



Victorian Certificate of Education 2011

SUPERVISOR TO ATTACH PROCESSING LABEL HERE

STUDENT NUMBER

Figures

Words

Letter

--

VCE VET ENGINEERING STUDIES

Written examination

Monday 21 November 2011

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

Section	Number of questions	Number of questions to be answered	Number of marks
A	15	15	15
B	2	2	15
C	1	1	15
D	9	9	15
E	4	4	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 32 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.

Question 1

How many milliamps are equal to 7.2 amps?

- A. 0.72
- B. 720
- C. 7200
- D. 72000

Question 2

Which of the following currents would cause the most severe electric shock when flowing through a person to earth?

- A. 350 μ A
- B. 35 mA
- C. 0.35 A
- D. 0.035 A

Question 3

An electric drill has the symbol shown in Figure 1 on its case.



Figure 1

The symbol means the drill

- A. must be earthed.
- B. is not insulated.
- C. is single insulated.
- D. is double insulated.

Question 4

Which effect of an electric current can cause corrosion of metals?

- A. heating
- B. lighting
- C. chemical
- D. magnetic

Question 5

Figure 2 shows a voltmeter which will be used to measure the supply voltage under no-load conditions.

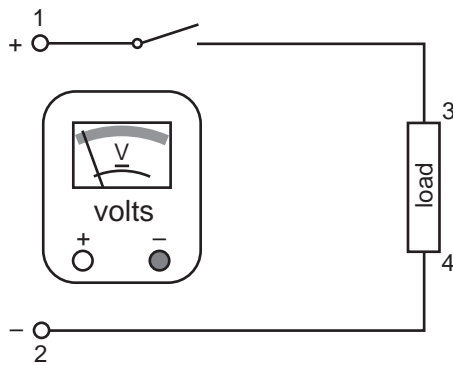


Figure 2

Where should the positive and negative leads of the voltmeter be connected?

- A. across 1 and 3 with the switch open
- B. across 3 and 4 with the switch open
- C. across 1 and 2 with the switch open
- D. across 3 and 4 with the switch closed

Question 6

Which one of the following is an example of an overload?

- A. three 10 amp fan heaters running on the same 16 amp fuse
- B. water between the contacts of a 10 amp socket outlet
- C. a person in contact between a live wire and earth
- D. cutting a live cable with insulated pliers

Use Figure 3 to answer Questions 7–9.

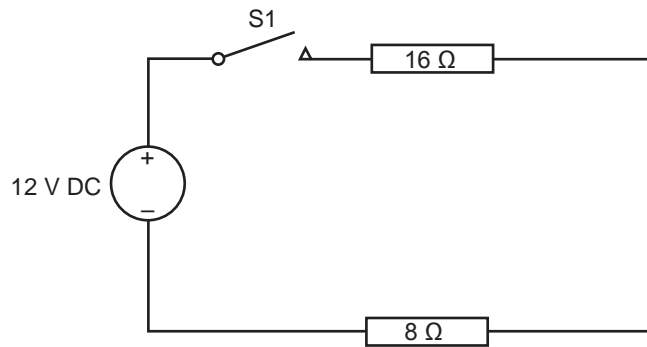


Figure 3

Question 7

How much current will flow in the circuit shown in Figure 3 when the switch is **open**?

- A. 8 A
- B. 16 A
- C. 24 A
- D. No current will flow.

Question 8

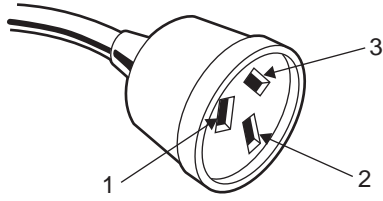
If DC voltmeter leads are placed across S1 in Figure 3, what reading will be obtained?

- A. 0 volts
- B. 8 volts
- C. 12 volts
- D. 24 volts

Question 9

The circuit in Figure 3 is commonly referred to as a

- A. series circuit.
- B. parallel circuit.
- C. complex circuit.
- D. series/parallel circuit.

Question 10**Figure 4**

On the extension lead socket shown in Figure 4, the **correct active** terminal position is

- A. terminal 1 or 2, depending on the polarity of the supply voltage.
- B. terminal 1 only.
- C. terminal 2 only.
- D. terminal 3 only.

Question 11

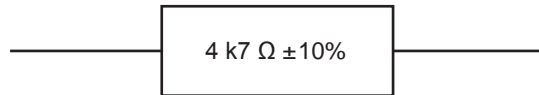
The correct colour(s) for the earth wire on a 230 volt extension lead is

- A. green.
- B. green/blue.
- C. green/brown.
- D. green/yellow.

Question 12**Figure 5**

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

- A. capacitor
- B. transformer
- C. power diode
- D. fixed resistor

Question 13**Figure 6**

What are the upper and lower values of the power resistor shown in Figure 6?

- A. 4.23 to 5.17 ohms
- B. 42.3 to 51.7 ohms
- C. 423 to 517 ohms
- D. 4230 to 5170 ohms

Question 14

An electric toaster draws 0.25 amperes at 250 volts.

Which of the following is the power rating of the toaster?

- A. 62.5 W
- B. 100 W
- C. 250 W
- D. 1000 W

Question 15

When an electrical current flows through a conductor it causes a

- A. chemical reaction within the conductor.
- B. magnetic field around the conductor.
- C. decrease in conductor temperature.
- D. reduction in conductor resistance.

CONTINUES OVER PAGE

TURN OVER

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 stepped block.

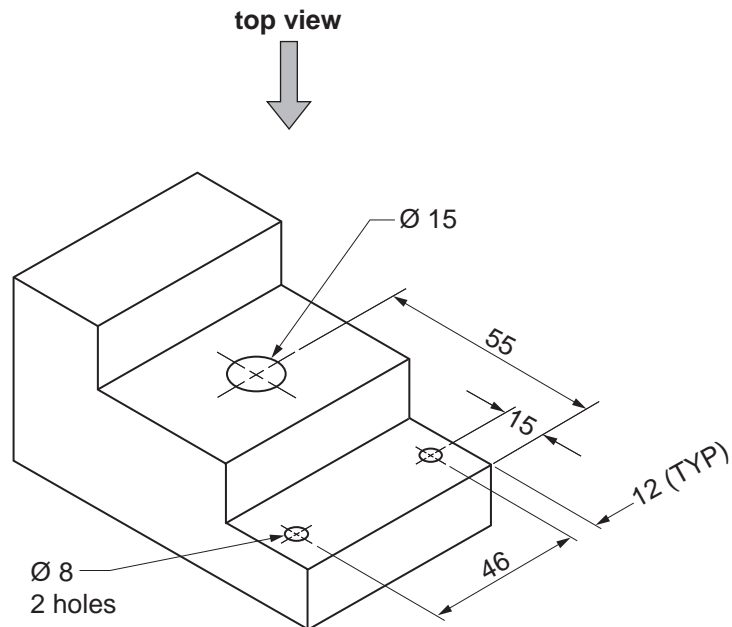
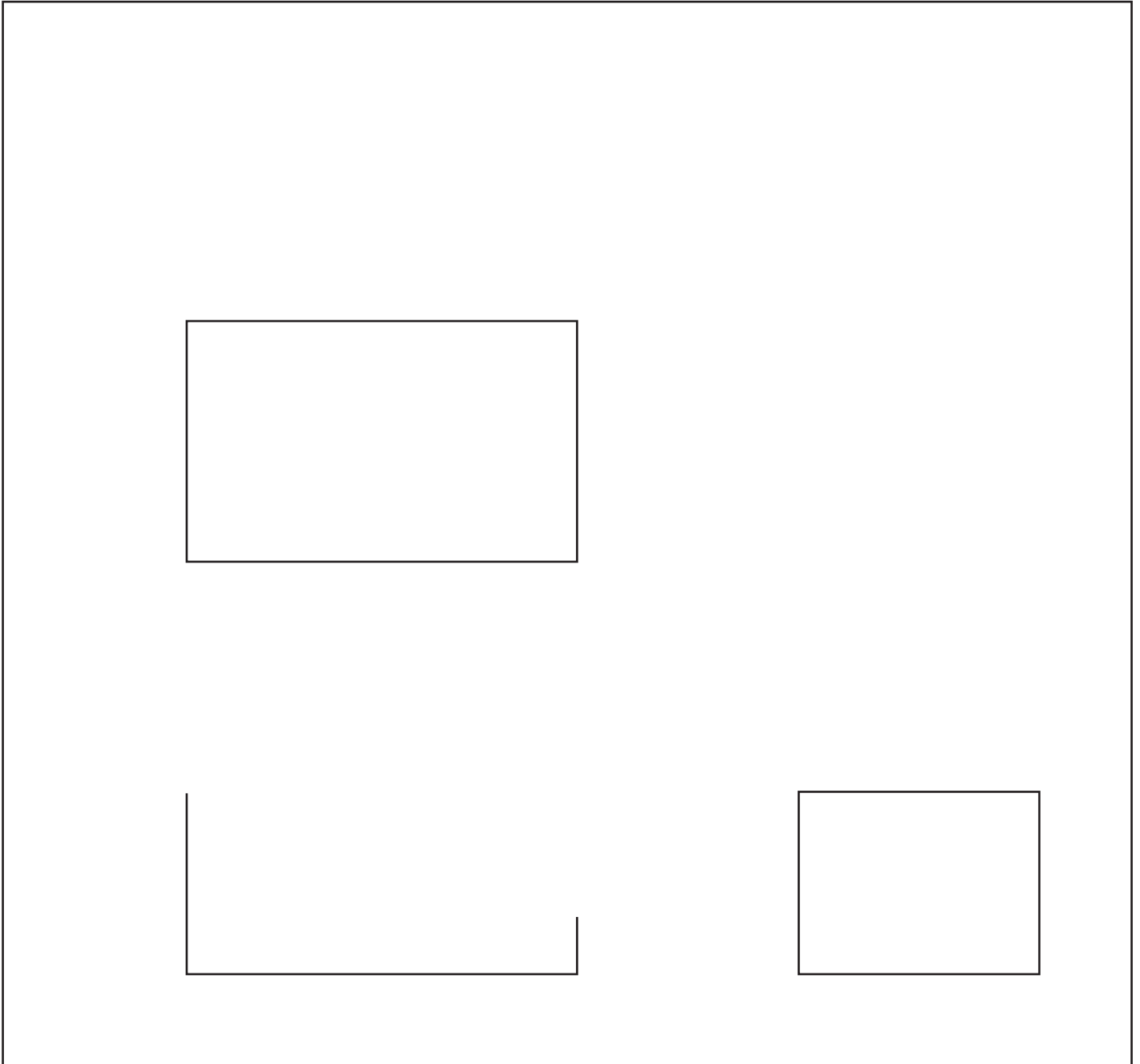


Figure 1

Question 1

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

- Use conventional drawing systems.
- Show views in third-angle projection.
- Show all hidden detail.
- Dimension the **size** and **position** of the holes in the top view. No other dimensions are required.



6 marks

Figure 2 shows a detailed drawing of a clamp block.

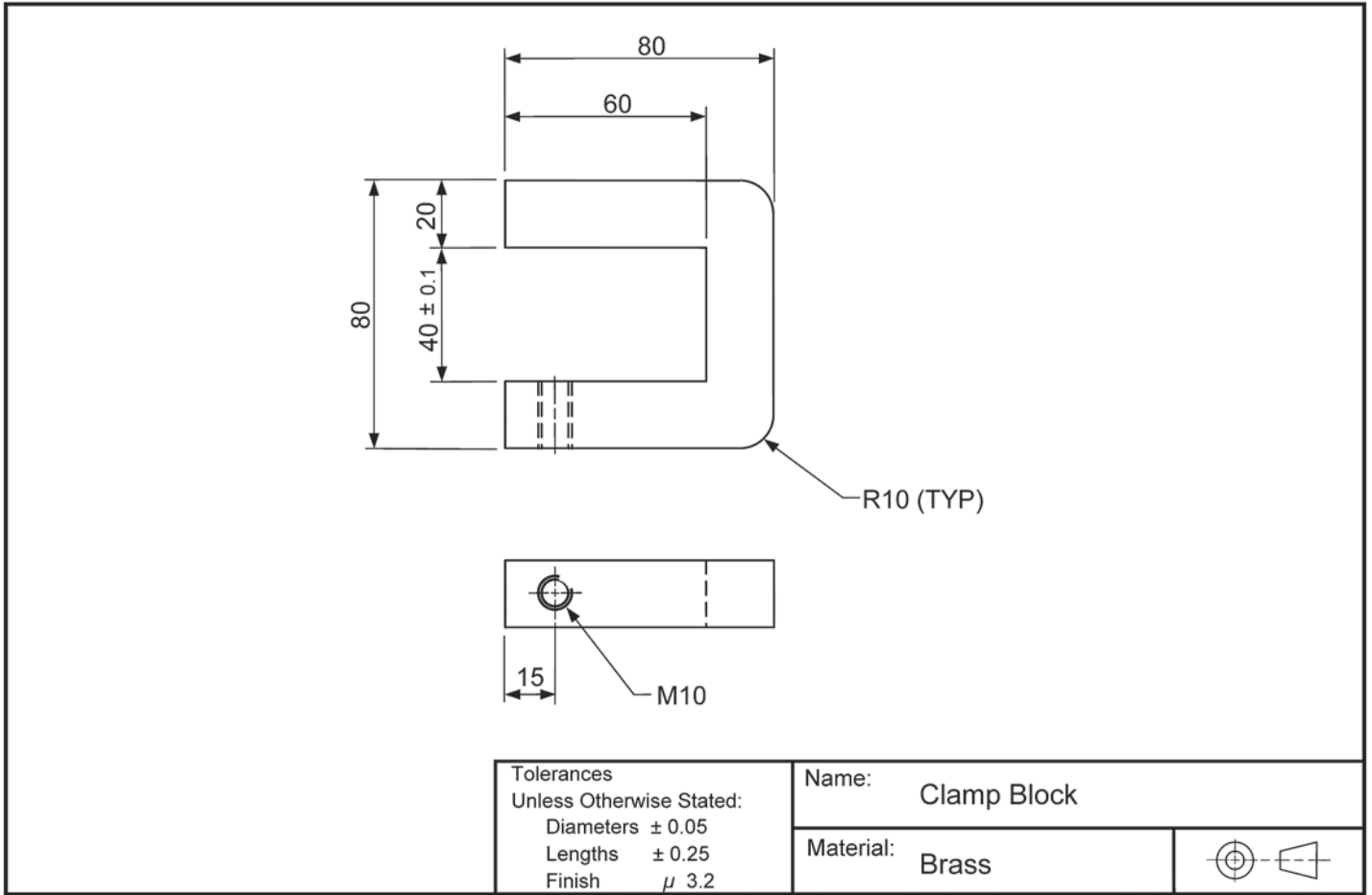


Figure 2

Question 2

a. What are the maximum and minimum sizes allowed for the 40 mm slot in the clamp block?

maximum _____

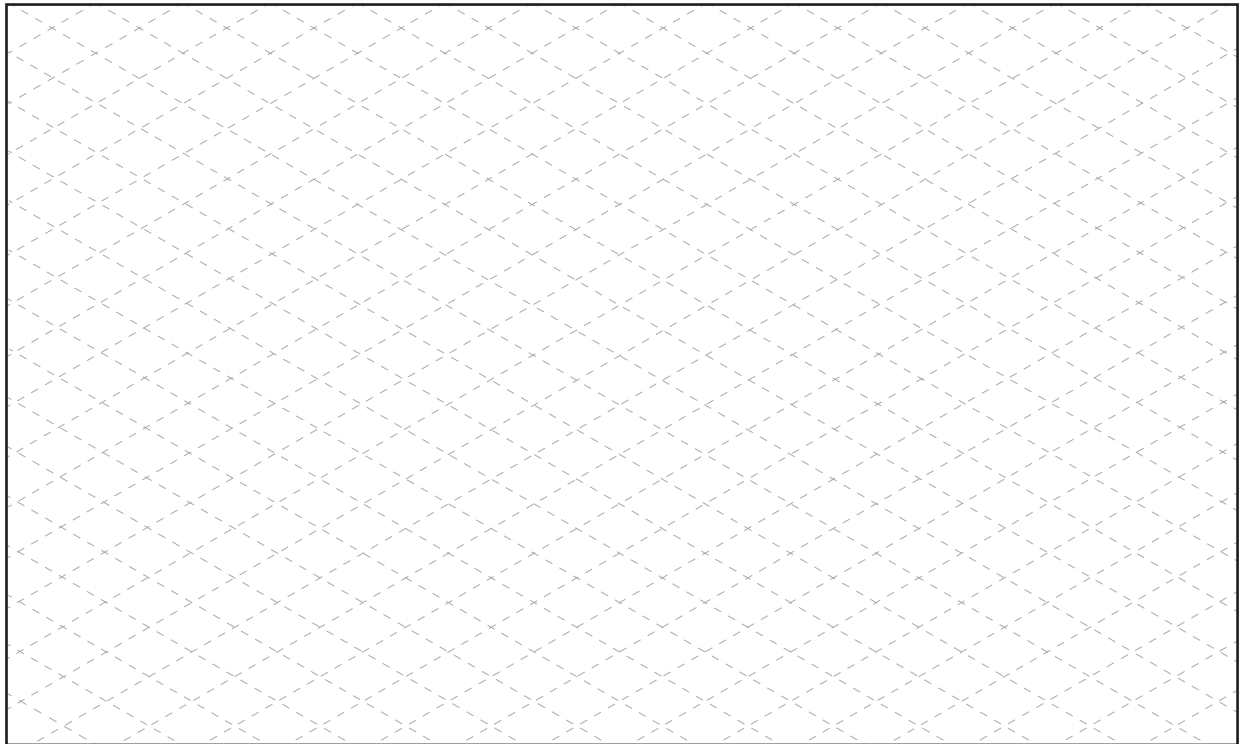
minimum _____

2 marks

b. The R10 in the clamp block has (TYP) after it. What does (TYP) indicate?

_____ 1 mark

- c. In the space provided below, sketch an isometric view of the clamp block shown in Figure 2.
Do not dimension the drawing.



3 marks

Figure 3 shows a drawing of a spacer bar.

- d. Complete the **sectioned** side view, showing the holes going through the spacer bar.

top view							
side view							
section A-A							
<table border="1" style="width: 100%;"> <tr> <td style="width: 30%;"> Tolerances Unless Otherwise Stated: Diameters ± 0.05 Lengths ± 0.25 Finish $\mu 3.2$ </td> <td style="width: 40%;"> Name: Spacer Bar </td> <td style="width: 30%;"></td> </tr> <tr> <td></td> <td> Material: Mild Steel </td> <td style="text-align: center;"> </td> </tr> </table>		Tolerances Unless Otherwise Stated: Diameters ± 0.05 Lengths ± 0.25 Finish $\mu 3.2$	Name: Spacer Bar			Material: Mild Steel	
Tolerances Unless Otherwise Stated: Diameters ± 0.05 Lengths ± 0.25 Finish $\mu 3.2$	Name: Spacer Bar						
	Material: Mild Steel						

Figure 3

3 marks

Total 15 marks

**END OF SECTION B
TURN OVER**

SECTION C – VBN 776 Using 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 detailed drawing of a plumb bob.

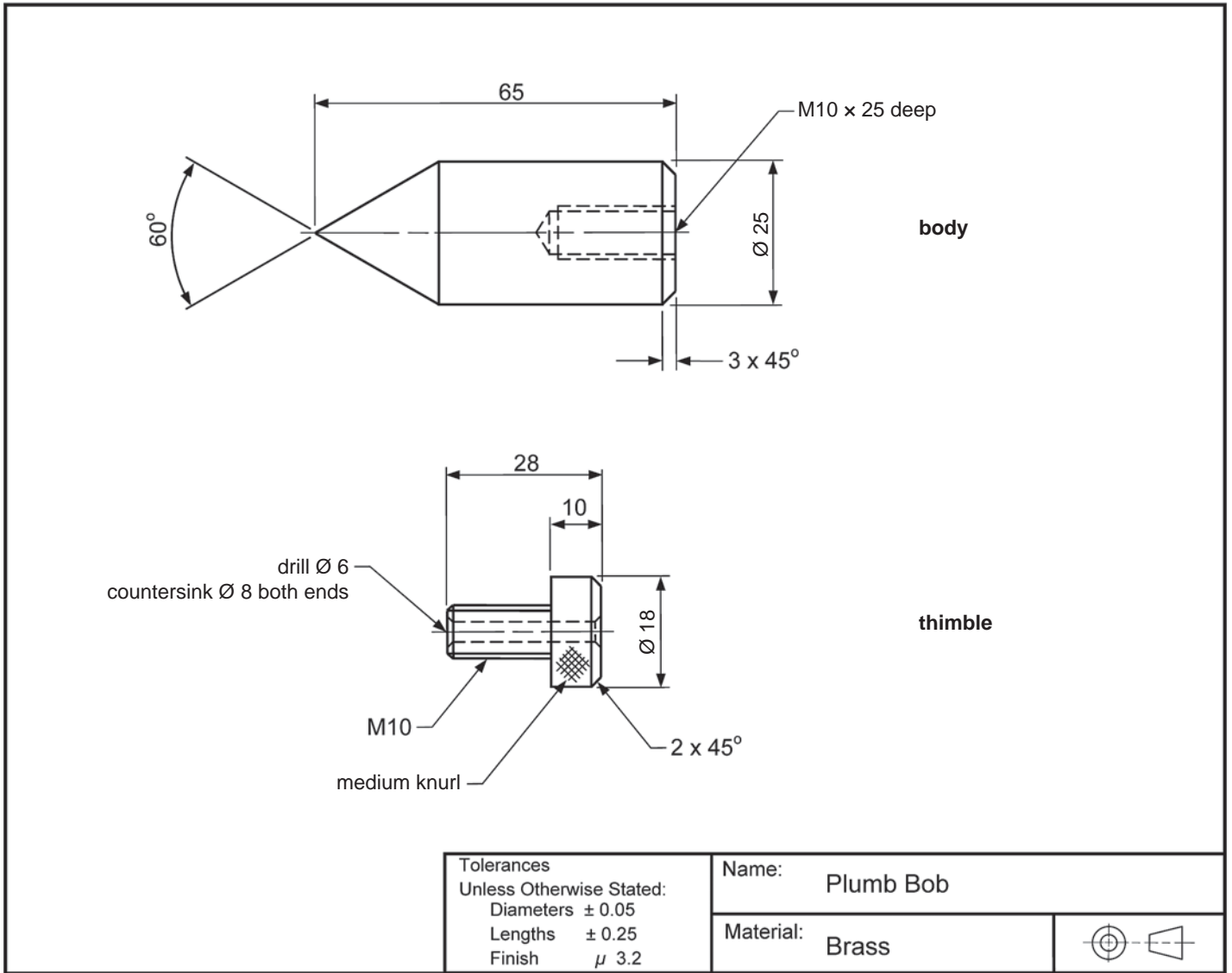


Figure 1

Question 1

a. At what angle is the top slide on the lathe set when turning the point of the plumb bob body?

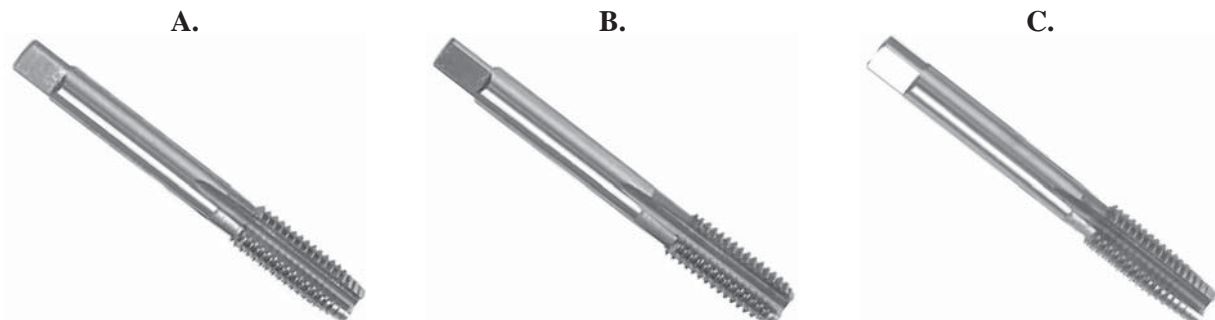
1 mark

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 2

- b. Use the thread chart shown in Figure 2 to determine the drill required for the M10 thread in the plumb bob body.

1 mark



The three taps shown will be used to tap the M10 thread in the plumb bob body.

- c. Which of the taps should be used last? Give a reason for your answer.

2 marks



Figure 3

- d. What is the name of the tool shown in Figure 3?

1 mark

- e. From the following list, select the most suitable size for the major diameter before cutting the M10 thread on the thimble.
- A. 12.50
 - B. 10.35
 - C. 9.95
 - D. 8.50
 - E. 8.00

1 mark

The thimble will be made from a $\text{Ø}18$ piece of bar which is 300 mm long.

- f. Complete the sequence of operations in order to make the thimble.

Step	Operation
1	Face and centre drill bar

5 marks

- g. What is the purpose of the knurl on the thimble?

1 mark

When the plumb bob, made to correct specifications, was assembled, the thimble would not screw all the way down, which resulted in a gap between the body and thimble as shown in Figure 4.

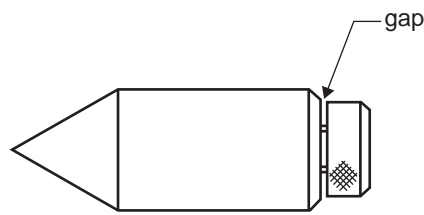


Figure 4

- h.** Describe what can be done to fix the gap.

2 marks

When another plumb bob was assembled, the thimble screwed in at an angle as shown in Figure 5.



Figure 5

- i.** What could have caused this?

1 mark

Total 15 marks

SECTION D – VBN 777 Handle engineering materials

Instructions for Section D

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

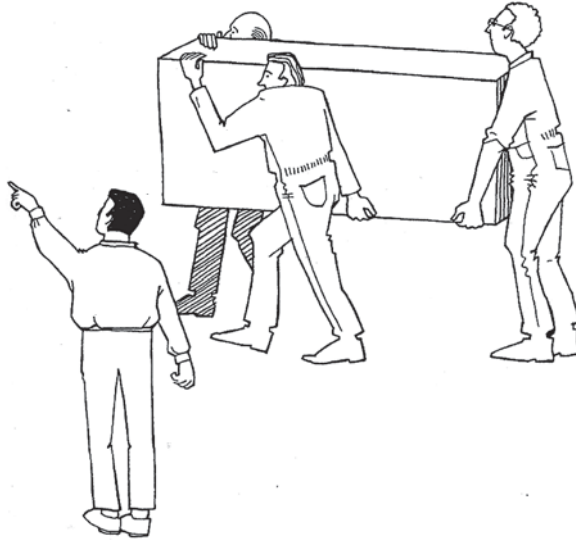


Figure 1

Question 1

a. What type of lift is shown in Figure 1?

1 mark

In Figure 1, the person at the front of the picture who is not lifting is the leader of the lift.

b. State **one** responsibility this person has.

1 mark

Question 2

In engineering, gloves are sometimes worn to protect the hands from injury.

- a. Give one example of a task where it is recommended that gloves be worn.

1 mark

- b. Give one example where gloves must **not** be worn because they would be a safety hazard.

1 mark

Question 3

Name **two** pieces of equipment that are commonly used to move heavy materials in engineering workshops and that require a licence to operate.

2 marks

Question 4

Aisles are intended to provide a safe path to move along people and materials.

Describe a situation that would create an unsafe aisle.

1 mark

The following is a Material Safety Data Sheet (MSDS).

MSDS – Material Safety Data Sheet

Product Name: **THINNER**

Recommended Use: **Industrial Solvent**

1. HAZARDOUS IDENTIFICATION

Hazardous substance according to the criteria of Dangerous Goods

2. FIRST AID MEASURES

Inhalation:

Remove from contaminated area. Apply artificial respiration if not breathing. Seek medical assistance.

Ingestion:

If poisoning occurs, contact a doctor or poisons information centre. If swallowed, do not induce vomiting, give a glass of water.

Skin:

If skin contact occurs, remove contaminated clothing and wash skin thoroughly.

Eye:

If in eyes, hold eyes open, flood with water for at least 15 minutes and see a doctor.

3. FIRE FIGHTING MEASURES

Substantial Extinguishing Media:

Use foam extinguisher.

Specific Hazards:

This product is extremely flammable. Vapours are heavier than air and will travel to low level areas.

4. ACCIDENTAL RELEASE MEASURES

Emergency Procedures:

Thinner is a flammable liquid. Vapour may form explosive mixtures with air. Avoid heat and all ignition sources. Use only in well-ventilated areas. Product transfer and storage equipment must be earthed.

5. HANDLING AND STORAGE

Precautions for Safe Handling:

Wear chemical goggles or face shield. Wear protective clothing as necessary to avoid skin contact. Wear chemical resistant gloves. This product is harmful if inhaled.

6. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Clear, colourless, mobile liquid with hydrocarbon odour

Boiling Point: 80–110° C

Solubility: Miscible with water

Flash Point: 1

Flammability: HIGHLY FLAMMABLE. This product should be stored and used in a well-ventilated area away from naked flames, sparks and other sources of ignition. Keep the container tightly closed.

Water
Extinguisher

Foam
Extinguisher

Wet Chemical
Extinguisher

Carbon Dioxide
Extinguisher

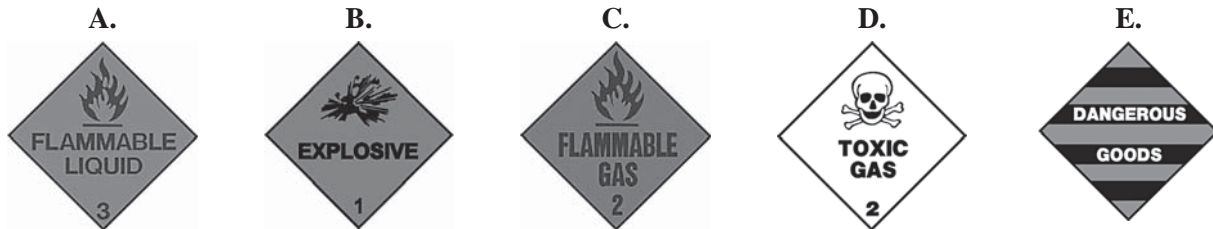
Question 5

Which one of the above fire extinguishers would be most suitable to use if thinner ignites?

1 mark

Question 6

Which one of the following safety signs would you expect to see displayed where drums of thinner are stored?



1 mark

Question 7

What should you do if thinner is accidentally swallowed?

1 mark

Question 8

In a room where thinner is used frequently, a fan extractor is installed at ground level.

Why is an extraction system for thinner more effective at ground level?

1 mark

Question 9

The photo below shows a person pouring thinner from a 20 litre drum and a person using a grinder.



Apart from poor ventilation, list four specific safety hazards in this photo.

- 1. _____

- 2. _____

- 3. _____

- 4. _____

4 marks
Total 15 marks

CONTINUES OVER PAGE

TURN OVER

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 vice used for woodwork.

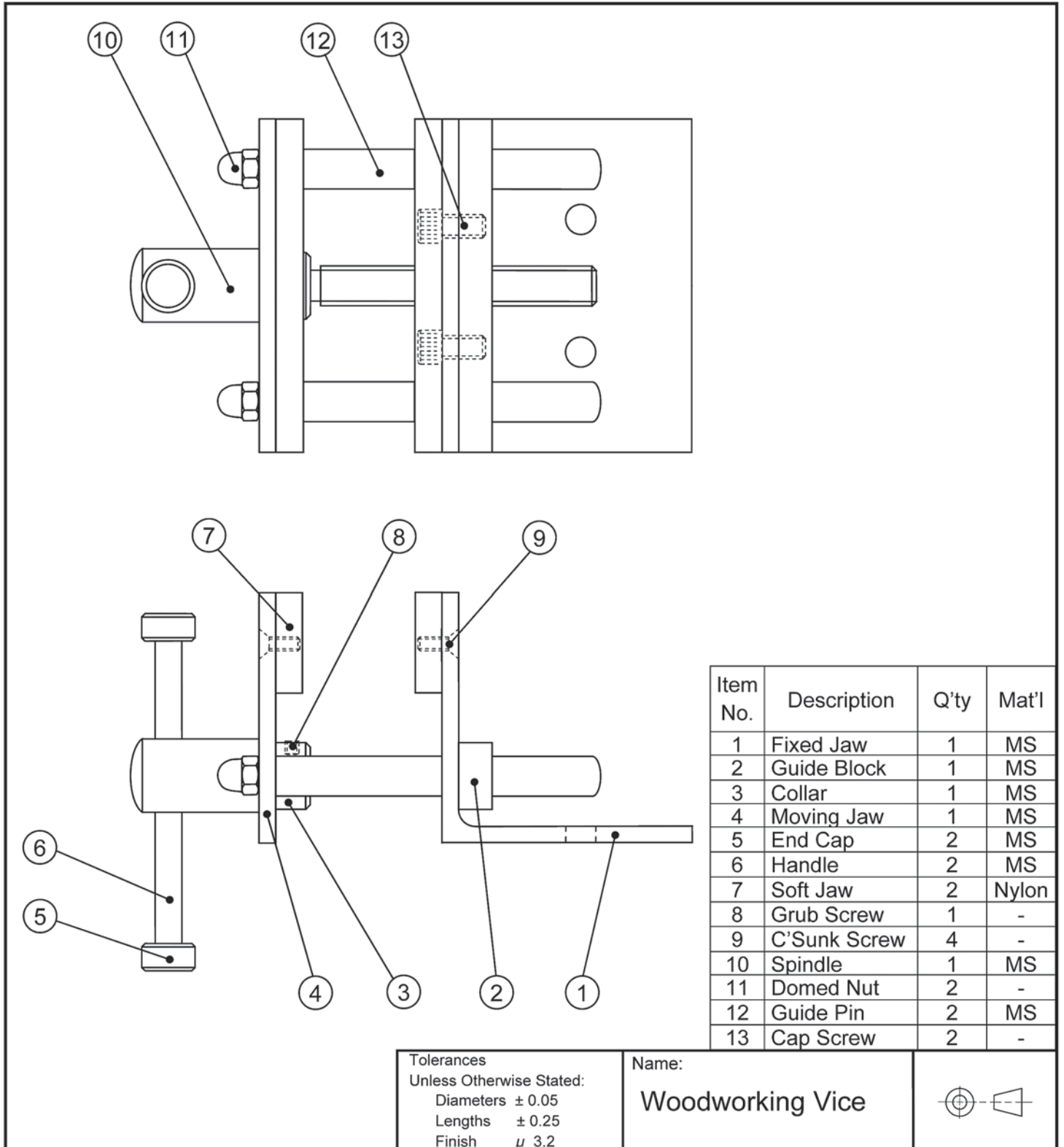


Figure 1

Question 1

- a. List all the components of the woodworking vice shown in Figure 1 that are commercially available (i.e. do not need to be made).

1 mark

- b. List **two** hand tools needed to assemble the woodworking vice.

1 mark

- c. What is likely to happen if a countersunk screw (item 9 in Figure 1) is overtightened during assembly?

1 mark

Figure 2 shows a detailed drawing of the fixed jaw. Question 2 relates to the manufacture of the fixed jaw.

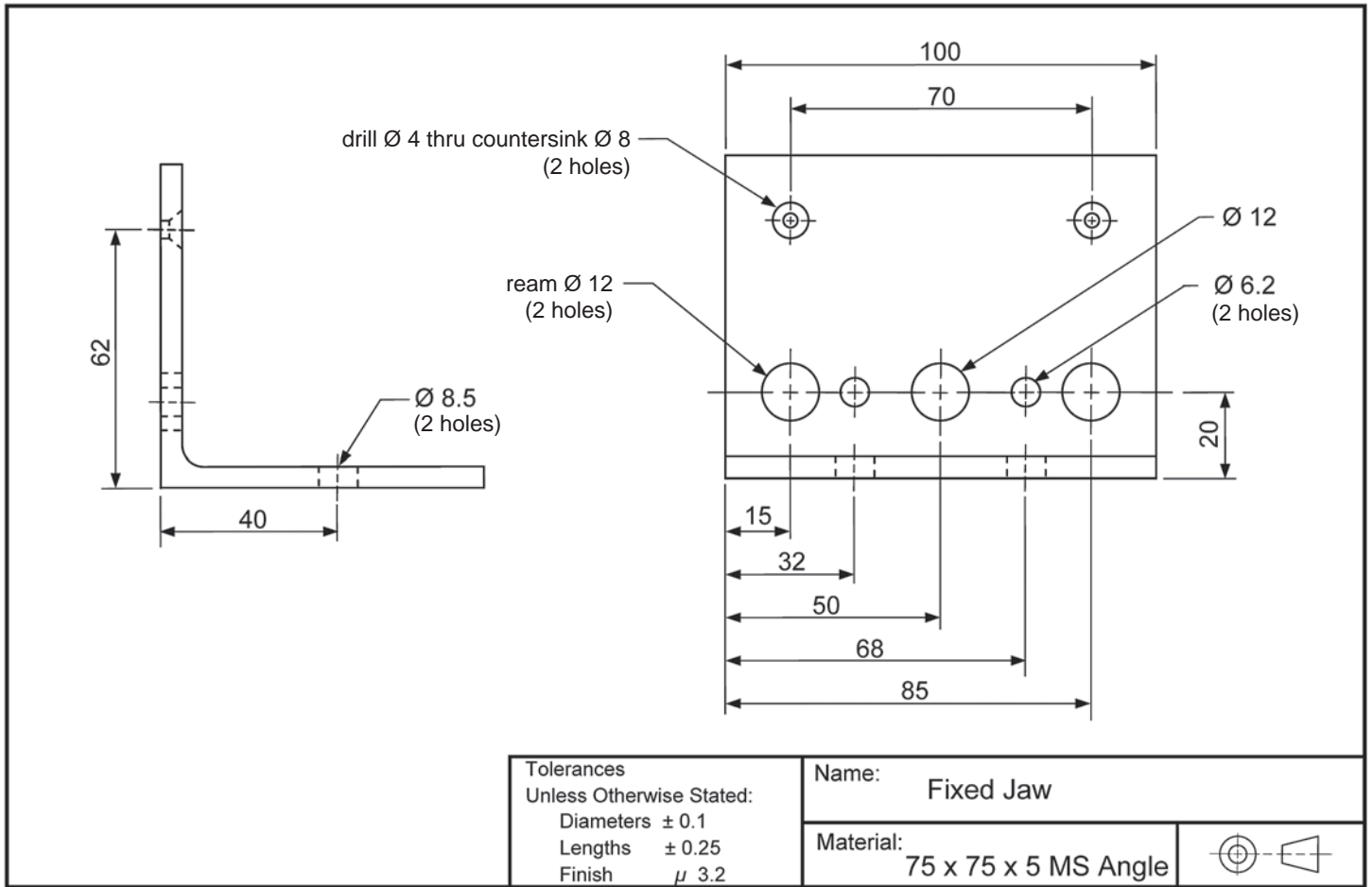


Figure 2

Question 2

- a. Use an arrow to show a datum on the drawing in Figure 2.

1 mark

A 1 m length of 75 mm angle iron has been placed on the saw for cutting.

- b. How long should the material be cut to make the fixed jaw?

1 mark

The material for the fixed jaw has just been cut.

- c. Describe **two** operations that need to be done to the material before it is ready for marking out.

2 marks

The holes will be marked out using the marking tool shown in Figure 3.



Figure 3

- d.**
- i.** What is the name of the marking tool shown in Figure 3?
-
- ii.** Describe one check that should be done to the marking tool shown in Figure 3 to make sure that your marking out is accurate.

1 + 1 = 2 marks

The holes in the fixed jaw and the guide block, in Figure 1 on page 22, need to be accurately lined up so that they match.

- e.**
- i.** If the holes in the guide block and the fixed jaw are not accurately lined up, how could this affect the operation of the vice?

- ii.** Describe in detail how to make sure that the holes line up.

1 + 2 = 3 marks

The marked out lines on the angle iron are difficult to see.

- f.** What can be done to the angle iron to make the lines easier to see?

1 mark

Twist drills made from High Speed Steel (HSS) will be used to drill the holes in the fixed jaw. It is important that these drills are used at the correct rpm.

- g.** What are the two major factors which determine the correct rpm of the drills?

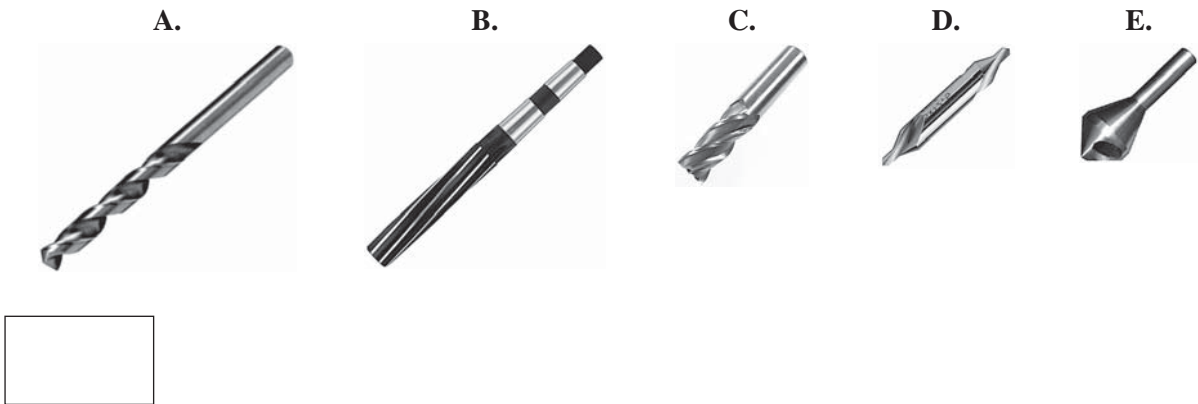
1. _____
2. _____

2 marks

h. Why are two of the $\text{\O} 12$ holes in the fixed jaw reamed and not drilled to size?

1 mark

i. Which of the tools shown below is a reamer?



1 mark

Figure 4 shows a detailed drawing of a spindle and collar. Question 3 relates to the manufacture of the spindle and collar.

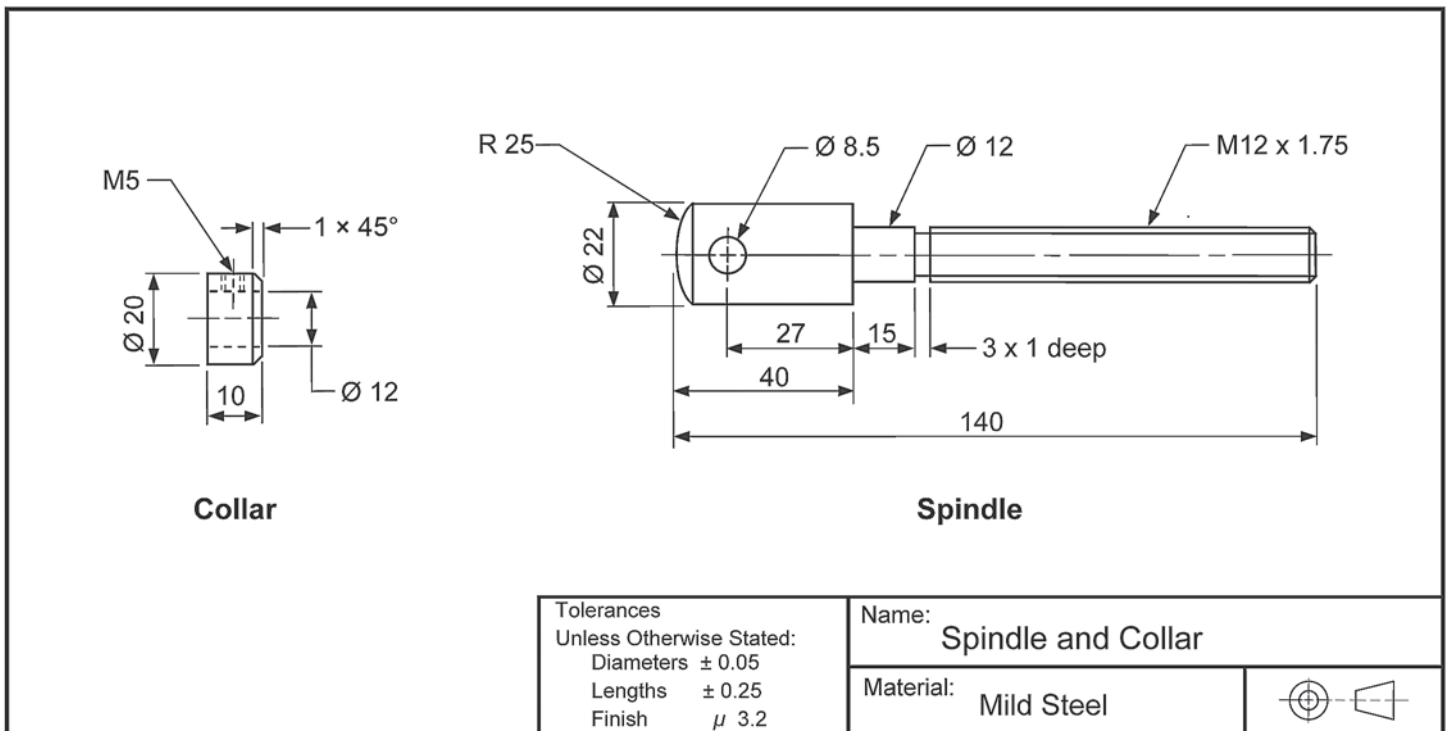


Figure 4

Question 3

The collar shown in Figure 4 will be made out of a 400 mm long piece of $\text{Ø} 22$ mild steel bar.

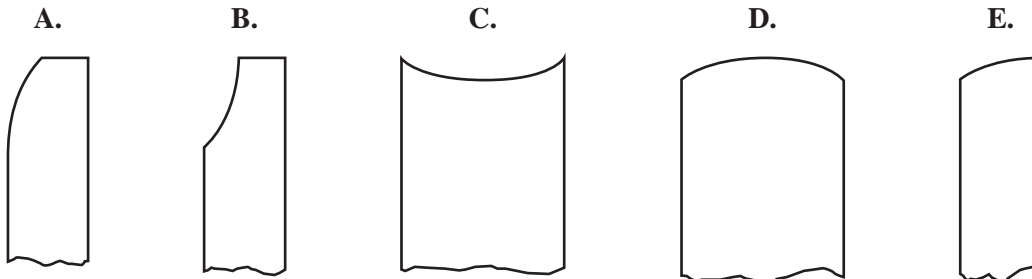
a. List six tools you will need to make the collar.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

3 marks

The radius on the end of the spindle will be machined using a form tool.

b. Which of the following form tool shapes would be most suitable to machine the R25?



1 mark

The lathe shown in Figure 5 will be used to make the spindle.

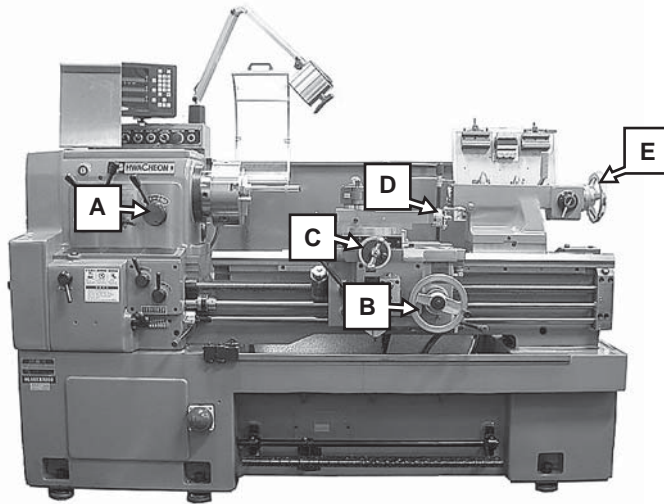


Figure 5

- c. i. Which hand-wheel is used to face off the spindle?

- ii. Which hand-wheel is used to feed the centre drill?

- iii. Which hand-wheel is used to feed the tool along the work when turning the diameters?

1 + 1 + 1 = 3 marks

Figure 6 shows a detailed drawing of a guide pin.

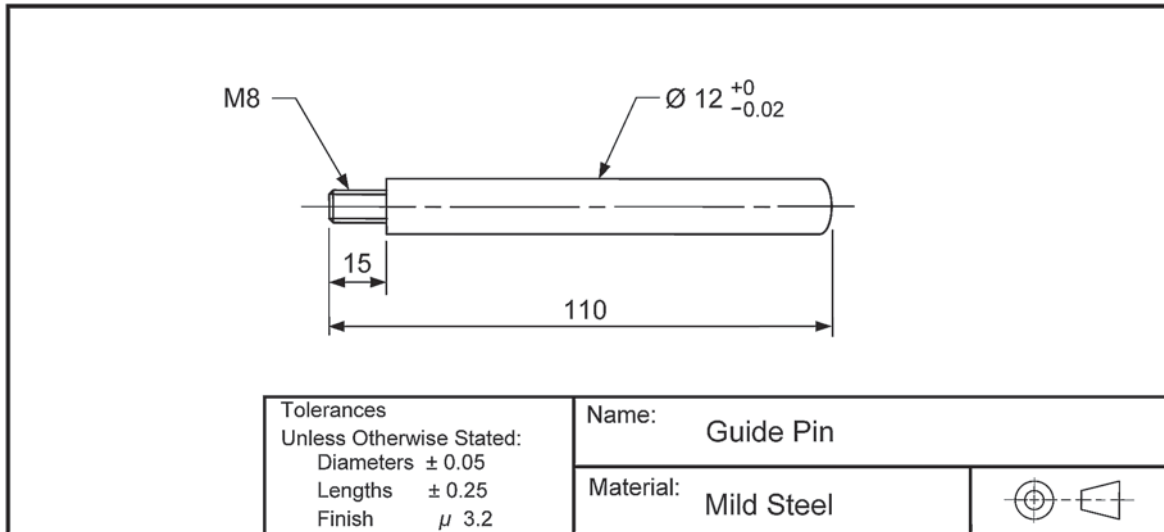


Figure 6

The diameter of the guide pin has been specifically toleranced.

- d.** Explain why the general tolerance has not been applied to this diameter.

2 marks

Figures A and B show an HSS tool and a cemented carbide tool.



- e.** Which is the cemented carbide tool?

1 mark

One of the tools which will be used to make the spindle on page 26 is shown in Figure 7.

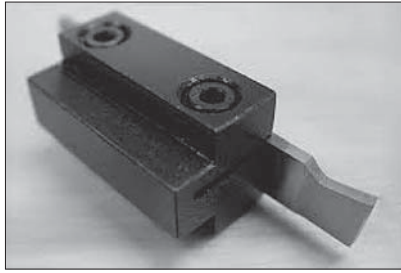


Figure 7

- f. i.** What is the name of this tool?

- ii.** Which feature of the spindle will be machined using this tool?

1 + 1 = 2 marks

While using the tool shown in Figure 7, the spindle starts to chatter.

- g.** Explain what you would do to eliminate the chatter.

2 marks

The thread of the spindle is labelled M12 × 1.75.

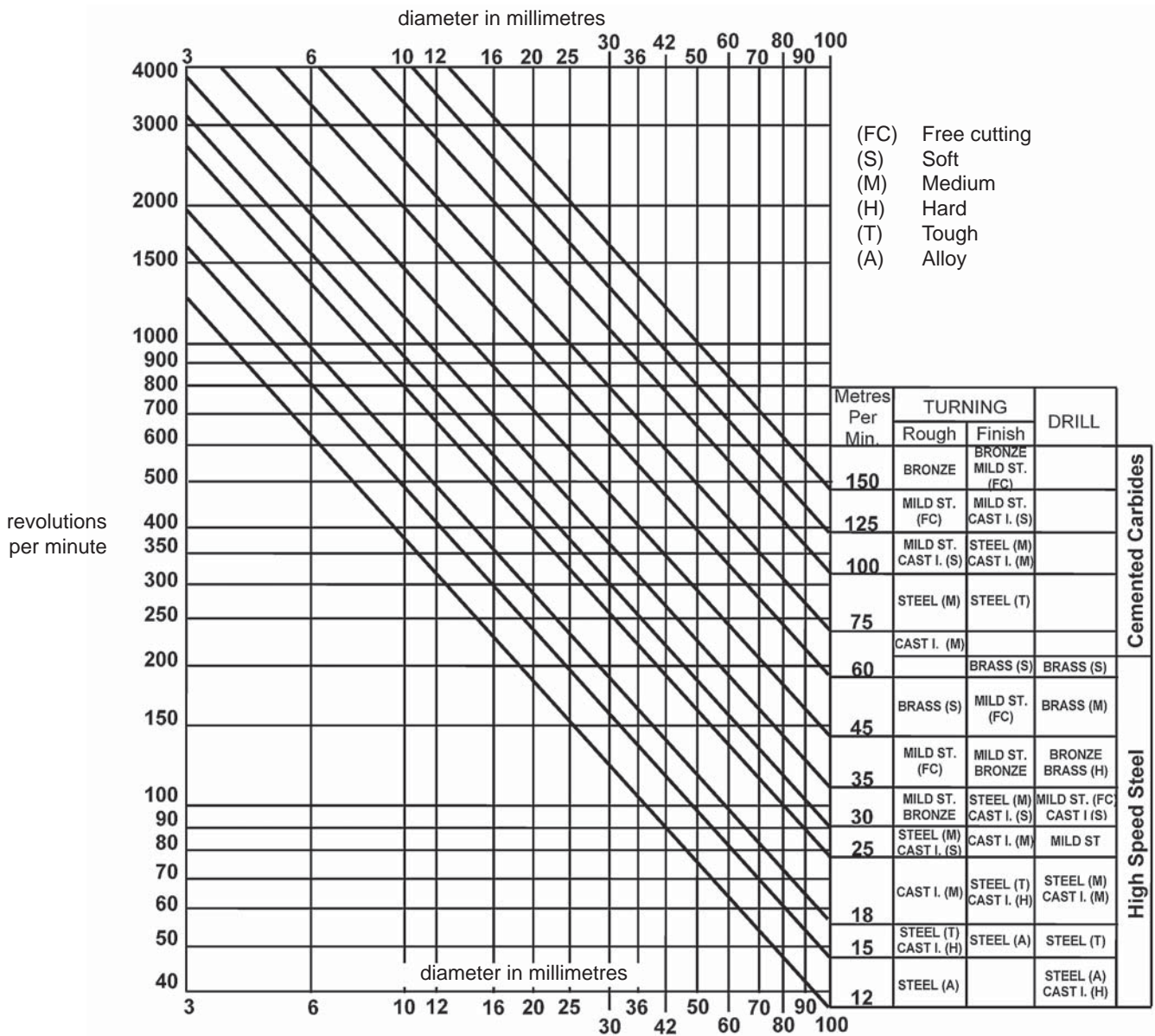
- h. i.** What does the 12 indicate?

- ii.** What does the 1.75 indicate?

1 + 1 = 2 marks

A cemented carbide tool is being used to finish turn the Ø 22 of the spindle.

- i. Use the nomogram shown below to calculate the approximate rpm setting for the lathe.



rpm _____

2 marks

- j. Use the nomogram to find the **cutting speed** for drilling bronze.

Cutting speed _____

1 mark

The soft jaws of the woodworking vice will be milled to length on a vertical milling machine and held in a vice as shown in Figure 8.

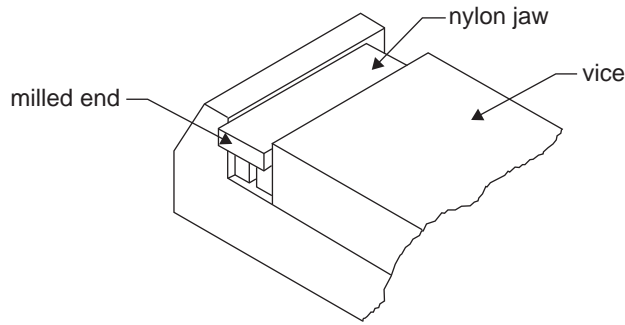


Figure 8

Question 4

The nylon jaw in Figure 8 is sitting on parallel strips.

- a. Why is it important to tap down the nylon jaw so that the parallel strips do not move?

1 mark

- b. What type of milling cutter would be suitable for milling the ends of nylon jaws?

1 mark

When checking the milled end of the nylon jaw, it was found to be out of square as shown in Figure 9.

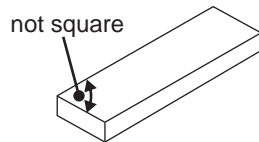


Figure 9

- c. i. What is the most likely cause for the milled end being out of square?

- ii. Explain in detail how to fix this problem so that the ends are milled square.

1 + 1 = 2 marks

Total 40 marks