



Victorian Certificate of Education 2013

SUPERVISOR TO ATTACH PROCESSING LABEL HERE

STUDENT NUMBER

Letter

Figures

Words

VCE VET ENGINEERING STUDIES

Written examination

Wednesday 20 November 2013

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>Section</i>	<i>Number of questions</i>	<i>Number of questions to be answered</i>	<i>Number of marks</i>
A	15	15	15
B	4	4	15
C	2	2	15
D	11	11	15
E	3	3	40
			Total 100

- Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners, rulers, 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 white out liquid/tape.
- A scientific calculator is allowed in this examination.

Materials supplied

- Question and answer book of 31 pages.
- Answer sheet for multiple-choice questions.

Instructions

- Write your **student number** in the space provided above on this page.
- Check that your **name** and **student number** as printed on your answer sheet for multiple-choice questions are correct, **and** sign your name in the space provided to verify this.
- All written responses must be in English.

At the end of the examination

- Place the answer sheet for multiple-choice questions inside the front cover of this book.

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

SECTION A – VBN 771 Apply electrotechnology principles in an engineering work environment

Instructions for Section A

Answer **all** questions in pencil on the answer sheet provided for multiple-choice questions.

Choose the response that is **correct** or that **best answers** the question.

A correct answer scores 1, an incorrect answer scores 0.

Marks will **not** be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

Use Figure 1 to answer Questions 1–9.

Figure 1 shows an electrical circuit.

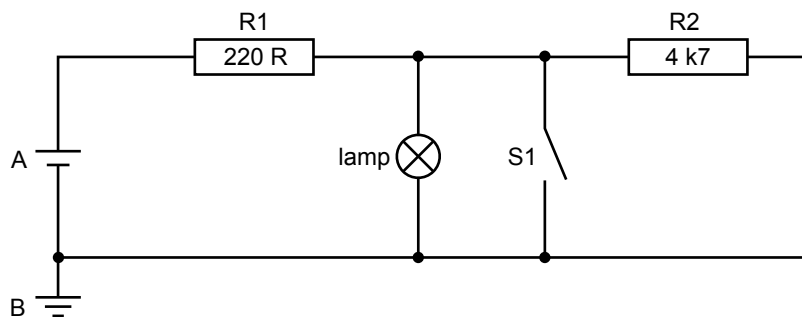


Figure 1

Question 1

Which one of the following would be the best material for the circuit conductors shown in Figure 1?

- A. steel
- B. ceramic
- C. copper
- D. PVC

Question 2

What is the value, in ohms, of R2?

- A. 4.7 ohms
- B. 470 ohms
- C. 4700 ohms
- D. 47000 ohms

Question 3

The component labelled 'A' is

- A. a cell.
- B. a battery.
- C. a capacitor.
- D. an inductor.

Question 4

If the voltage across R1 was 2.2 volts, what current would be flowing through it?

- A. 1 milliampere
- B. 10 milliamperes
- C. 10 microamperes
- D. 100 milliamperes

Question 5

Closing S1 would

- A. create a short circuit.
- B. increase circuit current.
- C. decrease circuit current.
- D. not affect circuit current.

Question 6

The symbol labelled 'B' indicates that the

- A. circuit is earthed.
- B. circuit has a second battery.
- C. circuit has overvoltage protection.
- D. circuit is suitable for alternating current only.

Question 7

With the switch in Figure 1 open, a voltmeter fitted in parallel with S1 would read

- A. zero volts.
- B. the voltage across R1.
- C. the voltage across R2.
- D. the total applied circuit voltage.

Question 8

S1 can be used to

- A. dim the lamp.
- B. turn off the lamp.
- C. turn the entire circuit on.
- D. turn the entire circuit off.

Question 9

Which effect of an electrical current is **not** present?

- A. the thermal effect
- B. the chemical effect
- C. the magnetic effect
- D. the piezoelectric effect

Question 10**Figure 2**

The symbol shown in Figure 2 indicates that an electrical device

- A. is uninsulated.
- B. is for DC current only.
- C. must be installed in an insulated enclosure.
- D. does not need an earth connection for safe operation.

Question 11

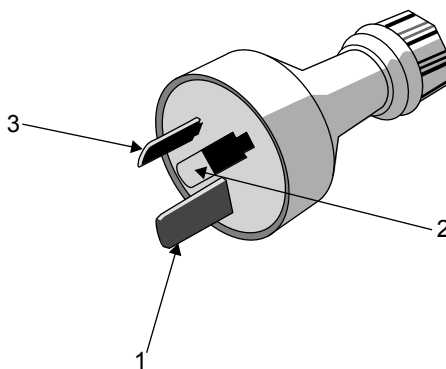
Which meter can directly measure the power in an electrical circuit?

- A. an ammeter
- B. a wattmeter
- C. a multimeter
- D. an ohmmeter

Question 12

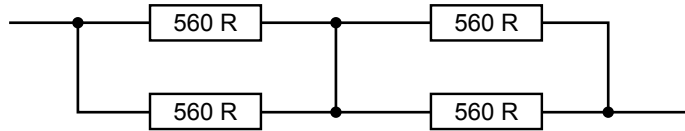
A photovoltaic cell can

- A. charge a battery.
- B. form part of a light meter.
- C. directly power an electronic circuit.
- D. be used in all of the above applications.

Question 13**Figure 3**

Identify the connections on the 240 V AC plug top shown in Figure 3.

- A. 1 – active 2 – earth 3 – neutral
- B. 1 – neutral 2 – active 3 – earth
- C. 1 – earth 2 – active 3 – neutral
- D. 1 – earth 2 – neutral 3 – active

Question 14**Figure 4**

What is the total resistance of the circuit shown in Figure 4?

- A. 2240 ohms
- B. 1680 ohms
- C. 1120 ohms
- D. 560 ohms

Question 15**Figure 5**

Which electrical component is represented by the symbol shown in Figure 5?

- A. diode
- B. capacitor
- C. variable resistor
- D. light-emitting diode

SECTION B – VBN 773 Produce basic engineering sketches and drawings**Instructions for Section B**

Answer **all** questions in the spaces provided. All dimensions are in mm (millimetres).

Figure 1 shows an isometric view of a machine part, with the three holes going all the way through.

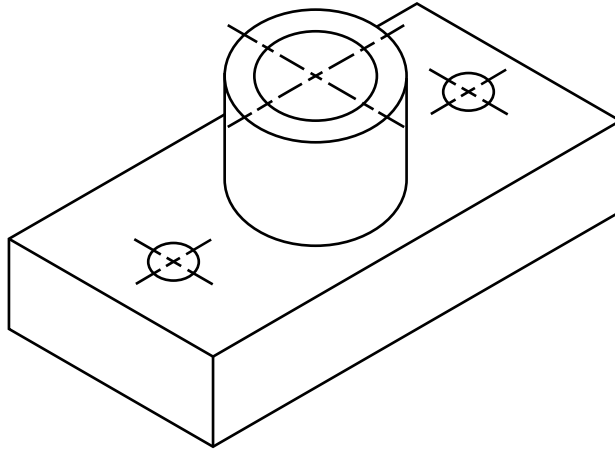
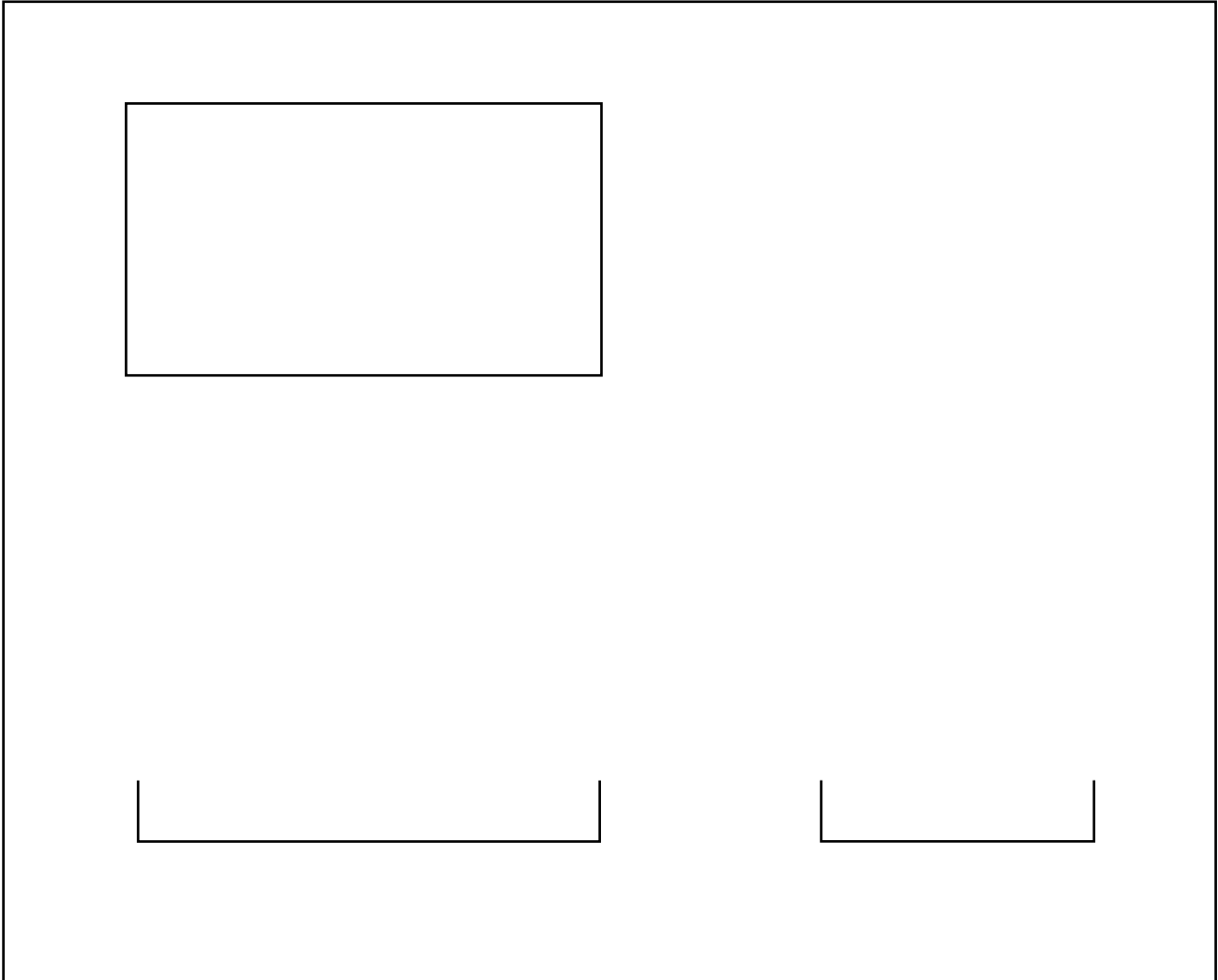


Figure 1

Question 1 (4 marks)

On the sketch below, complete the top, side and end views of the machine part shown in Figure 1.

- Use conventional drawing systems.
- Show views in third-angle projection.
- Show all hidden detail and centre lines.



Question 2 (4 marks)

Figure 2 shows an angle iron bracket with two holes.

Correctly dimension the drawing using the following information.

- The angle iron is $40 \times 40 \times 150$.
- Both holes are $\text{Ø } 12$.
- The holes are 25 mm from one end and 100 mm between centres.

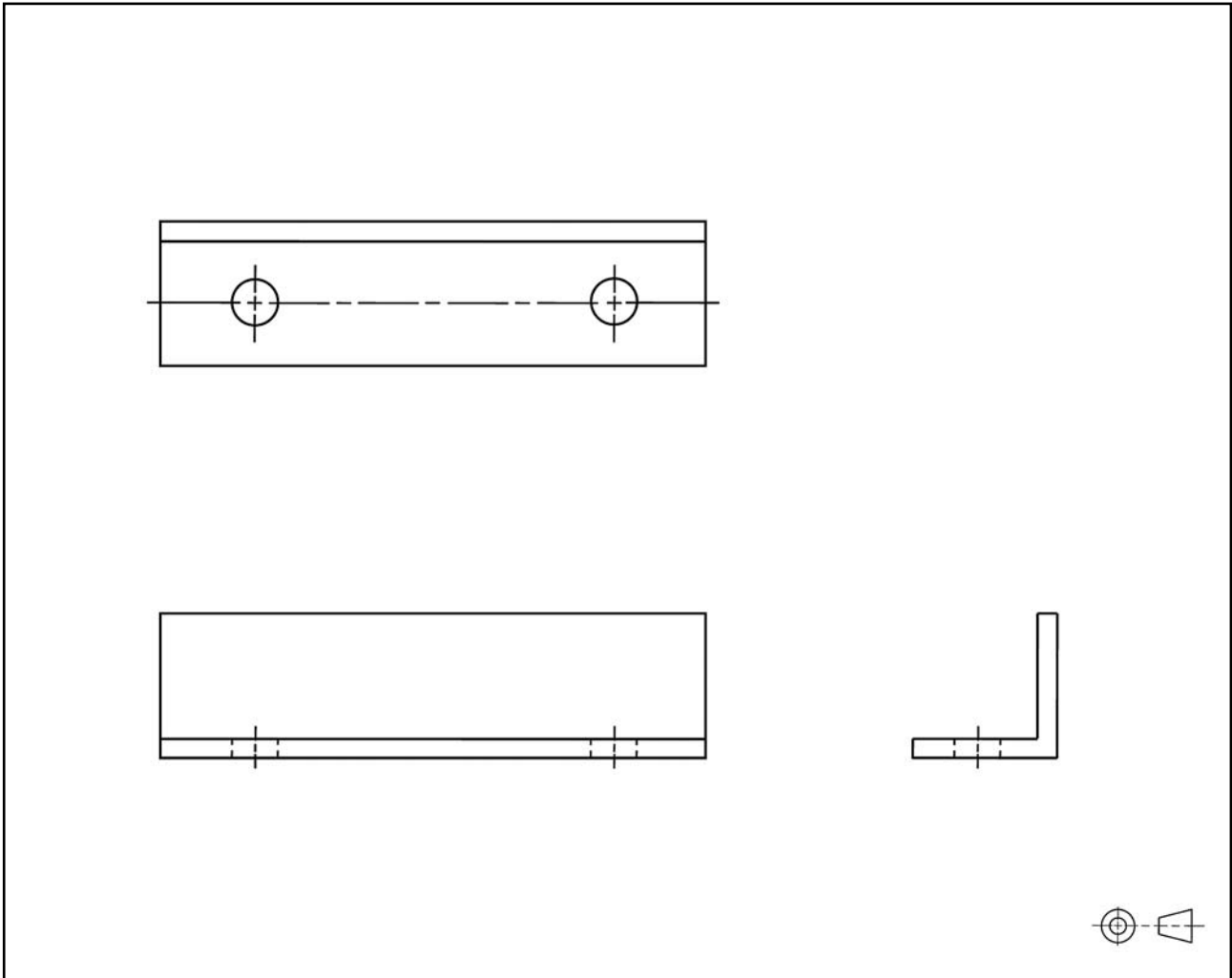
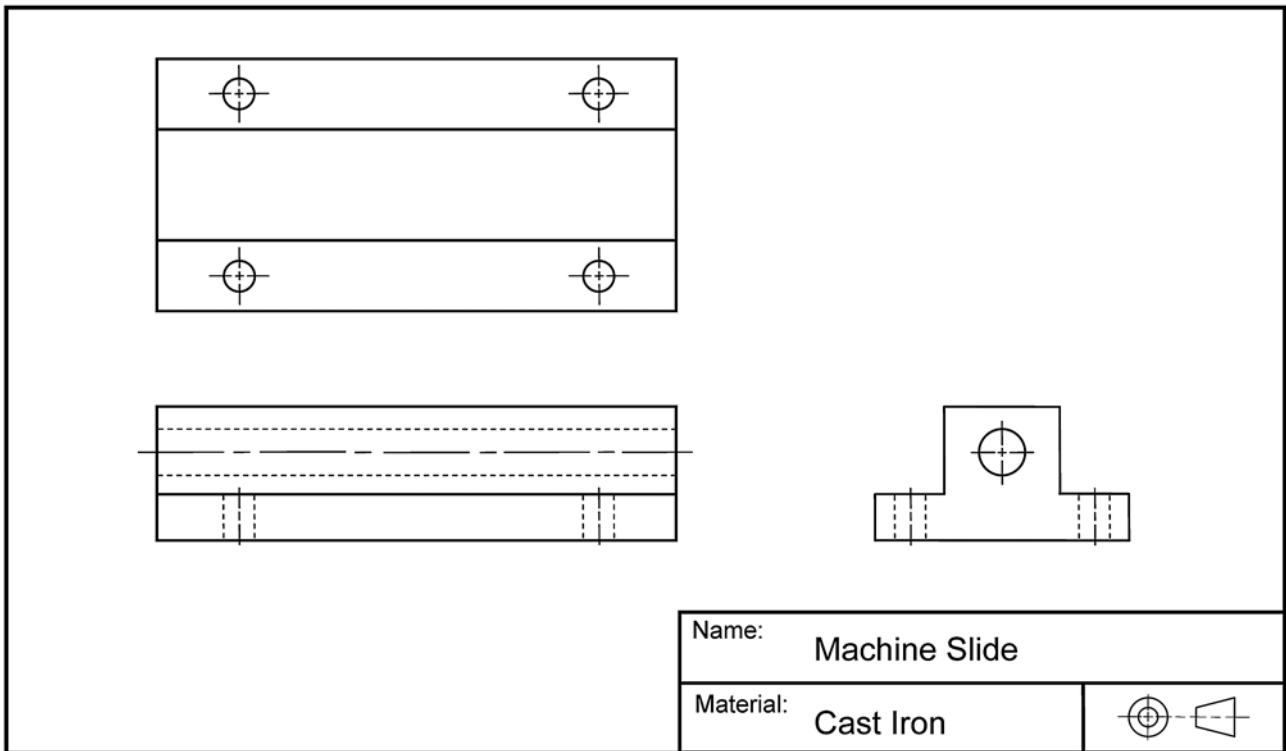


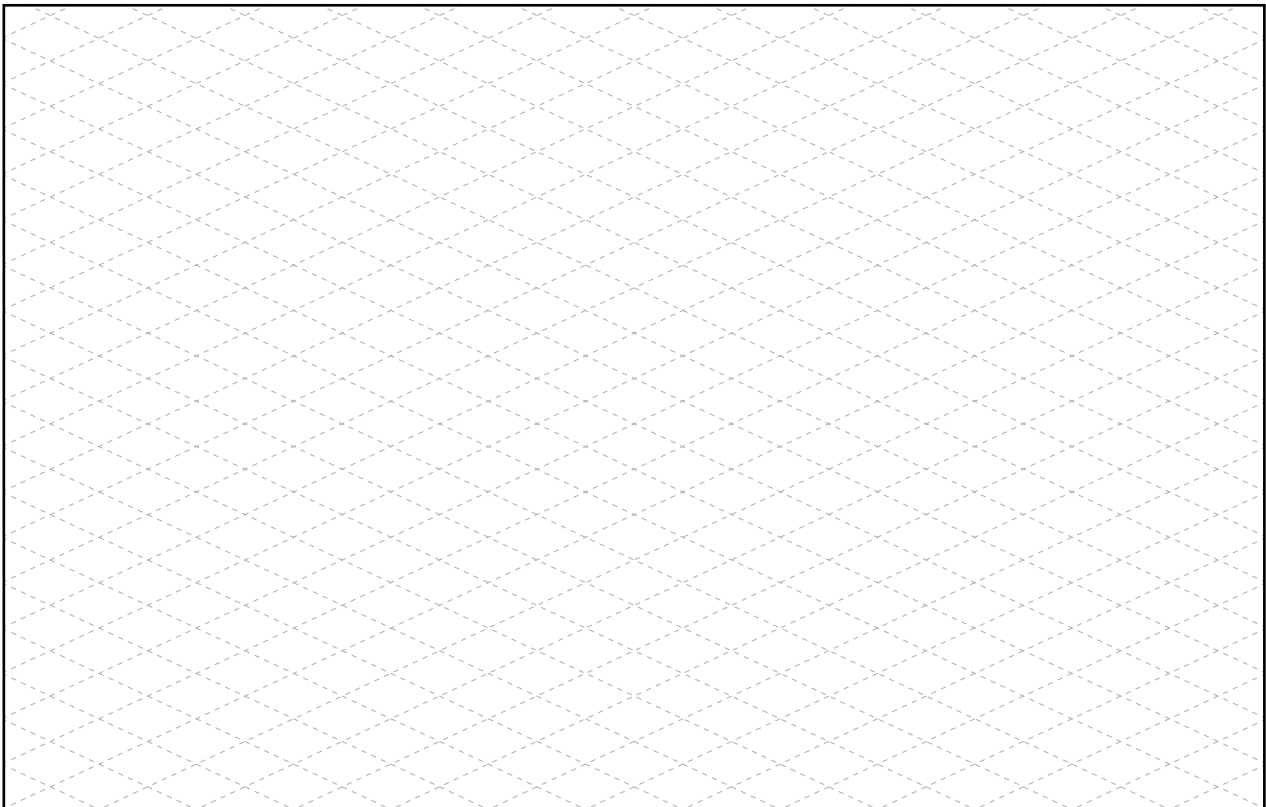
Figure 2

Question 3 (3 marks)

Figure 3 shows a machine slide.

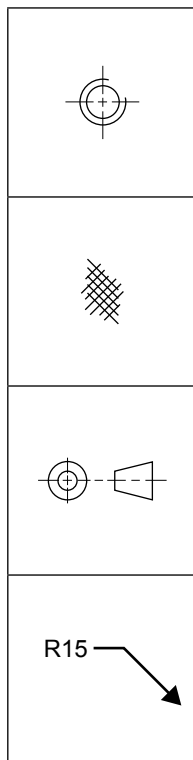
**Figure 3**

In the space provided below, sketch an isometric view of the machine slide shown in Figure 3.



Question 4 (4 marks)

Describe what each of the drawing symbols shown below represents.



SECTION C – VBN 776 Use basic engineering concepts to plan the manufacture of engineering components

Instructions for Section C

Answer **all** questions in the spaces provided. All dimensions are in mm (millimetres).

Figure 1 shows a base plate made from 3 mm thick, bright mild steel.

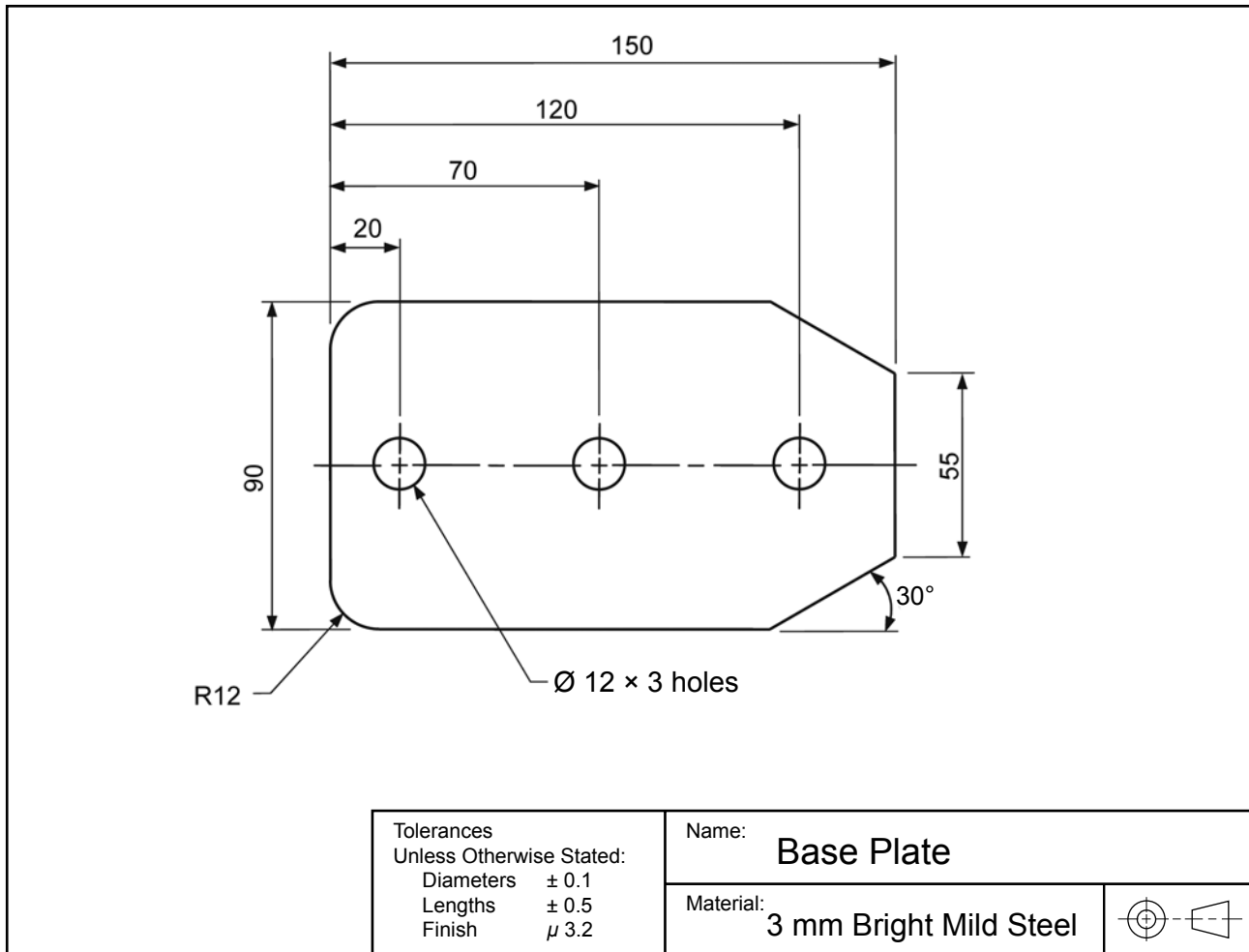


Figure 1

The base plate shown in Figure 1 will be made from a piece of 3 mm × 100 mm wide, bright mild steel that has been cut to 153 mm long, as shown in Figure 2.

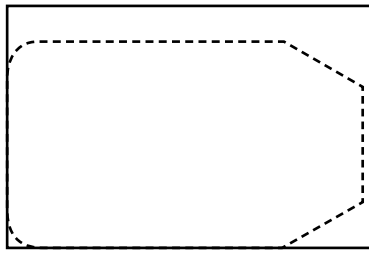


Figure 2

Question 1 (8 marks)

a. Before marking out, the two edges will need to be square to each other.
 Draw arrows on Figure 2 to show which two faces will need to be square. 1 mark

b. The bright mild steel plate makes it difficult to see the marking out lines.
 List two things that can be done to make the marking out more visible. 2 marks

- _____
- _____

c. List four tools required to mark out the base plate. 2 marks

- _____
- _____
- _____
- _____

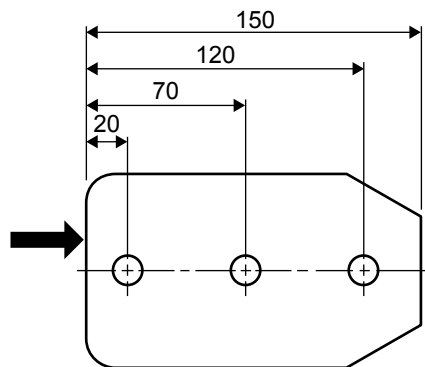


Figure 3

d. When dimensions are taken from an edge, indicated by the arrow in Figure 3, what is this edge called? 1 mark

After marking out, the excess material shown shaded in Figure 4 will be removed before filing to final size.

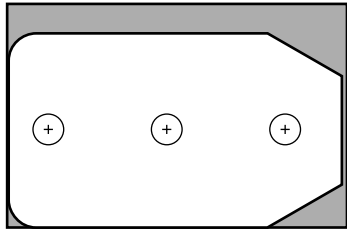


Figure 4

- e. Suggest **one** way that the excess material could be cut away. 1 mark

- f. Which one of the following files would be the most suitable to finish filing the R12 radii to shape? 1 mark

A. square file



B. warding file



C. round file



D. flat file



E. needle file



Figure 5 shows a drawing of a slide block.

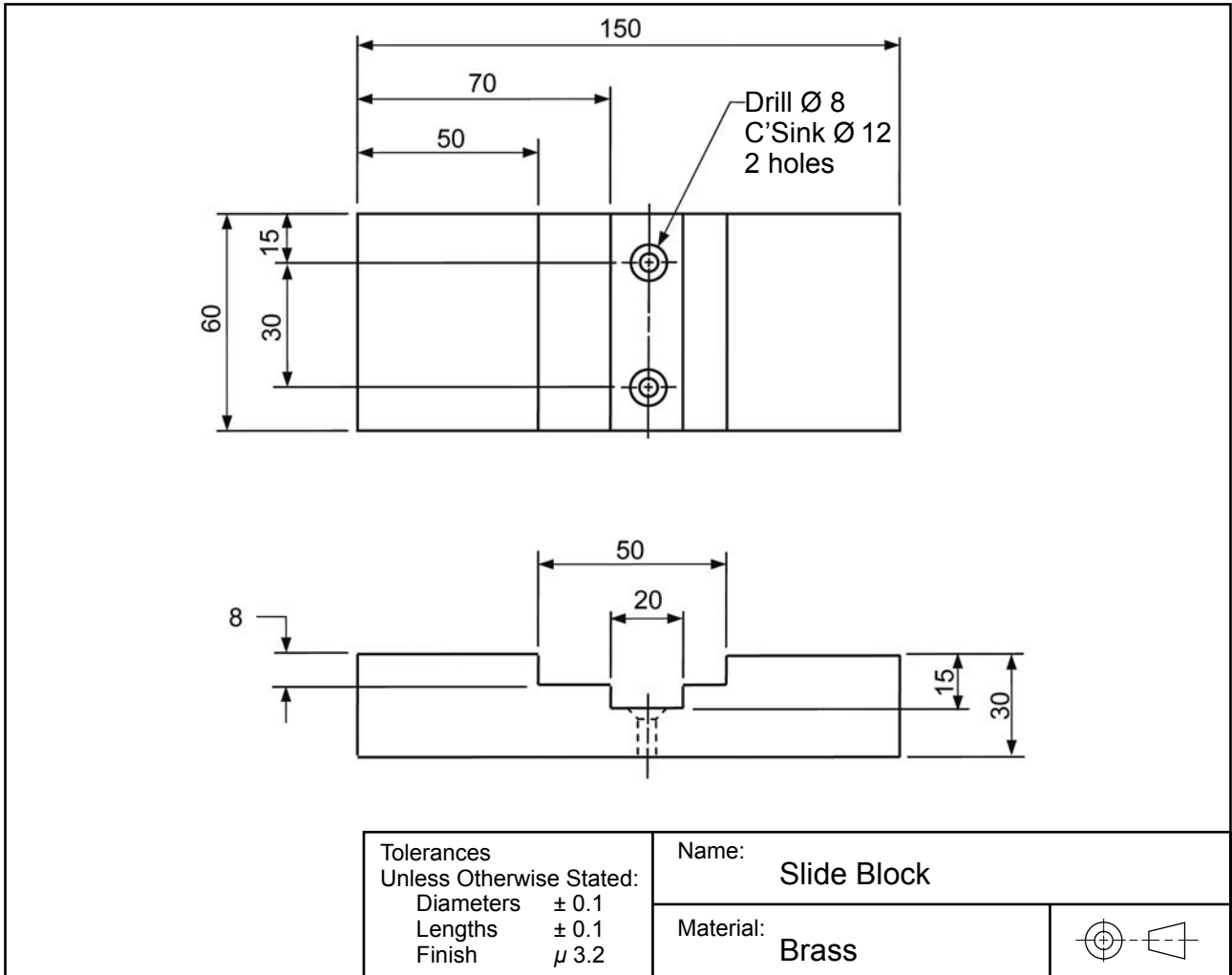


Figure 5

Question 2 (7 marks)

a. What material is the slide block made from?

1 mark

The width, height and length of the slide block have been finish machined to $60 \times 30 \times 150$.

- b. List, in the correct sequence, the operations required to complete the rest of the slide block. 5 marks

Step	Operation
1	

- c. Which measuring tool would be suitable to accurately measure the width of the 20 mm step? 1 mark

SECTION D – VBN 777 Handle engineering materials**Instructions for Section D**

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

Question 1 (1 mark)

Explain how safety shoes differ from normal footwear.

Question 2 (1 mark)

In most workplaces, employees must wear PPE.

What does PPE stand for?

Question 3 (2 marks)

You are required to lift and store 1200×900 metal sheets that have sharp edges.

List two ways to minimise the risk of cutting yourself.

- _____
- _____

Question 4 (1 mark)

A sling has a tag with 'SWL 250 kg' on it.

Explain what 'SWL 250 kg' means.

Question 5 (2 marks)

List two precautions that you should take when carrying a 3 metre length of $\text{Ø } 25$ mm steel tube through a workshop to avoid injuring yourself and others.

- _____
- _____

Question 6 (1 mark)**Figure 1**


Suggest one precaution that needs to be followed in a work area displaying the sign shown in Figure 1.


Question 7 (3 marks)

Tick (✓) the correct boxes.

Is a licence required in order to operate the following equipment?

	Yes	No
 forklift	<input type="checkbox"/>	<input type="checkbox"/>

 electric pallet truck	<input type="checkbox"/>	<input type="checkbox"/>
--	--------------------------	--------------------------

 hoist	<input type="checkbox"/>	<input type="checkbox"/>
--	--------------------------	--------------------------

Question 8 (1 mark)

The dividing head shown in Figure 2 weighs 38 kg. It is currently sitting on a milling machine table.



Figure 2

Describe **one** safe method of shifting the dividing head from the milling machine table to a storage shelf 15 metres away.

Question 9 (1 mark)

Why do safety glasses offer better protection than normal glasses?

Question 10 (1 mark)

Give the general name for documents that provide important information about hazardous chemicals found in workplaces.

Question 11 (1 mark)

Before using a sling, it should be inspected to make sure it is safe to use.

Give **one** example of something that would make a sling unsafe to use.

SECTION E – VBN 778 Produce basic engineering components and products using fabrication and machining

Instructions for Section E

Answer **all** questions in the spaces provided. All dimensions are in mm (millimetres).

Figure 1 shows an assembly drawing of a machine vice.

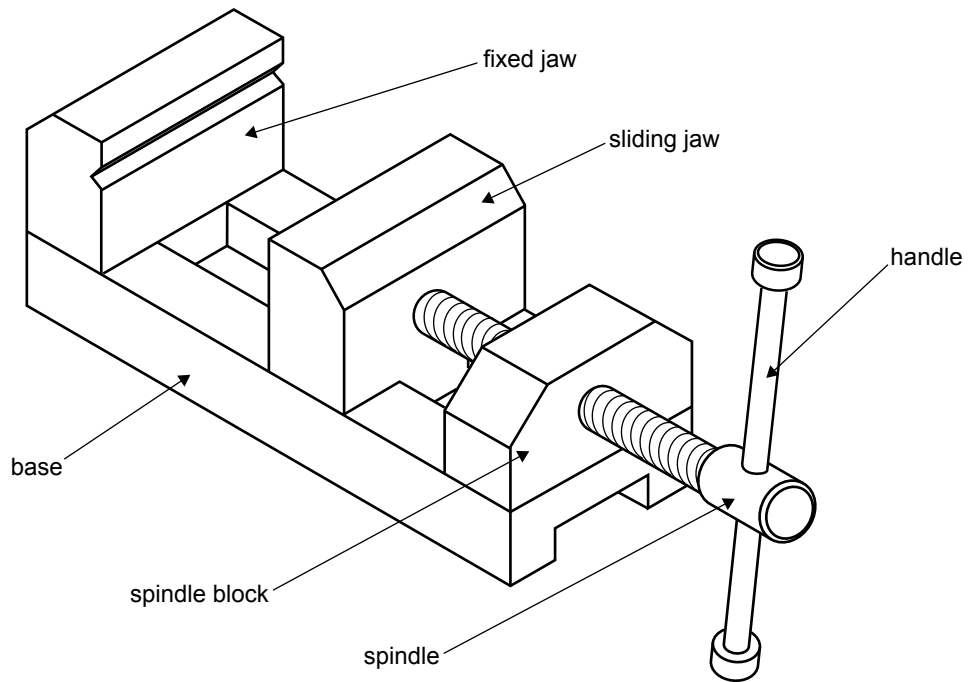


Figure 1

Figure 2 shows a detailed drawing of the machine vice base.

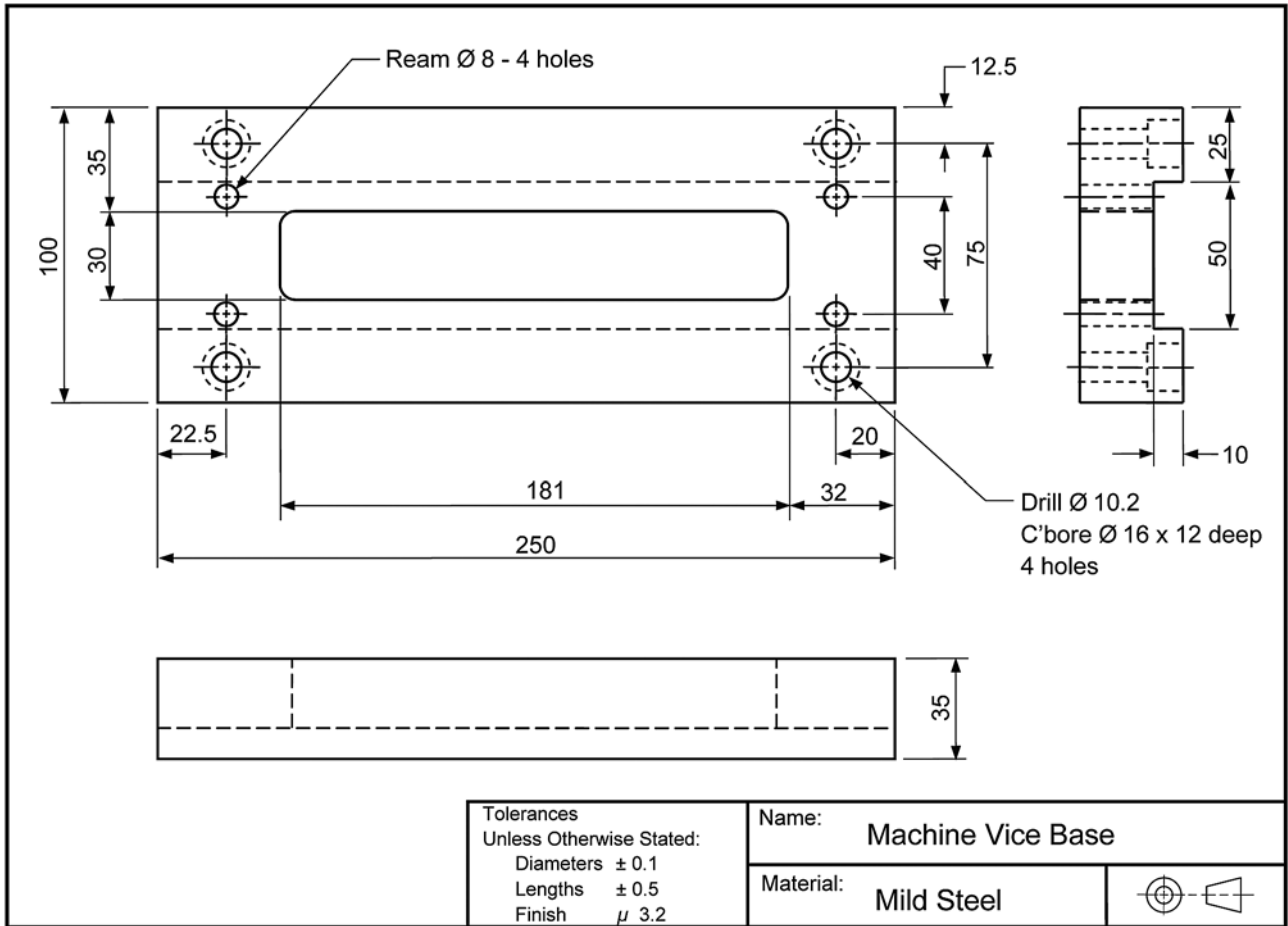


Figure 2

Question 1 relates to the manufacture of the machine vice base.

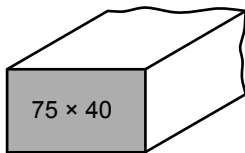
Question 1 (11 marks)

a. Rectangular mild steel is available in the following sizes.

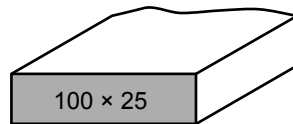
Which size is most suitable for making the machine vice base?

1 mark

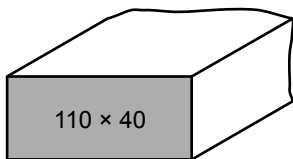
A.



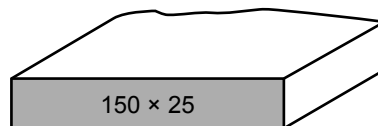
B.



C.



D.



- b. After the material has been cut on a saw, the ends will need to be milled square.
What length should the material be cut to? 1 mark

The material will be held in a vice for milling the 50 mm wide slot, as shown in Figure 3.

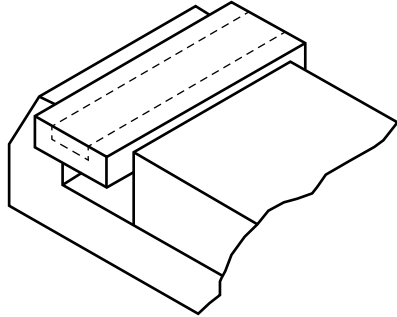


Figure 3

- c. What should be used under the material to make sure that it is sitting level in the vice? 1 mark
-
- d. What type of milling cutter would be suitable to mill the slot? 1 mark
-
- e. A trial cut of the slot has been made.
How can you check that the slot is being milled parallel to the sides? 1 mark
-
- f. After checking the trial cut, you found that the step was not parallel to the sides.
What is the most likely cause of this? 1 mark
-

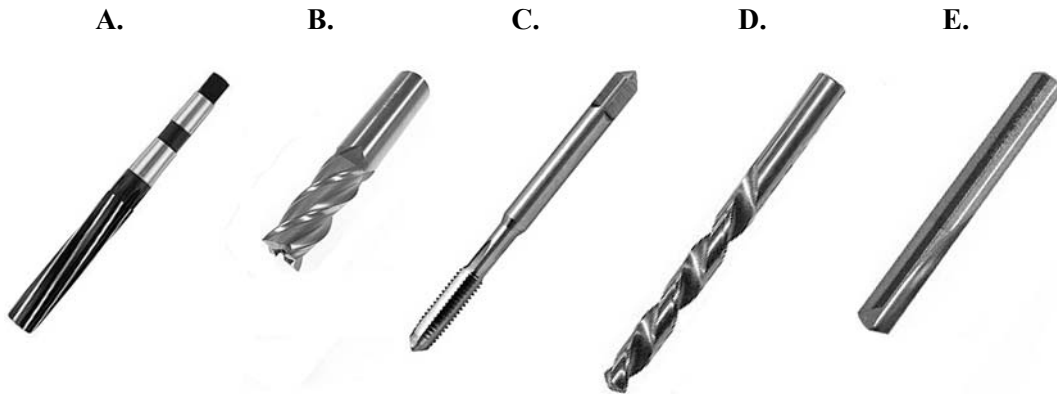


Figure 4

g. The holes in the machine vice base will be marked out using the tool shown in Figure 4.
 What is the name of this tool? 1 mark

h. What is the main advantage of using the tool shown in Figure 4 instead of a rule and square? 1 mark

i. Which one of the following tools is called a reamer? 1 mark



j. The Ø 8 holes need to be drilled before reaming.
 Which one of the following drill sizes would be the most suitable? 1 mark

- A.** 8.5
- B.** 8.0
- C.** 7.8
- D.** 7.0
- E.** 6.4

- k.** Give **one** reason why the drawing specifies reaming the $\text{\O} 8$ holes and not just drilling. 1 mark
-

Figure 5 shows a detailed drawing of the machine vice fixed jaw.

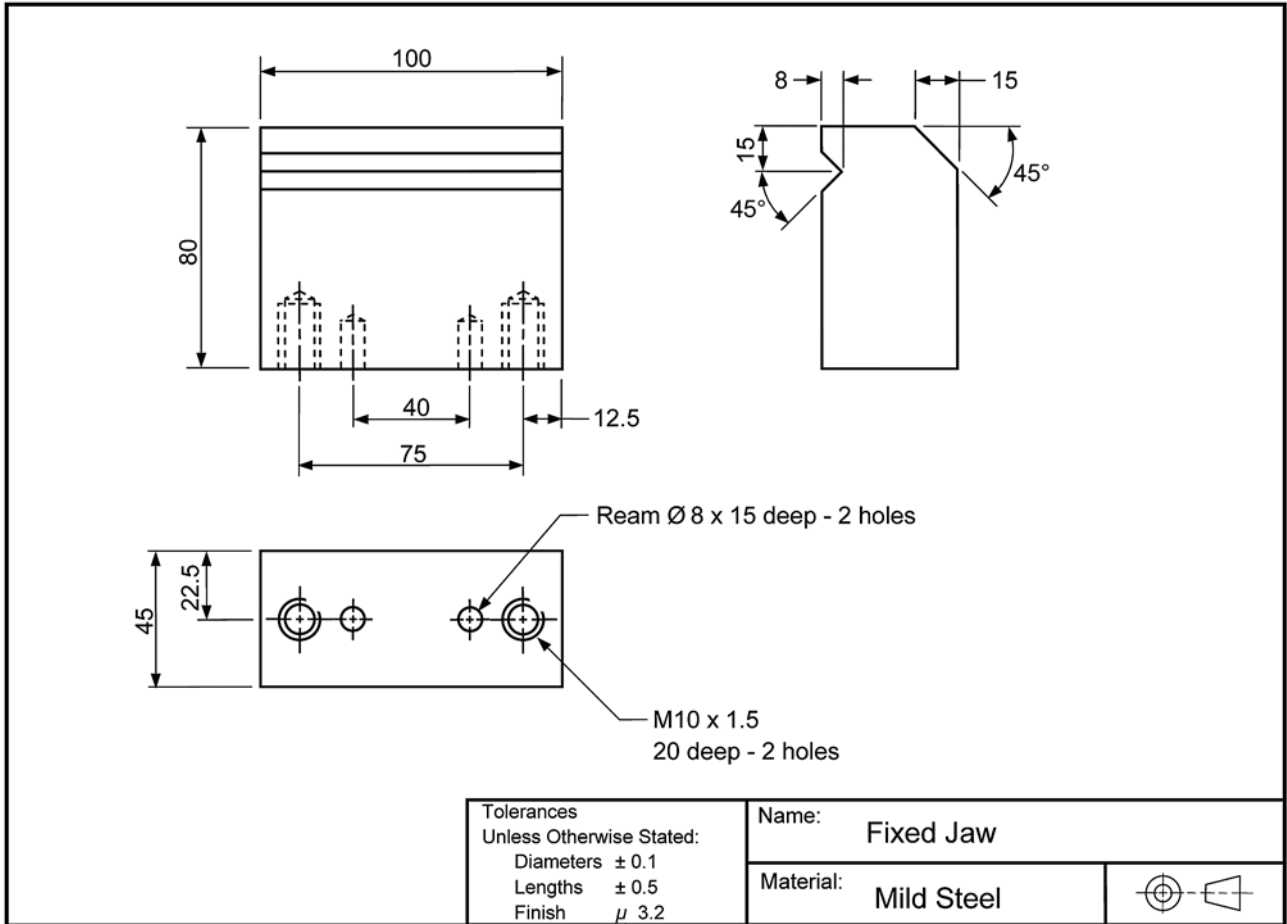
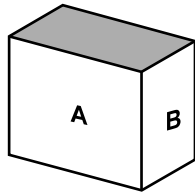


Figure 5

Question 2 relates to the manufacture of the fixed jaw.

Question 2 (17 marks)

When making the fixed jaw, faces A and B have been machined square to each other. Next, the fixed jaw will be held in the vice shown in Figure 6 so that the top (shown shaded) can be milled.



- a. i. Which one of the machined faces would be best to put against the vice jaw so that the top will be milled square? 1 mark



Figure 6

- ii. Indicate with an arrow on Figure 6 which vice jaw this face should be clamped against. 1 mark

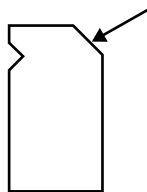


Figure 7

- b. Which measuring tool can be used to check the angle of the bevel, indicated with an arrow, in Figure 7? 1 mark

c. The threads are $M10 \times 1.5$

i. What does M10 stand for?

1 mark

ii. What does 1.5 stand for?

1 mark

I.S.O. METRIC COARSE THREADS							
NOTE:—All dimensions in mm							
O.Dia.	Core	Pitch	Depth	Flat	Effec.	Tapp'g Drill	Cl'ance Drill
1.6	1.1706	0.35	0.2147	0.04375	1.373	1.25	1.65
1.8	1.3706	0.35	0.2147	0.04375	1.573	1.45	1.85
2.0	1.5092	0.40	0.2454	0.05000	1.740	1.60	2.05
2.2	1.6480	0.45	0.2760	0.05625	1.908	1.75	2.25
2.5	1.9480	0.45	0.2760	0.05625	2.208	2.05	2.60
3.0	2.3866	0.50	0.3067	0.06250	2.675	2.50	3.10
3.5	2.7638	0.60	0.3681	0.07500	3.110	2.90	3.60
4.0	3.1412	0.70	0.4294	0.08750	3.545	3.30	4.10
4.5	3.5798	0.75	0.4601	0.09375	4.013	3.80	4.60
5.0	4.0184	0.80	0.4908	0.10000	4.480	4.20	5.10
6.0	4.7732	1.00	0.6134	0.12500	5.350	5.00	6.10
7.0	5.7732	1.00	0.6134	0.12500	6.350	6.00	7.20
8.0	6.4664	1.25	0.7668	0.15625	7.188	6.80	8.20
10.0	8.1596	1.50	0.9202	0.18750	9.026	8.50	10.20
12.0	9.8530	1.75	1.0735	0.21875	10.863	10.20	12.20
14.0	11.5462	2.00	1.2269	0.25000	12.701	12.00	14.25
16.0	13.5462	2.00	1.2269	0.25000	14.701	14.00	16.25
18.0	14.9328	2.50	1.5336	0.31250	16.376	15.50	18.25
20.0	16.9328	2.50	1.5336	0.31250	18.376	17.50	20.25
22.0	18.9328	2.50	1.5336	0.31250	20.376	19.50	22.25
24.0	20.3194	3.00	1.8403	0.37500	22.051	21.00	24.25

Figure 8

d. Using the chart shown in Figure 8, find the tapping drill size needed for the M10 threads.

1 mark



Figure 9

- e. The pedestal grinder shown in Figure 9 will be used to sharpen the drill, but it is unsafe to use as shown.

Explain what is wrong and why this poses a safety risk.

2 marks

- f. A set of M10 taps are shown below.

Which tap should be used last when tapping the M10 threads? Explain your answer.

2 marks

A.



B.



C.



- g. When tapping, the tap should periodically be turned in reverse before continuing to tap. What is the reason for this?

1 mark

- h. Explain how you would check that the tap is going in square when tapping.

1 mark

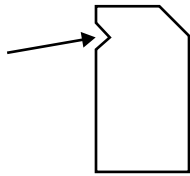


Figure 10

- i. The fixed jaw of the vice has a V cut into its face, as shown in Figure 10. What is the purpose of this V? 1 mark

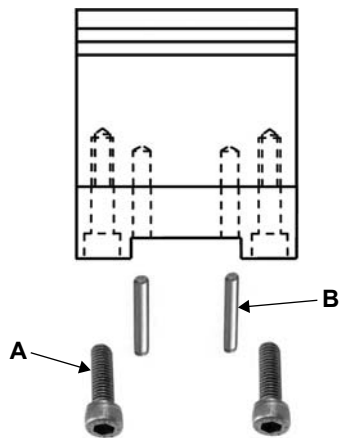


Figure 11

- j. The fasteners shown in Figure 11 will be used to fasten the fixed jaw to the base.
 - i. What is the name of fastener A? 1 mark

 - ii. What is the name of the tool that is used to tighten fastener A? 1 mark

 - iii. What is the name of fastener B? 1 mark

 - iv. What is the purpose of using fastener B? 1 mark

Figure 12 shows a detailed drawing of the handle.

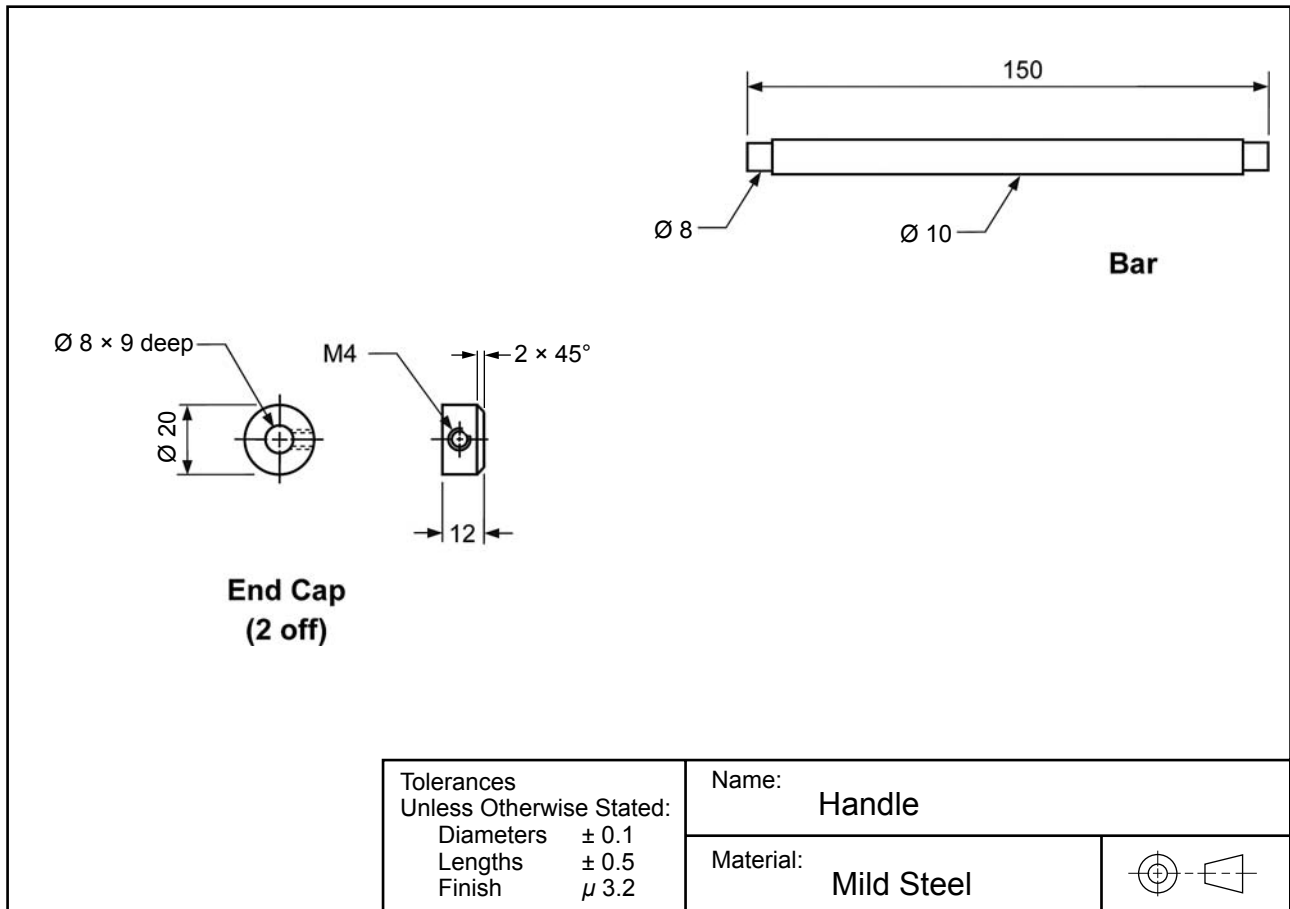


Figure 12

Question 3 relates to the manufacture of the handle.

Question 3 (12 marks)

- a. When turning down the end caps on the lathe, the cutting tool needs to be set on centre height. Explain how this is done. 1 mark

- b. Explain how the cutting process would be affected if the tool was set **above** centre height. 1 mark



Figure 13

c. When turning down the $\text{\O} 20$ on the end caps, a cut was taken and the diameter was measured with the tool shown in Figure 13.

i. What is the name of the measuring tool shown in Figure 13? 1 mark

ii. Give **one** example of what could cause inaccurate readings when using the tool shown in Figure 13. 1 mark

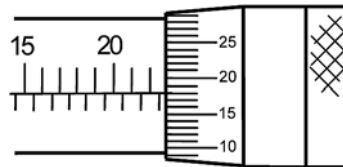


Figure 14

iii. What is the measurement of the diameter, as shown in Figure 14? 1 mark

iv. Based on the measurement shown in Figure 14, what distance does the cutting tool need to be moved in for the final cut to make the $\text{\O} 20$? 1 mark

v. What is the name of the slide on the lathe that is used to move the cutting tool to set the diameter? 1 mark

d. Explain how the $2 \times 45^\circ$ chamfer is put on the end cap. 1 mark

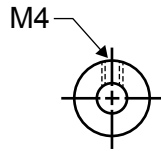


Figure 15

- e. The hole for the M4 thread will need to be marked and drilled in a drilling machine.
Explain how the hole is drilled accurately through the centre of the end cap, as shown in Figure 15.

2 marks



Figure 16

- f. The fastener shown in Figure 16 will be used to hold the end caps on the bar.
What is the name of this type of fastener?

1 mark

- g. Why is this fastener preferred over a normal screw or bolt in this situation?

1 mark
