 mm length
 - cut excess material from corners

Use the list to complete the following table showing the correct sequence of operations to make the component. Step 7 is shown.

3 marks

Step	Operation
1	
2	
3	
4	
5	
6	
7	<i>de-burr</i>

Figure 14 shows a piece of 100 mm wide $\times$ 8 mm thick steel bar cut to a length of 144 mm. The end plate will be marked out and made from this, as indicated by the broken lines.

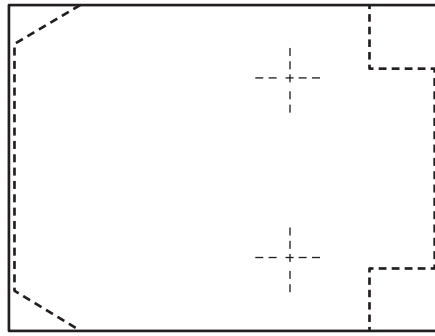


Figure 14

- b.** List four tools that are required to mark out the end plate as shown in Figure 14. 2 marks

1. _____
2. _____
3. _____
4. _____

- c.** When tapping the holes in the end plate, the operator frequently reversed the tap before continuing.

State the reason for frequently reversing the tap.

1 mark

Figure 15 shows a sketch of a screw used in the end plate.

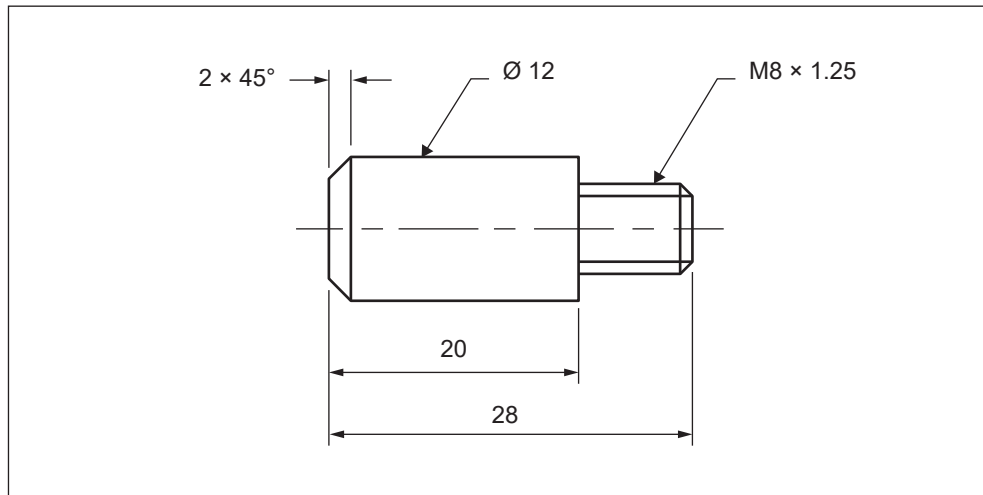


Figure 15

d. The thread is labelled M8 $\times$ 1.25

i. What does the 8 represent?

1 mark

ii. What does the 1.25 represent?

1 mark

Question 24 (3 marks)

Calculate the total volume, in m^3 , of the solid box shown in Figure 16. Show your working.

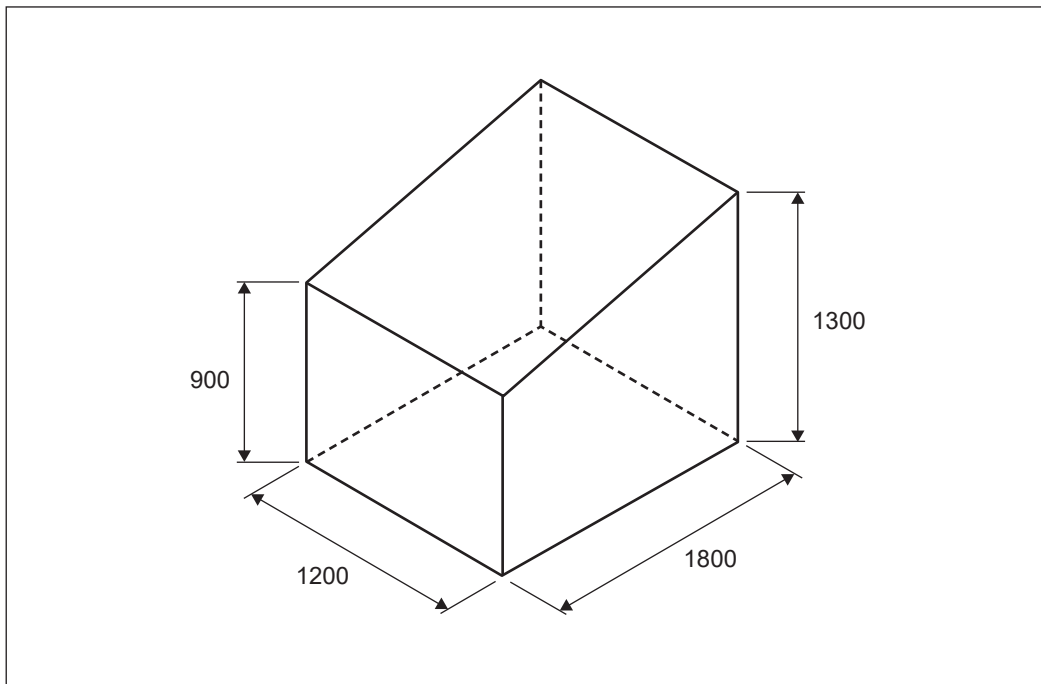


Figure 16

Question 25 (3 marks)

Figure 17 shows a box which will be made from 1.5 mm thick sheet metal.

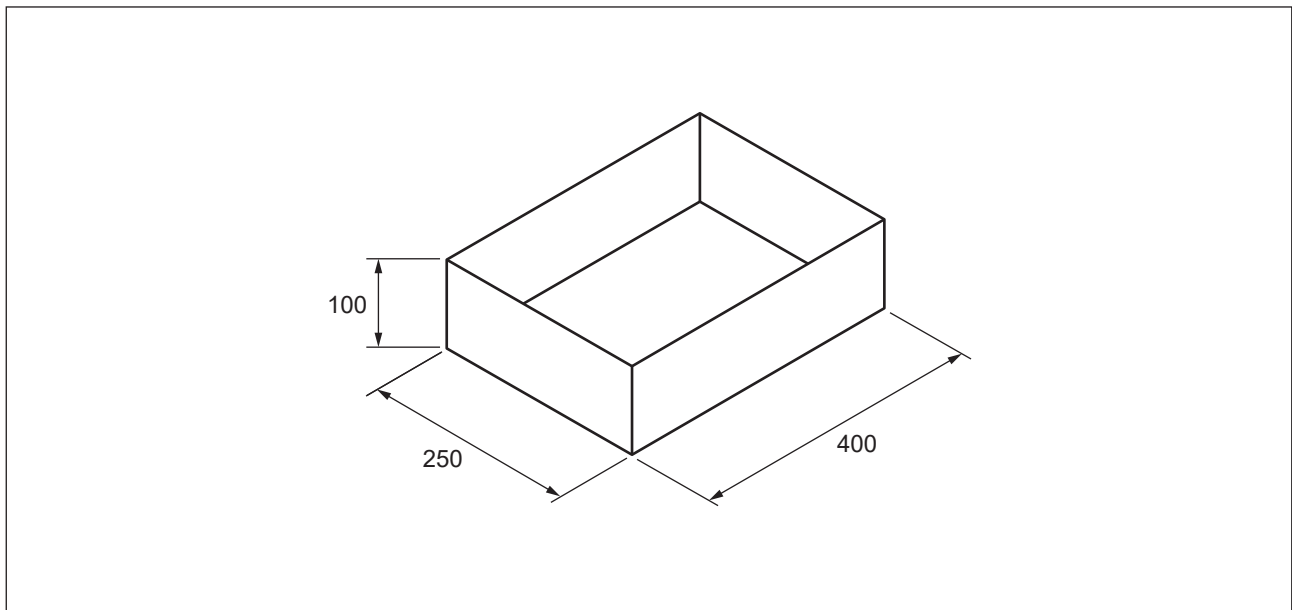


Figure 17

Figure 18 shows a flat layout drawing of the box shown in Figure 17.

The box will be held together by spot welding.

Complete the drawing by

- modifying the design to enable spot welding and
- showing all dimensions required to manufacture the box.

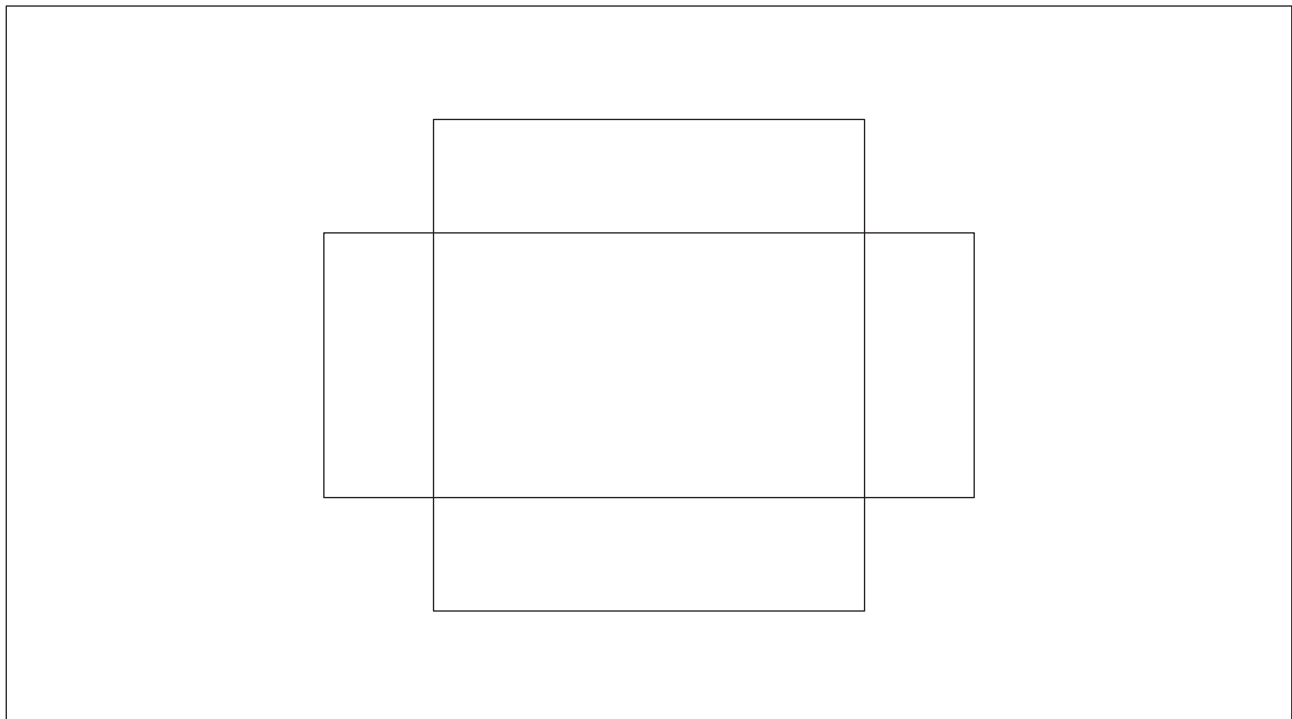


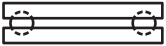
Figure 18

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Question 26 (3 marks)

The table below shows photos of three types of bearings and a sketch showing the side view of each.

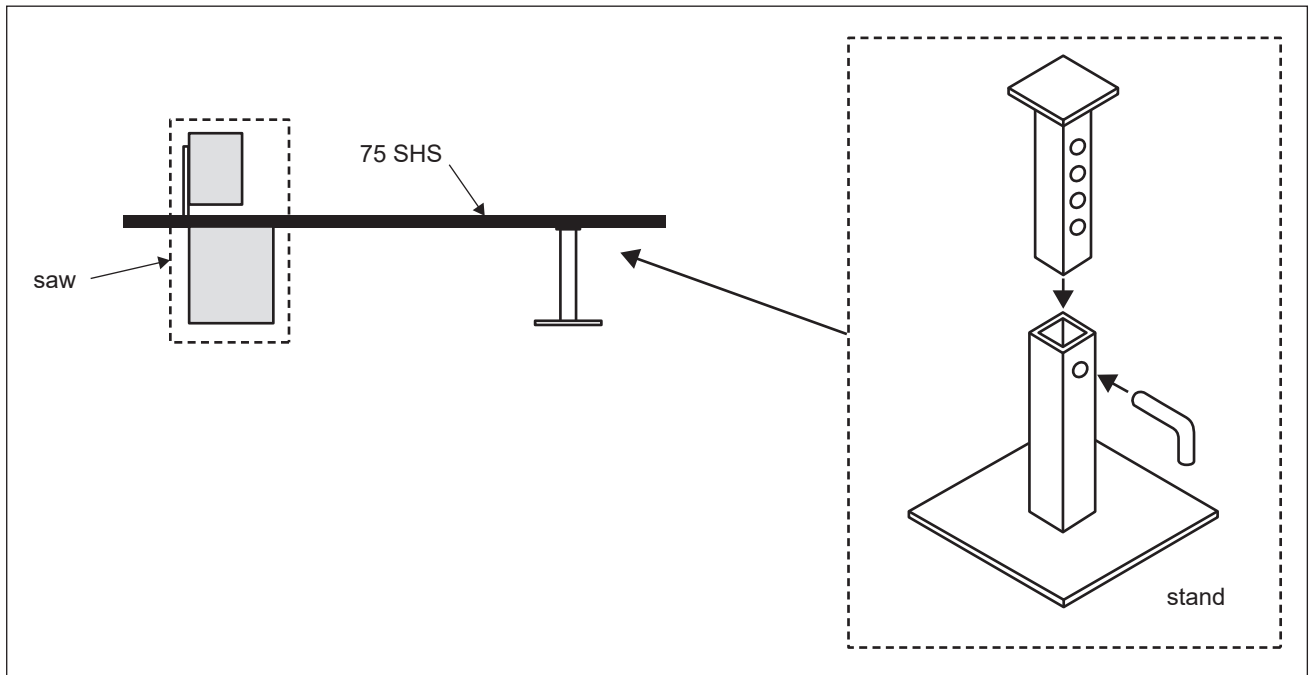
Complete the table below by naming the bearing shown and using arrows on the side view to indicate the direction(s) of load the bearing is designed to take.

Bearing	Name	Side view and load direction
		
		
		

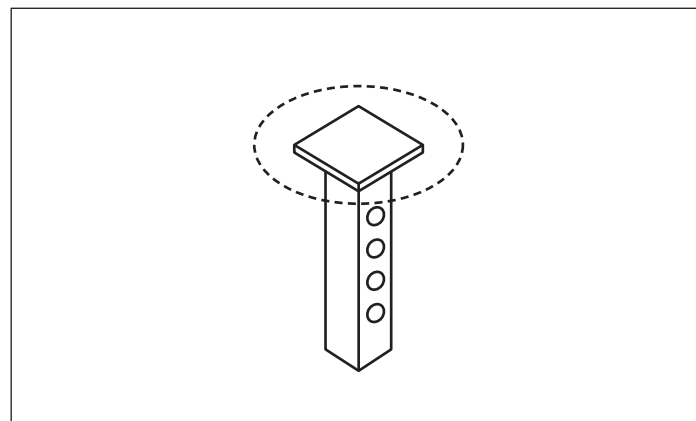
Sources (from top): Tong_stocker/Shutterstock.com; Fedorov Ivan Sergeevich/Shutterstock.com; Ildarss/Shutterstock.com

Question 27 (6 marks)

Figure 19 shows a stand that is being used to support the overhang of 6 m long pieces of 75 SHS when being cut on a saw.

**Figure 19**

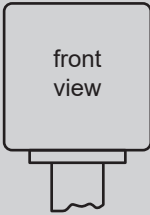
The flat top of the stand that is circled in Figure 20 measures $50 \times 50 \times 3$ thick. This is not ideal when sliding the SHS along the stand.

**Figure 20**

In the space below, sketch a design to add a rolling element to the top of the stand.

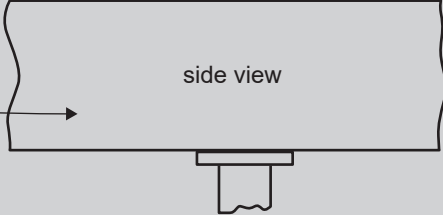
Your sketch must include the following:

- a rolling element to allow for easy sliding of the SHS
- a clear description of your design
- two views of the design (front and side)
- details of materials and components used
- basic dimensions of materials
- enough detail to allow for manufacture.



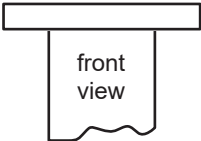
front
view

SHS

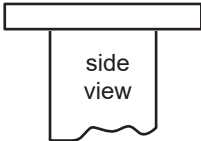


side view

Do not sketch in this area.



front
view



side
view

