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Write your **student number** in the boxes above. **Letter**

VET Engineering Studies

Question and Answer Book

VCE Examination – Wednesday 19 November 2025

- Reading time is **15 minutes**: 9.00 am to 9.15 am
- Writing time is **1 hour 30 minutes**: 9.15 am to 10.45 am

Approved materials

- Protractor, set square and aids for curve sketching
- One scientific calculator

Materials supplied

- Question and Answer Book of 32 pages

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

Contents

VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY
VICTORIA State Government

Instructions

- Answer **all** questions in the spaces provided.
- Write your responses in English.
- All dimensions are in millimetres (mm) except where specified.
- Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

Question 1 (2 marks)

State two items of personal protective equipment (PPE) that should be worn when manually handling large pieces of sheet metal.

1. _____

2. _____

Question 2 (1 mark)

Figure 1 shows five safety signs.

Circle the safety sign that is most likely to be found in a storage area for acetylene bottles.

Figure 1

Question 3 (5 marks)

a. State **one** main difference in composition between ferrous and non-ferrous metals. 1 mark

_____

b. Name two non-ferrous metals and a typical application for each. Give a different application for each metal. 4 marks

Non-ferrous metal	Typical application

Question 4 (1 mark)

Figure 2 shows a tool bracket with six equally spaced holes.

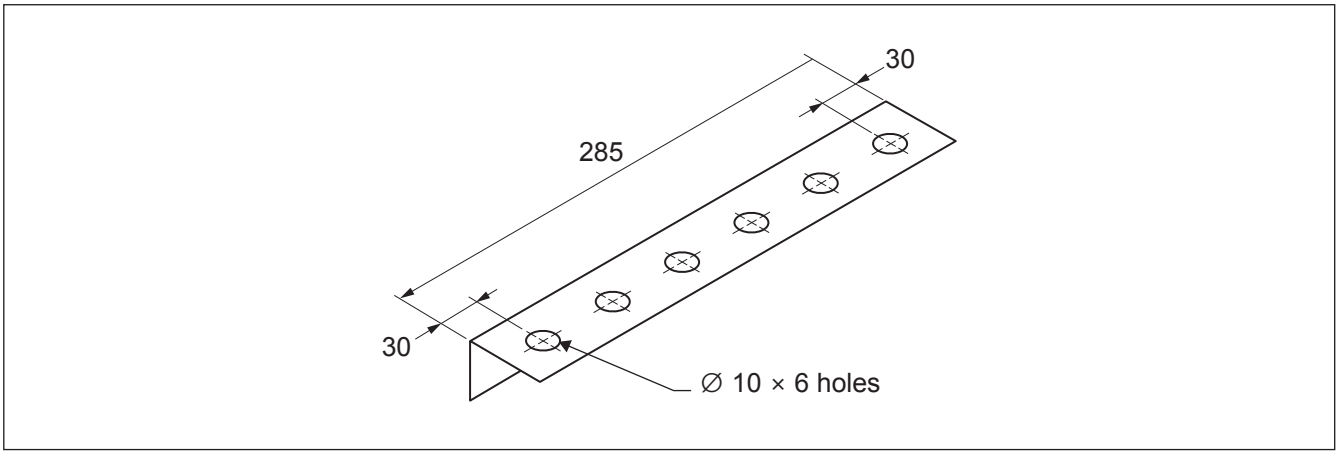

Figure 2

Calculate the centre distance between each hole.

Question 5 (2 marks)

Figure 3 shows a flange on a shaft held on by a plain nut and washer.

The nut and washer occasionally need to be removed for maintenance.

The flange is subject to vibration and the nut could come loose during operation.

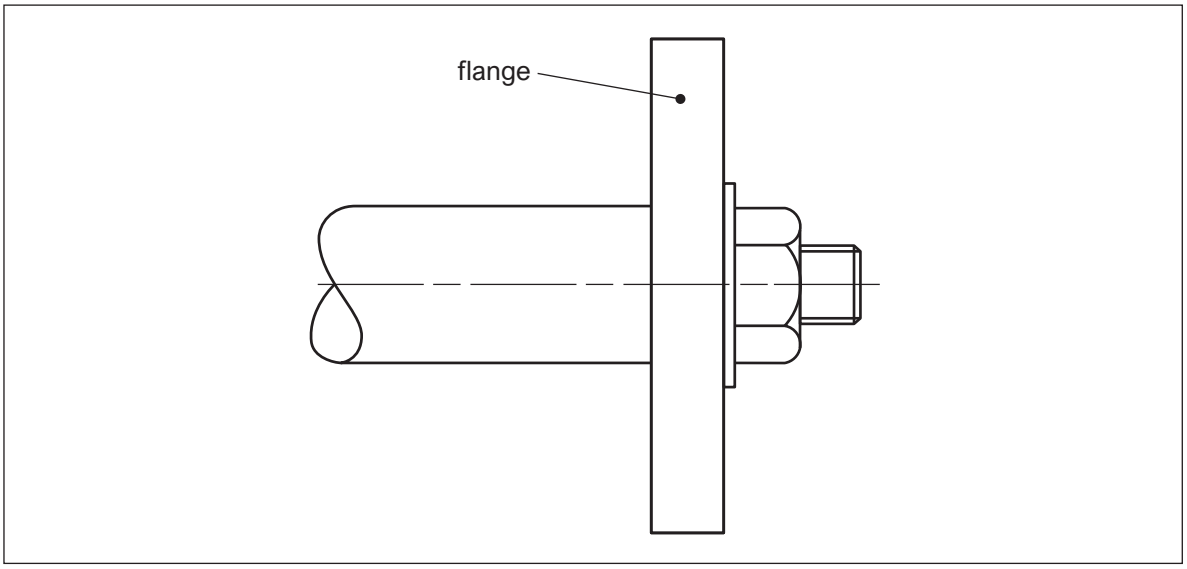

Figure 3

Identify two different modifications to the fastening system that will prevent the nut from coming loose.

1. _____

2. _____

Question 6 (4 marks)

Figure 4 shows a commonly used measuring tool. The three circled areas of the tool can be used for measuring.

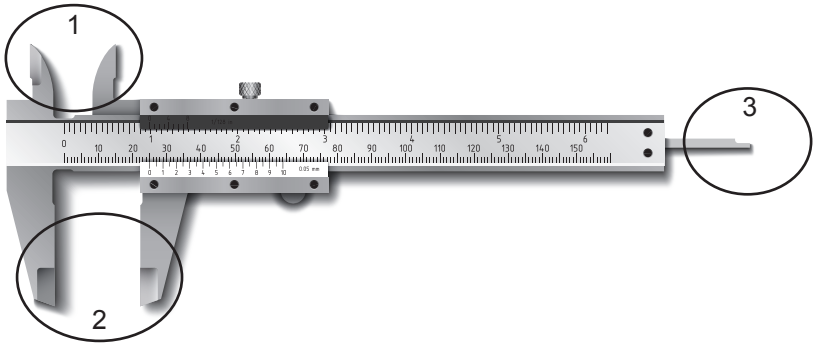

Figure 4

Source: Viktor Chursin/Shutterstock.com

a. State the name of the measuring tool shown in Figure 4. 1 mark

_____

b. Figure 5 shows a component with various dimensions represented by the letters A–G.

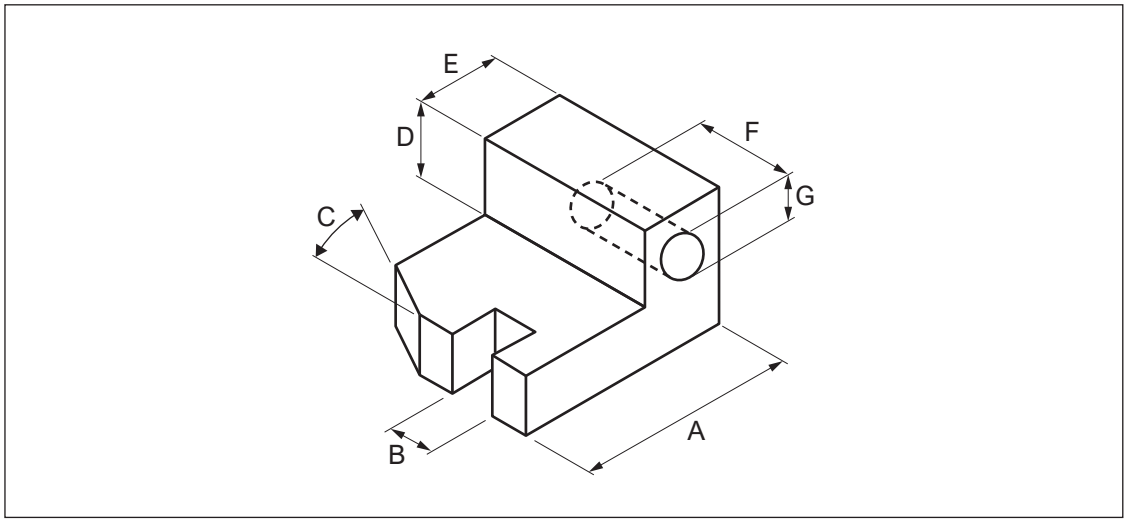

Figure 5

Complete the table below by selecting which dimensions from Figure 5 can be measured by the three areas circled on the measuring tool in Figure 4. Provide two dimensions per area. 3 marks

Circled area of measuring tool	Dimensions suitable for measurement	
1		
2		
3		

Do not write in this area.

Question 7 (4 marks)

Figure 6 is a pie chart showing different categories of injuries reported at a factory in 2024.

Reported injuries 2024

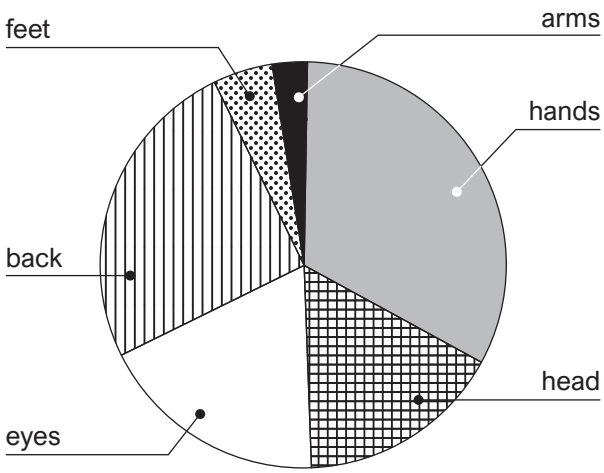

Figure 6

a. State the two highest reported categories of injury. 2 marks

Category 1 _____

Category 2 _____

b. For each category of injury stated in **part a**, list one preventative measure that the factory could implement to reduce these types of injuries. 2 marks

Injury category	Preventative measure

Question 8 (2 marks)

Cemented carbide tools are commonly used for milling and turning.

State two reasons why cemented carbide tools are preferred to high-speed steel (HSS) tools for milling and turning.

1. _____

2. _____

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Examination continues on the next page.

Question 9 (8 marks)

Figure 7 shows a sheet metal storage box with an open front and enclosed ends. It will be mounted onto the frame of a machine using four brackets.

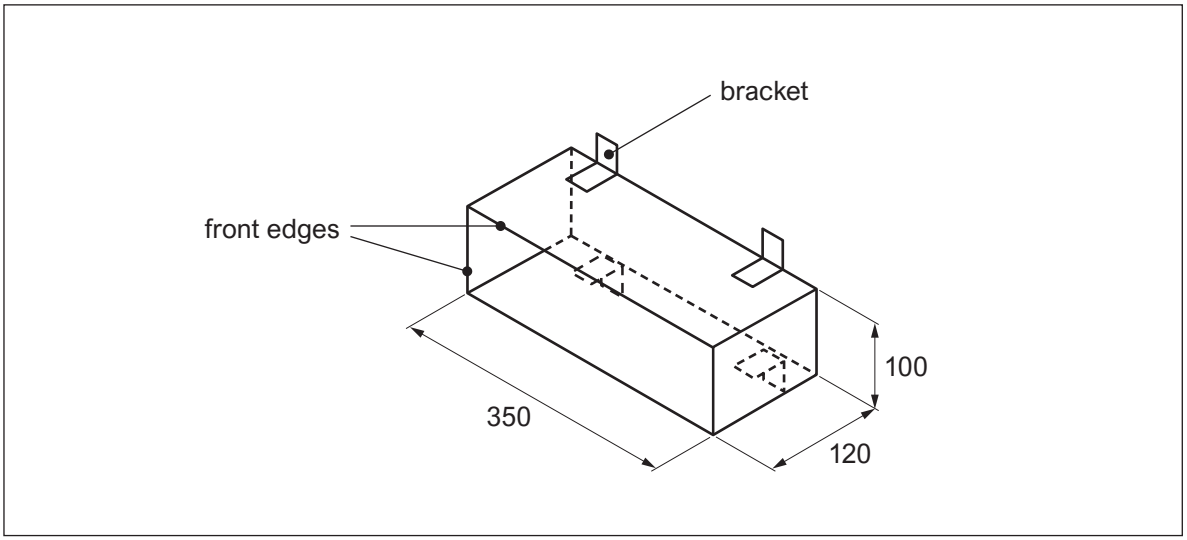

Figure 7

a. The storage box will be made from one rectangular piece of 1 mm thick sheet metal that will be folded and welded.

In the space provided below, sketch the outline of the storage box as a flat sheet before bending. Include dimensions for the length and width of the piece of sheet metal required to make the storage box. 2 marks

b. **i.** State the name of the machine used to cut the rectangular piece of sheet metal to size. 1 mark

_____

ii. Other than wearing correct PPE, list two safe work procedures that should be followed when using the machine stated in **part b.i**. 2 marks

1. _____

2. _____

c. The front edges of the storage box are not safe due to sharp edges, even after deburring.

Name two design changes/additions that would make the edges of the sheet metal safer. 2 marks

1. _____

_____

2. _____

_____

d. The brackets, which are also made of 1 mm thick sheet metal, will be welded to the storage box.

Identify the most suitable welding process. 1 mark

_____

Question 10 (4 marks)

The shaft shown in Figure 8 will be machined on a lathe.

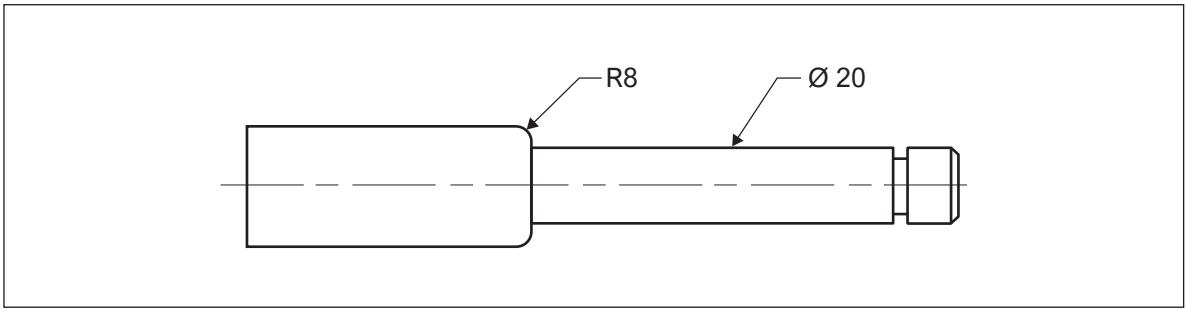

Figure 8

a. During machining, the shaft will need to be supported on the right-hand end using the tool shown in Figure 9.

Figure 9

Name the tool shown in Figure 9 and the part of the lathe that holds this tool. 2 marks

b. Figure 10 shows the top view of seven high-speed steel (HSS) lathe tools labelled A–G.

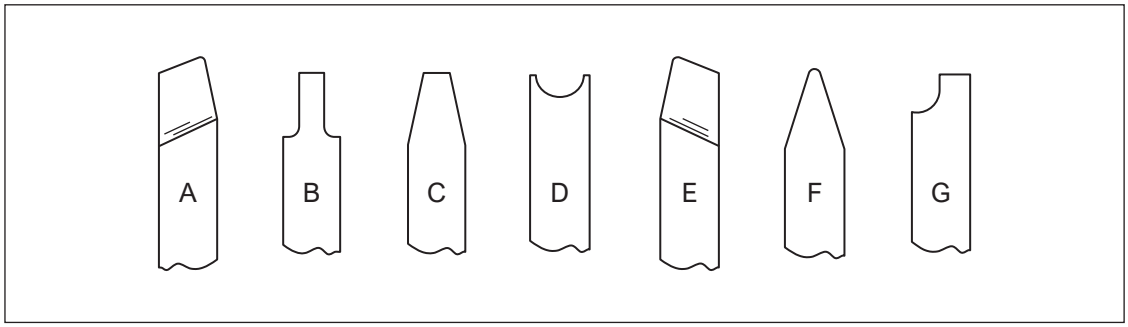

Figure 10

Complete the table below with the most appropriate tool from Figure 10 for machining each feature shown in Figure 8 on page 10. 2 marks

Feature	Tool
20 mm diameter of the shaft	
8 mm radius of the shaft	

Question 11 (4 marks)

Figure 11 shows a hook rack that will be manufactured for a boat.

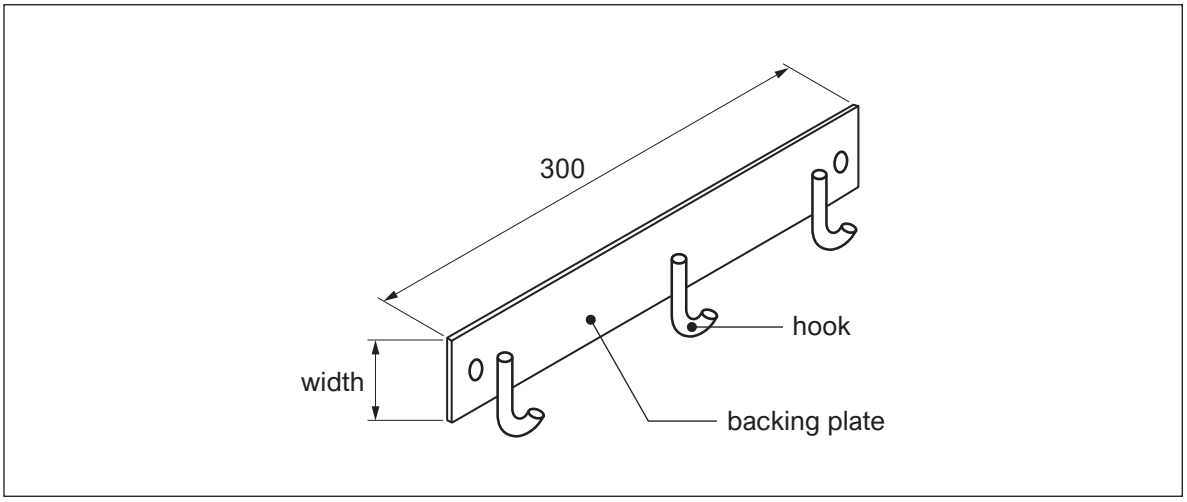

Figure 11

a. Name a suitable metal for the manufacture of the hook rack and state the reason for your response. 2 marks

b. The width of the backing plate of the hook rack was measured with a rule, as shown in Figure 12.

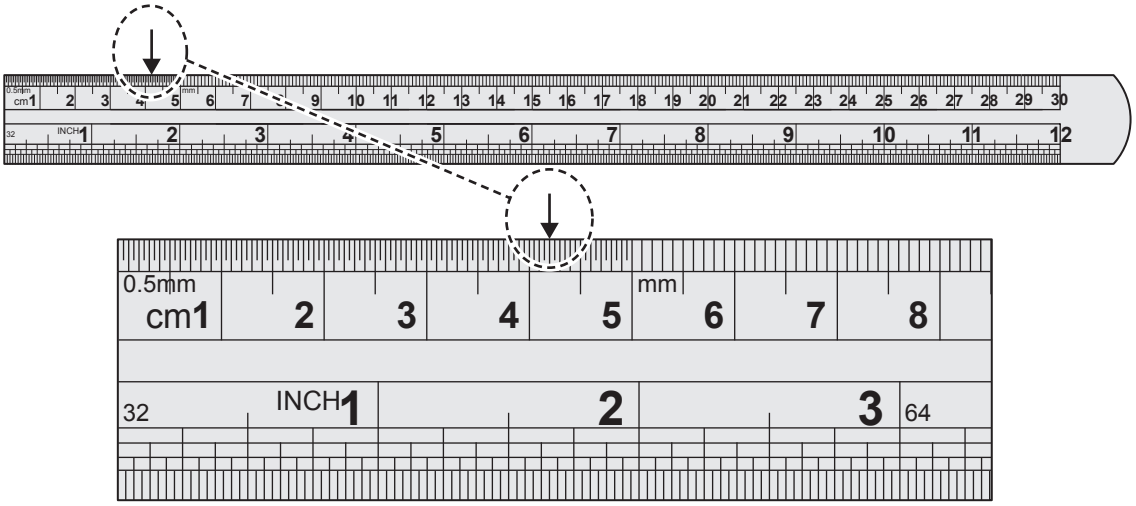

Figure 12

State the width of the backing plate in millimetres. 1 mark

c. The completed hook rack will be screwed to a 1.5 mm thick sheet metal wall that can only be accessed from the front.

Name the most suitable type of screw to use. 1 mark

Do not write in this area.

Question 12 (5 marks)

Figure 13 shows an isometric drawing of a steel base.

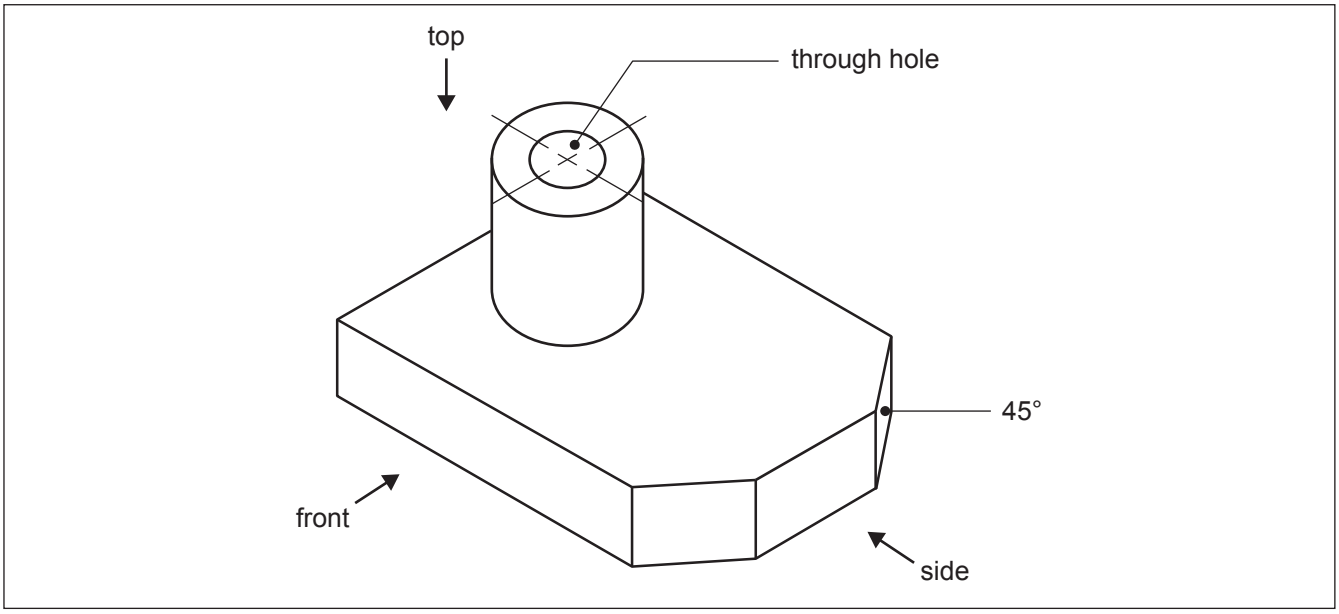

Figure 13

In the space provided below, draw the steel base shown in Figure 13 using third-angle projection. Your drawing should show:

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

Question 13 (5 marks)

The table below shows five types of bearings commonly used in engineering.

Complete the table by placing a tick (✓) in the appropriate columns to indicate which type of bearing is shown and the primary load the bearing is designed for.

Bearing	Type of bearing		Primary load		
	Plain	Anti-friction	Radial	Thrust	Radial and thrust
					
					
					
					
					

Sources (from top): NetPix/Shutterstock.com; Evannovostro/Shutterstock.com; Everyonephoto Studio/Shutterstock.com; Wirestock Creators/Shutterstock.com; SergeyMarina/Shutterstock.com

Question 14 (3 marks)

Figure 14 shows a steel plate with two datum lines indicated by ▶—□.

Some of the dimensions are drawn incorrectly.

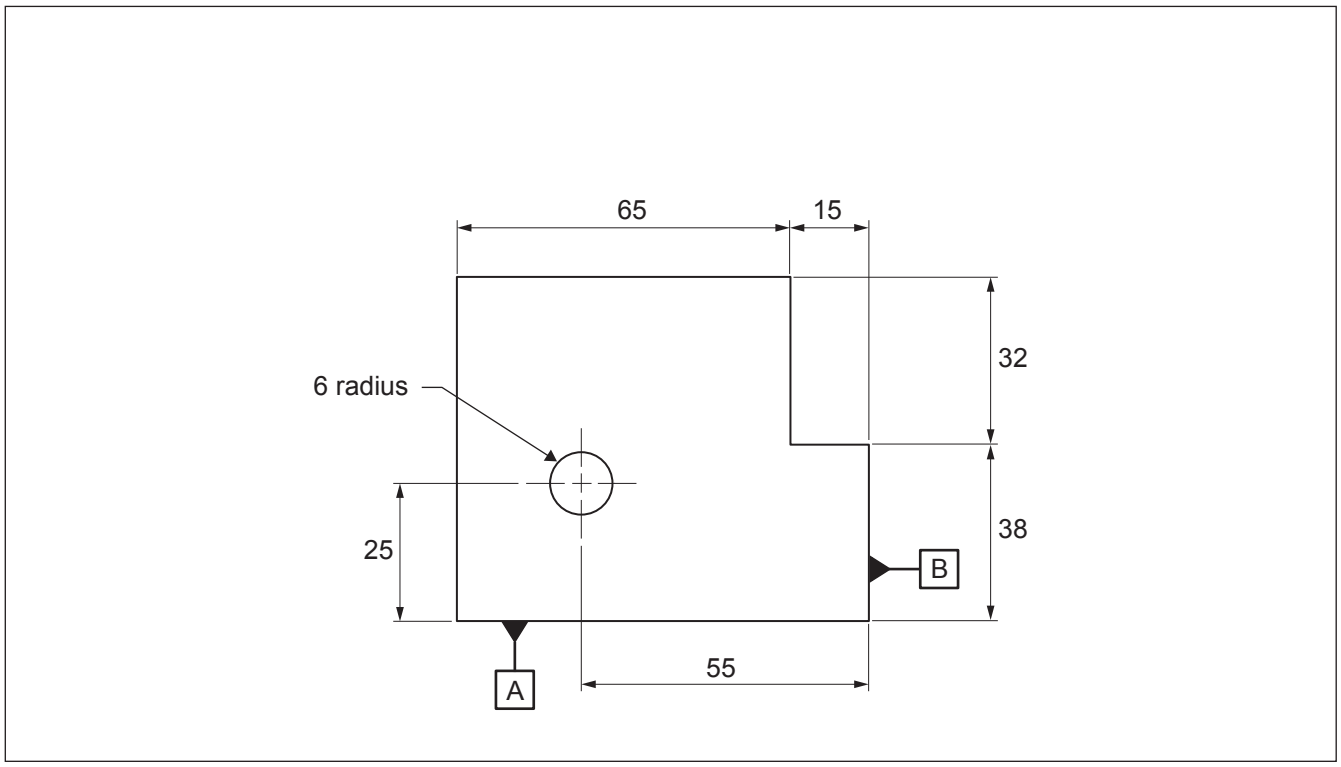

Figure 14

Use Figure 15 to complete the missing hole and length dimensions of the steel plate, referencing the datum lines.

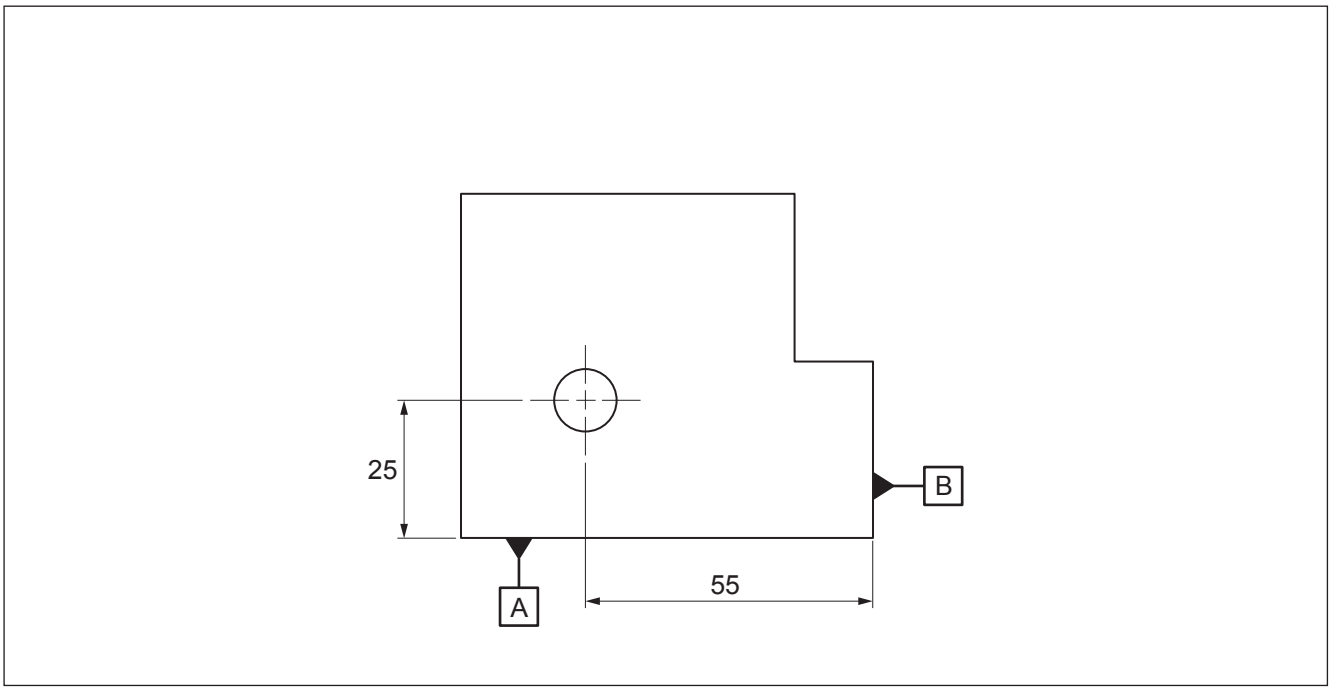

Figure 15

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Examination continues on the next page.

Question 15 (5 marks)

Figure 16 shows the floor plan of a maintenance workshop that will be laid with rubber floor matting. The shaded areas represent cabinets that are fixed to the floor.

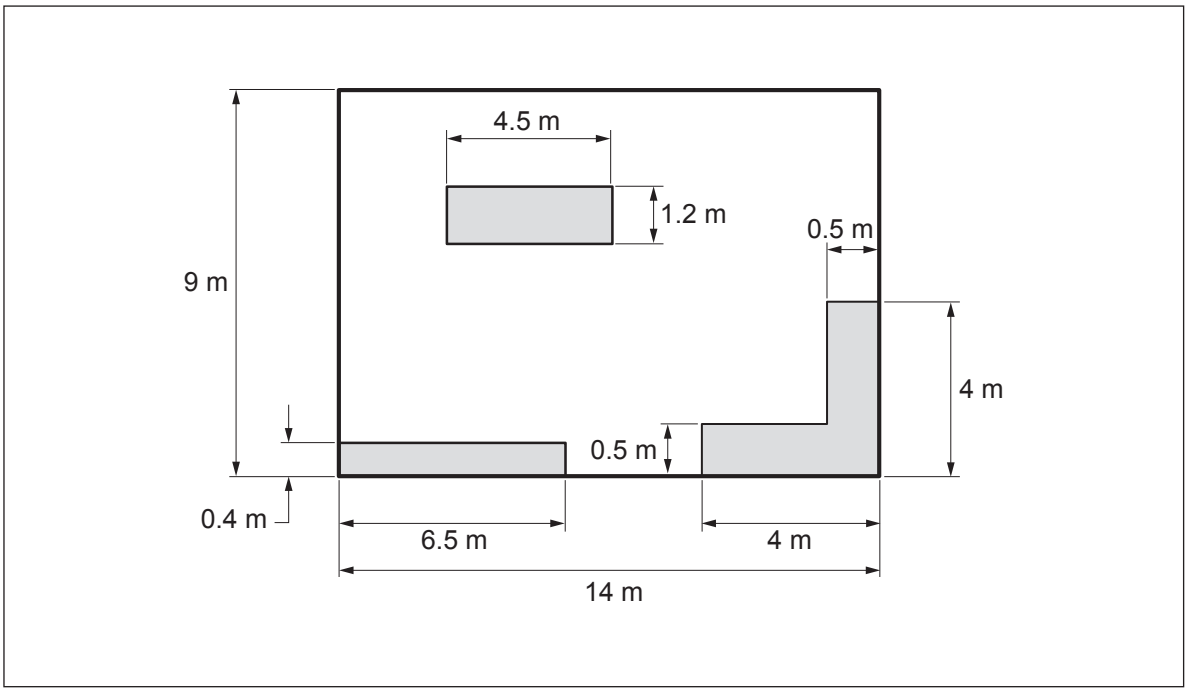


Figure 16

a. Calculate the area of floor that will be covered with rubber matting, in square metres, correct to two decimal places. Show your working out in the box below. 3 marks

b. The rubber floor matting comes in boxes of 20, with each piece measuring 800 mm × 800 mm.

Calculate the total number of boxes of rubber matting that need to be purchased to cover the floor of the maintenance workshop. Show your working. 2 marks

Question 16 (3 marks)

Figure 17 shows a frame for a bench-saw table using square hollow sections (SHS) and rectangular hollow sections (RHS).

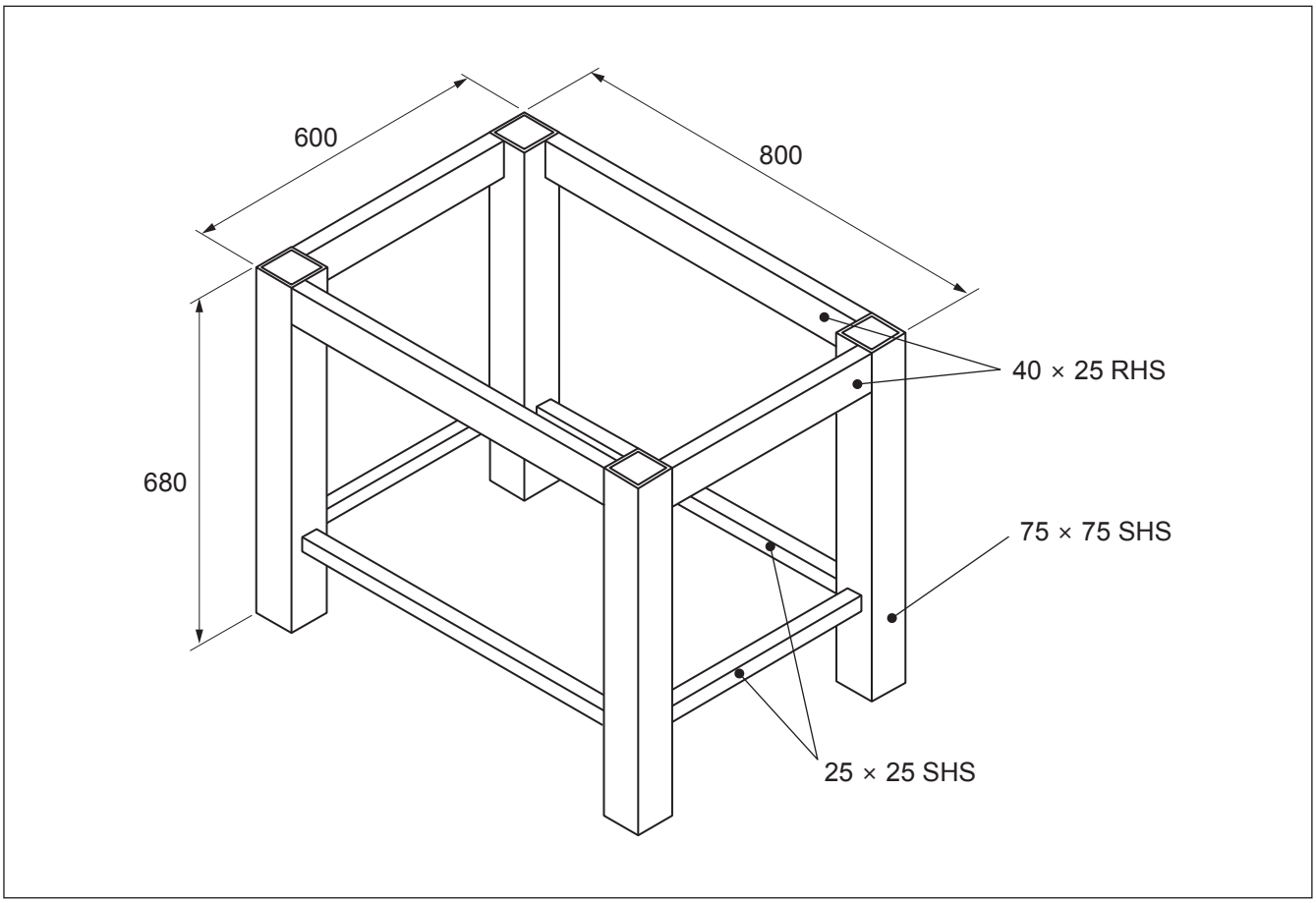


Figure 17

Complete the cutting list below for the bench-saw table shown in Figure 17.

Material	Length	Number of pieces

Question 17 (5 marks)

Figure 18 shows an assembly drawing for a component.

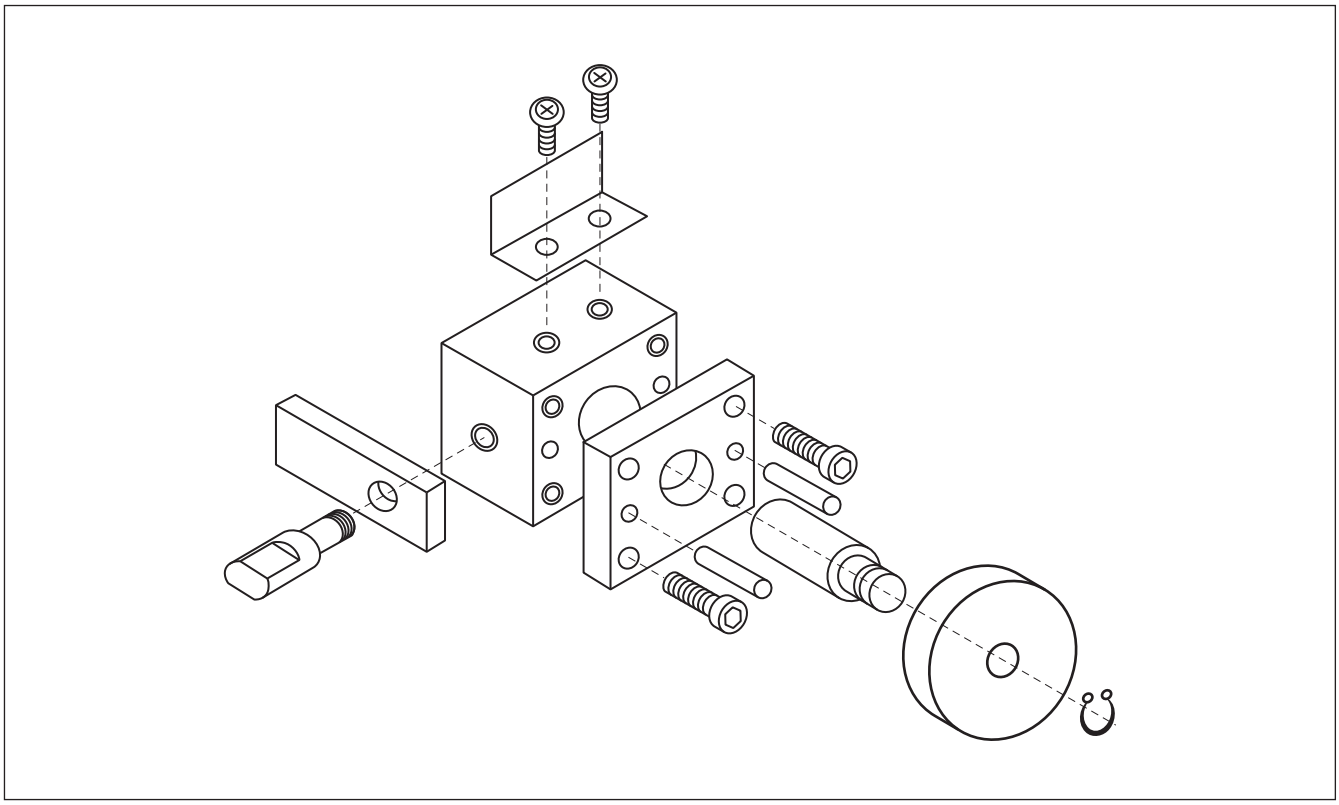


Figure 18

List five specific hand tools required to assemble the component shown in Figure 18.

1. _____

2. _____

3. _____

4. _____

5. _____

Question 18 (10 marks)

Figure 19 shows a block that will be made from a 100 mm × 40 mm aluminium bar.

A 150 mm long piece of the aluminium bar has been cut to manufacture the block.

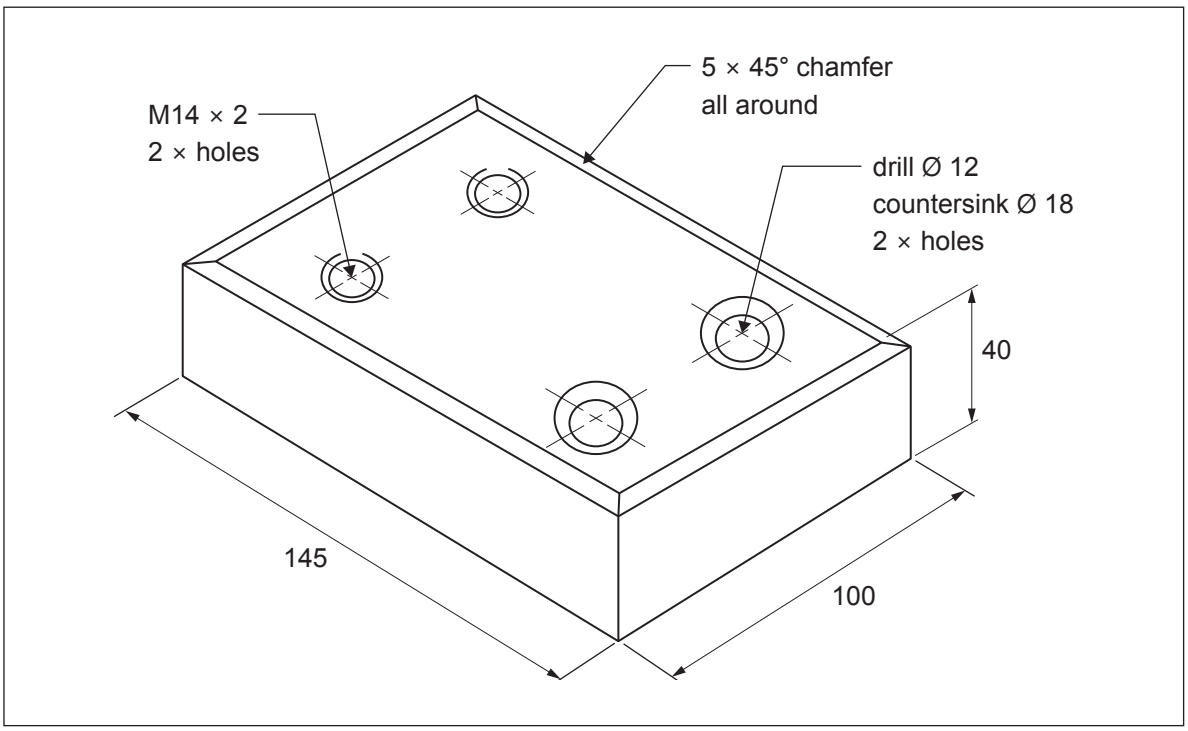


Figure 19

a. The seven main steps to manufacture the block are shown in the table below.
The steps are not in the correct sequence.

Complete the table below by numbering the steps 1–7 in the correct sequence to manufacture the block. 3 marks

Step	Correct sequence
Drill Ø 12 and countersink Ø 18 holes (× 2)	
Machine 5 × 45° chamfer	
Tap M14 threads (× 2)	
Drill M14 tapping size holes (× 2)	
Machine ends to length	
Mark out all holes	
Centre-punch all hole positions	

b. State the main purpose for using countersunk screws instead of standard bolts. 1 mark

_____

c. What is the best way to produce the 5 × 45° chamfer? State the machine required, the type of cutter and the work-holding method. 3 marks

Machine required _____

Type of cutter _____

Work-holding method _____

d. Figure 20 shows a sketch of a cap screw that will be used in the M14 × 2 thread.

Label the sketch to show the M14 dimension and the 2 dimension. 2 marks

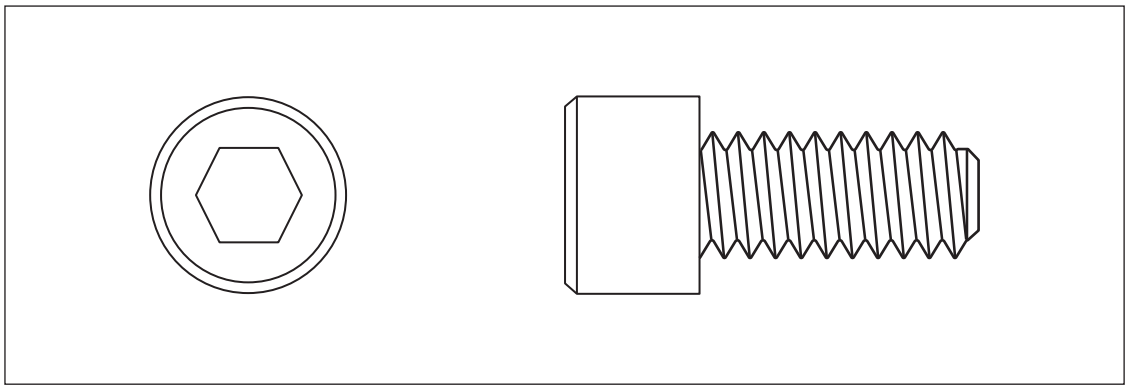


Figure 20

e. The tool shown in Figure 21 will be used to turn the tap used for the M14 × 2 thread.

Figure 21

State the name of this tool. 1 mark

_____

Question 19 (2 marks)

A rectangle, measured in inches ("), has sides 4¾" long and 2⅜" wide.

a. Calculate the perimeter of the rectangle in inches. 1 mark

b. Convert the perimeter of the rectangle to the nearest millimetre. 1 mark

1 inch (1") = 25.4 mm

Question 20 (4 marks)

Figure 22 shows a waste oil storage tank measuring 1500 mm diameter and 800 mm high.

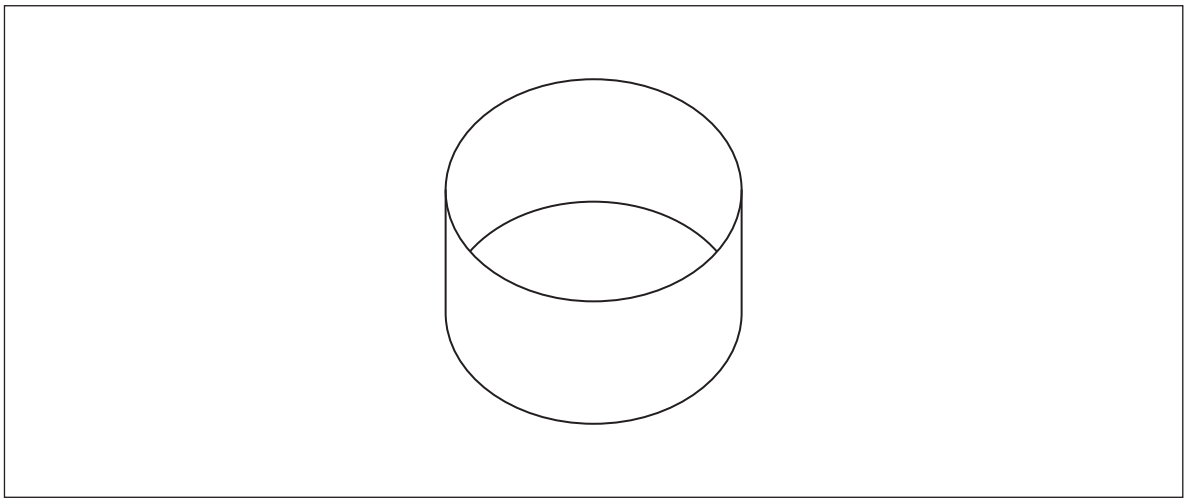


Figure 22

a. Calculate the volume of the tank in litres. Round your answer to the nearest whole litre. Show your working. 2 marks

1 L = 1 000 000 mm^3

Volume =

Question 20 continues on the next page.

b. The outside wall of the tank will be clad with flat galvanised sheet metal, which will be curved to suit the tank. Each piece of flat galvanised sheet metal measures 800 mm × 1200 mm.

i. Calculate how many sheets are required. 1 mark

ii. State the main advantage of flat galvanised sheet metal over plain sheet metal. 1 mark

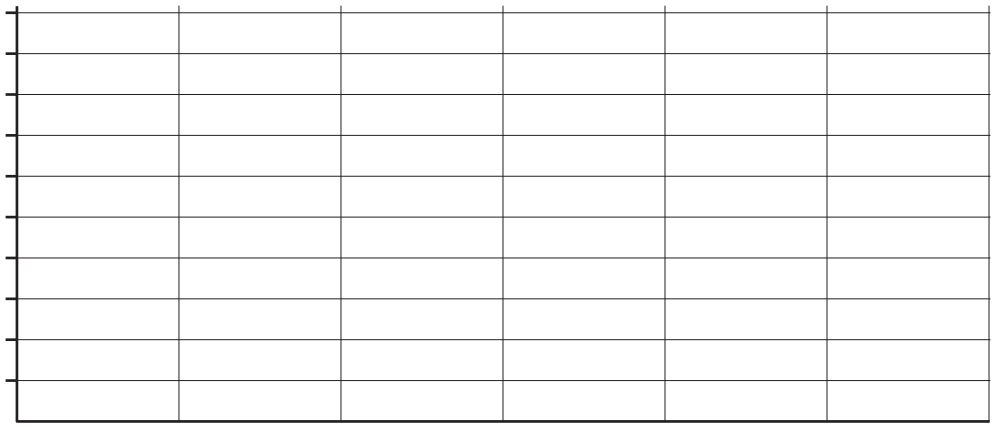
Question 21 (8 marks)

The table below shows the amount of material, in kilograms (kg), used in a metal fabrication workshop over a six-month period.

	Feb	Mar	Apr	May	Jun	Jul
Mild steel	450	380	320	280	300	330
Stainless steel	200	240	240	300	320	360

a. In the space provided below, draw a double-line graph to show the amount of the two materials used over the six-month period. Your graph must include the *x*-axis and *y*-axis labels, and a key. 5 marks

Amount of each material used from February to July



Key

b. State the month with the highest quantity of total material used. 1 mark

_____

c. List all the months in which more stainless steel than mild steel was used. 1 mark

_____

d. State the trend for stainless steel use across the six months. 1 mark

_____

Question 22 (7 marks)

Figure 23 shows an air inlet duct made from 1 mm thick sheet metal.

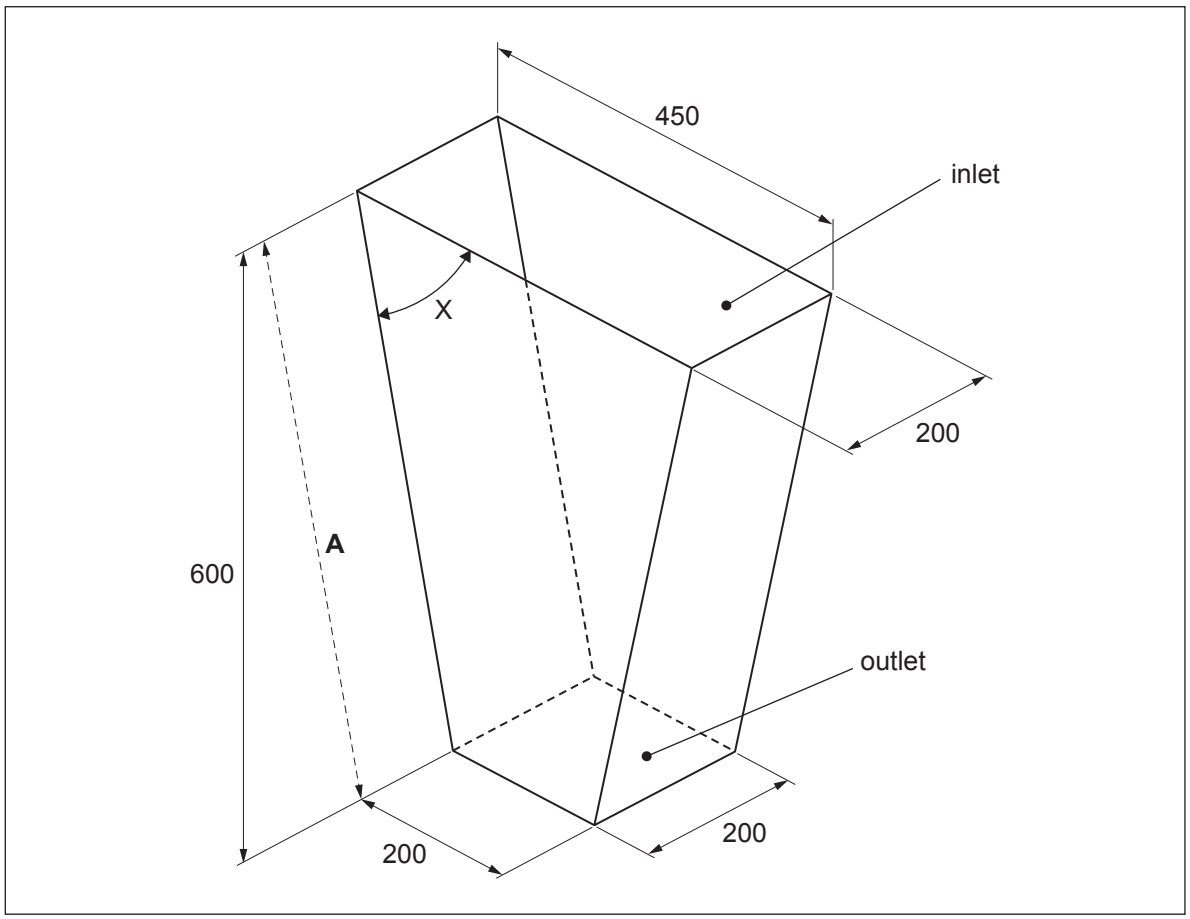


Figure 23

a. Calculate the length 'A' of the air inlet duct. Round your answer to the nearest millimetre. Show your working. 2 marks

b. Calculate angle 'X' of the air inlet duct, correct to one decimal place. Show your working. 3 marks

c. Calculate the percentage decrease in area between the inlet and outlet ends of the duct, correct to one decimal place. Show your working. 2 marks

Question 23 (6 marks)

Figure 24 shows the rear of a trailer and ramp designed to carry a ride-on mower.

The trailer frame on which the floor sits is made of 50 mm × 50 mm × 6 mm angle iron.

The trailer ramp is made of 5 mm steel checker plate. The method for attaching the ramp to the trailer has not yet been designed.

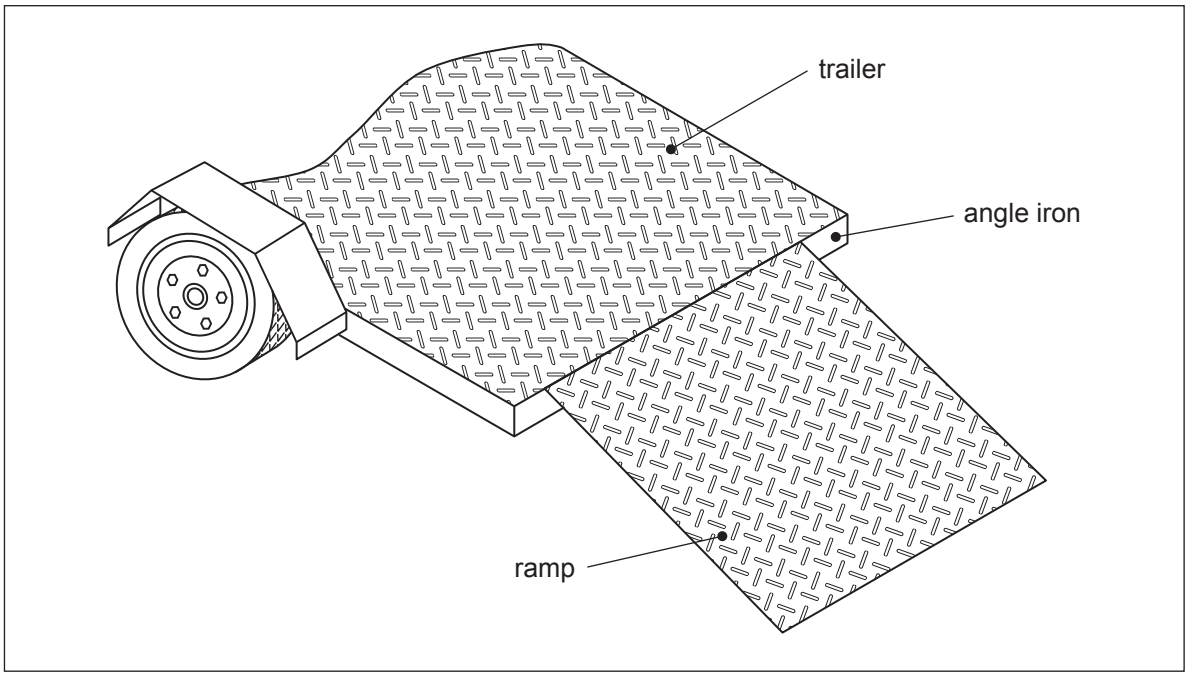


Figure 24

Question 23 continues on the next page.

a. Figure 25 shows the piece of angle iron used for the rear of the trailer and the top of the ramp.

Use Figure 25 to design a method of attaching the ramp to the trailer. Your design must show:

- a quick and easy way of attaching and removing the ramp
- details of all materials used and how they are attached. 4 marks

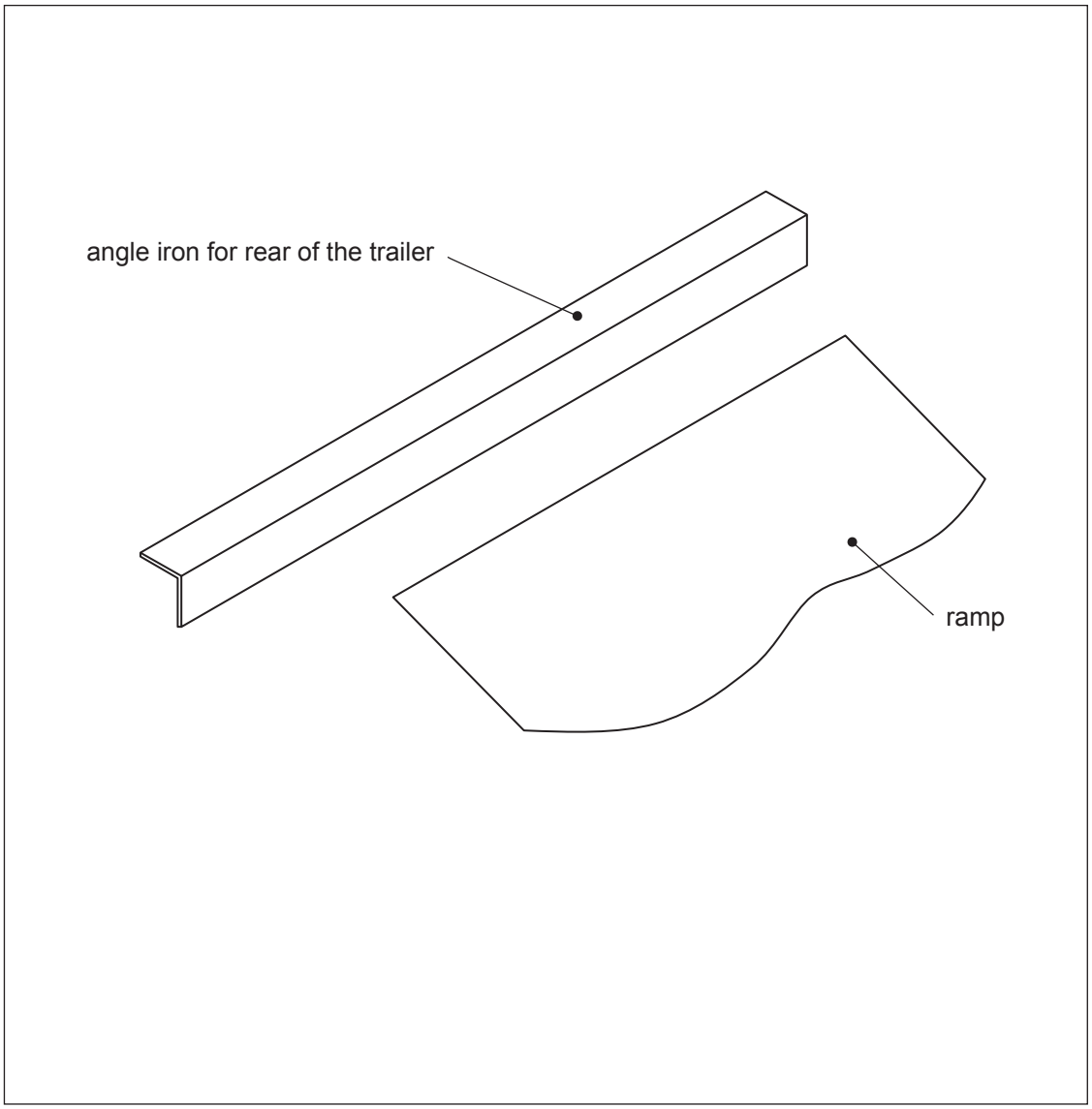


Figure 25

b. The ramp was found to be very heavy to handle when attaching and removing it from the trailer.

Describe and/or sketch a change or a new style of ramp design that will be lighter to handle but still strong enough to load the ride-on mower. 2 marks

End of Question and Answer Book