



Victorian Certificate of Education 2009

SUPERVISOR TO ATTACH PROCESSING LABEL HERE

STUDENT NUMBER

Figures

Words

Letter

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VCE VET ENGINEERING STUDIES CERTIFICATE II

Written examination

Wednesday 18 November 2009

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	3	3	15
C	2	2	15
D	8	8	15
E	2	2	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 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

A digital ohmmeter is being used to measure a component. The meter indicates $3.725\text{k}\Omega$.

This is equivalent to

- A. $0.3725\ \Omega$
- B. $37.25\ \Omega$
- C. $372.5\ \Omega$
- D. $3725\ \Omega$

Question 2

The voltage measured across a closed switch equals

- A. zero.
- B. the total supply voltage.
- C. half the supply voltage.
- D. double the supply voltage.

Question 3

Electrical power is measured in

- A. volts.
- B. watts.
- C. ohms.
- D. amperes.

Question 4

What can cause excessive voltage drop?

- A. using extra large-size wires
- B. too much insulation on the wires
- C. excessive resistance in part of the circuit
- D. an open circuit bypassing the load being tested

Question 5

One use for a piezoelectric device would be for

- A. temperature measurement.
- B. high-voltage insulators.
- C. gas ignition systems.
- D. voltage amplifiers.

Question 6

If a fuse blows again after it has been replaced, the most likely cause is that

- A. resistance in the circuit is too high.
- B. an open circuit has occurred in a component.
- C. the earth connector has become disconnected.
- D. the current or amps through the circuit is too high.

Question 7

The factor that does **not** affect the resistance of a conductor is its

- A. length.
- B. voltage rating.
- C. type of material.
- D. cross-sectional area.

Question 8

A resistor with a **gold** tolerance band has an accuracy of

- A. 1%
- B. 2%
- C. 5%
- D. 10%

Question 9

Components that are connected in parallel form

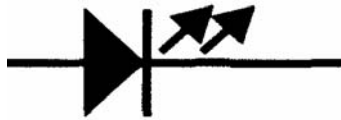
- A. several branches for current flow.
- B. a single path for current flow.
- C. a voltage divider.
- D. an open circuit.

Question 10

A 12-volt battery is rated at 20 ampere hours.

This means that it can supply 2 amps for

- A. 2 hours.
- B. 10 hours.
- C. 12 hours.
- D. 20 hours.

Question 11

What is the name of this device?

- A. transistor
- B. capacitor
- C. rectifier diode
- D. light-emitting diode (LED)

Question 12

A safety switch installed on a switchboard will activate when

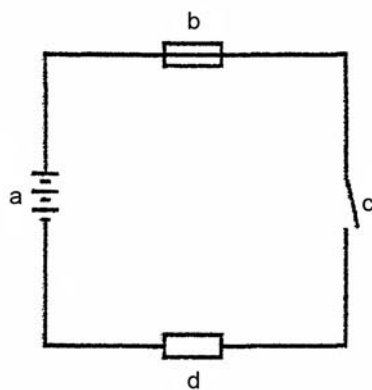
- A. the current being drawn by the active and neutral is out of balance.
- B. there is a short circuit between active and neutral.
- C. there is an open circuit in the cable.
- D. the circuit is overloaded.

Question 13

You are about to use a power drill and notice that the lead is damaged, exposing the wires.

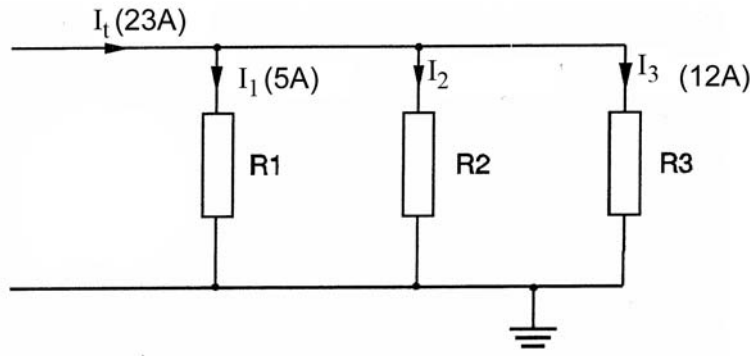
What is the **most** appropriate action to take?

- A. use another power drill
- B. repair the lead before using
- C. place insulation tape around the drill before using
- D. tag the drill as faulty and report the fault to your supervisor

Question 14

From the figure, select the letter that indicates a fuse.

- A. a
- B. b
- C. c
- D. d

Question 15

What is the current at I_2 for the circuit shown?

- A. 6 amps
- B. 12 amps
- C. 23 amps
- D. 40 amps

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

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

Question 1

Figure 1 shows an isometric view of a pin.

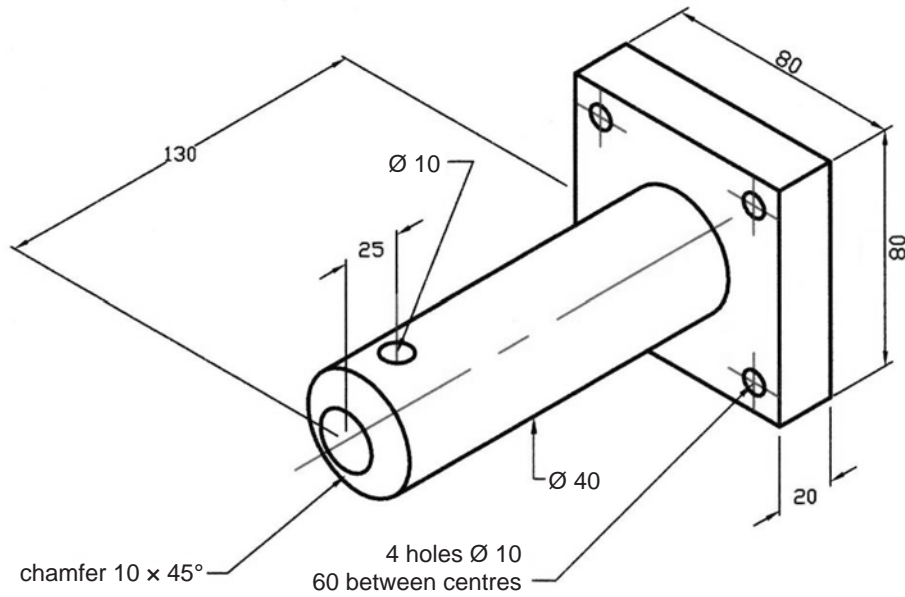
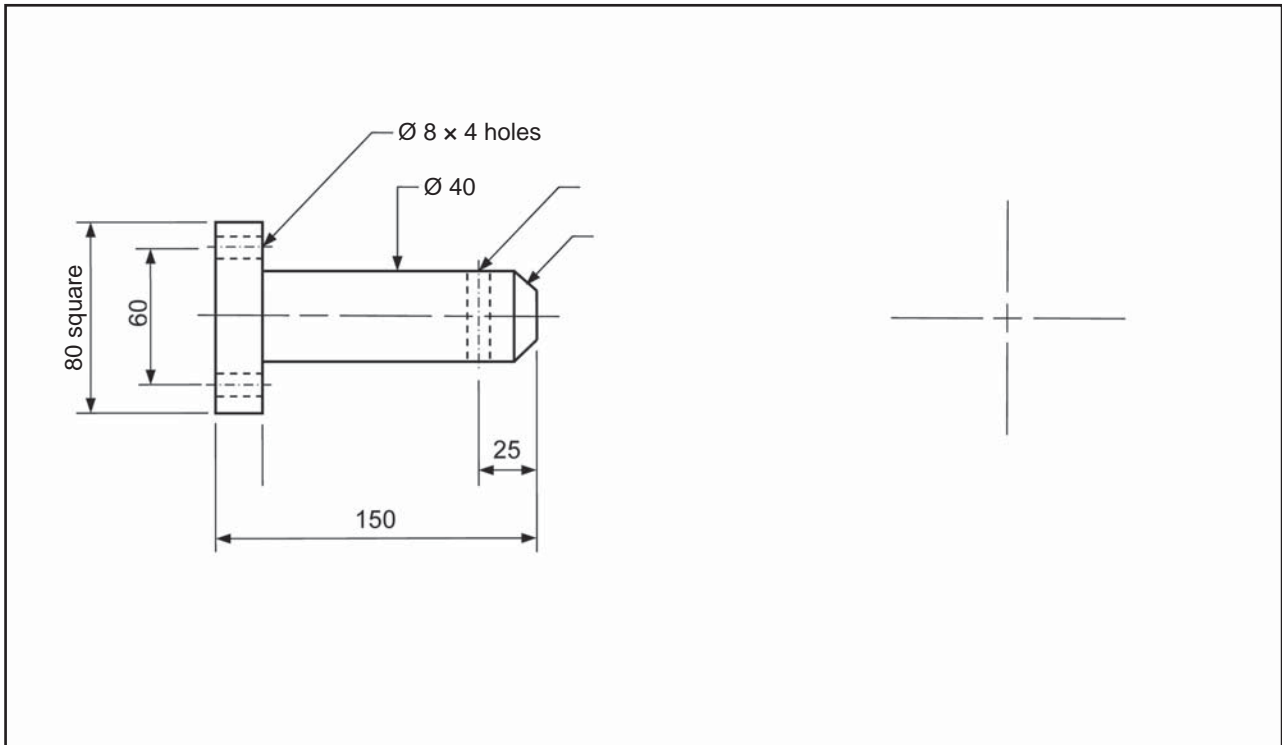


Figure 1

On the sketch below, complete the orthogonal views of the pin shown in Figure 1.

- use conventional drawing systems
- show views in third-angle projection
- show all hidden detail
- complete all missing dimensions



4 marks

Question 2

Figure 2 shows a detailed drawing of a clamp screw used in a G Clamp.

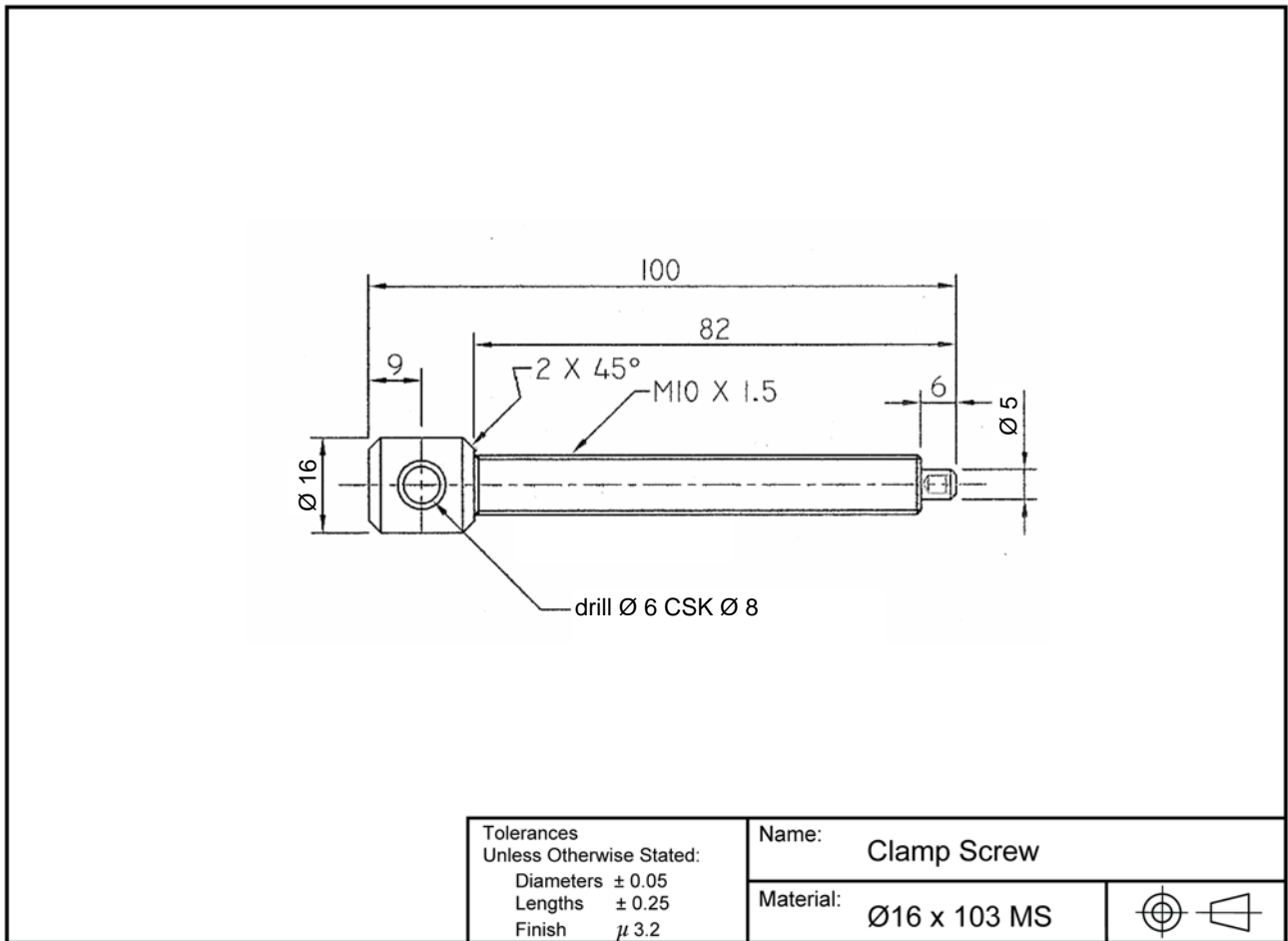


Figure 2

- a. What does CSK Ø 8 mean?

_____ 1 mark

- b. What is the pitch of the M10 thread?

_____ 1 mark

- c. How long is the head of the clamp screw?

_____ 1 mark

- d. What are the maximum and minimum lengths the clamp screw can be made to?

maximum _____ minimum _____

2 marks

- e. Complete the table below showing details of the material required to make the clamp screw.

Type of material	
Material size	

2 marks

Question 3

Figure 3 shows an orthogonal drawing of a tool block.

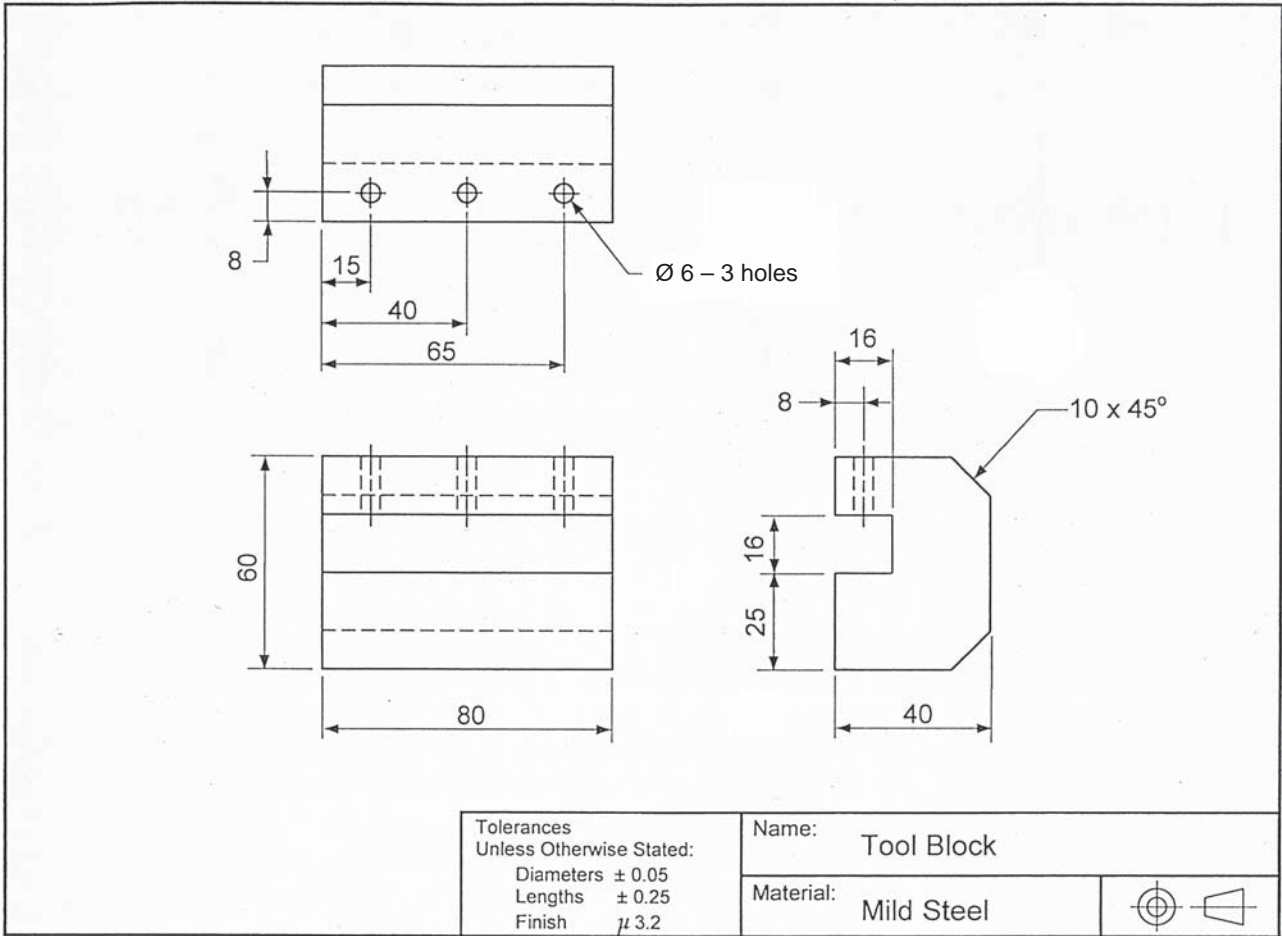
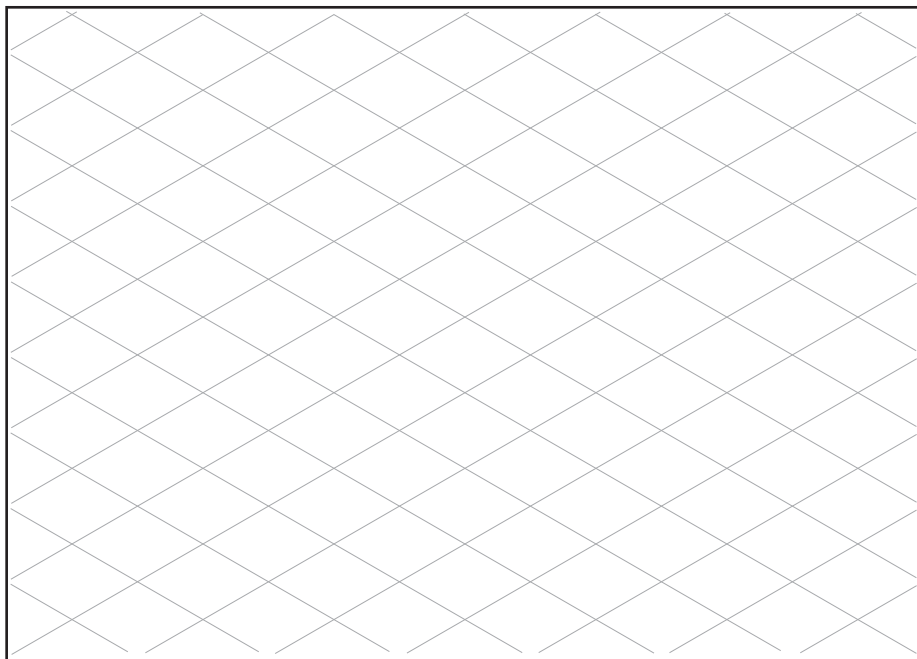


Figure 3

In the space provided below, draw an isometric drawing of the tool block shown in Figure 3.
(DO NOT DIMENSION THE DRAWING.)



4 marks

CONTINUES OVER PAGE

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 an assembly drawing of a machinist's jack.

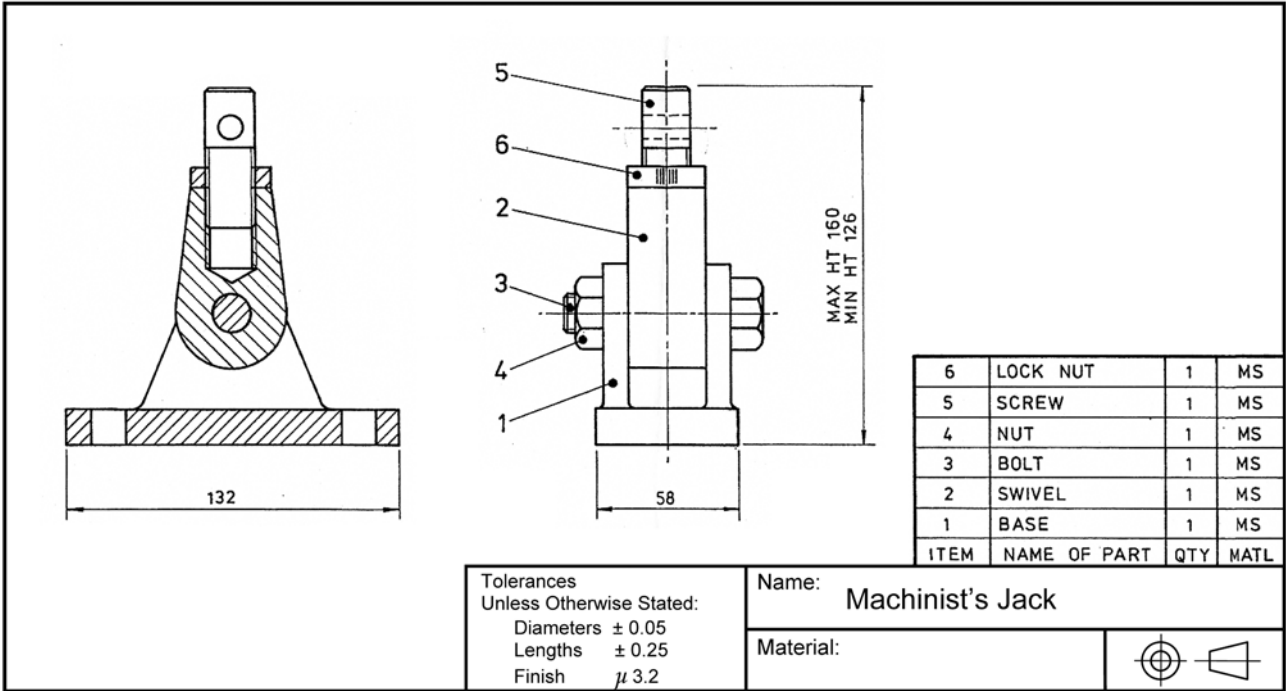


Figure 1

Figure 2 shows a detailed drawing of two components, a screw and a lock nut from the machinist's jack.

The questions in this section relate to the components shown in Figure 2.

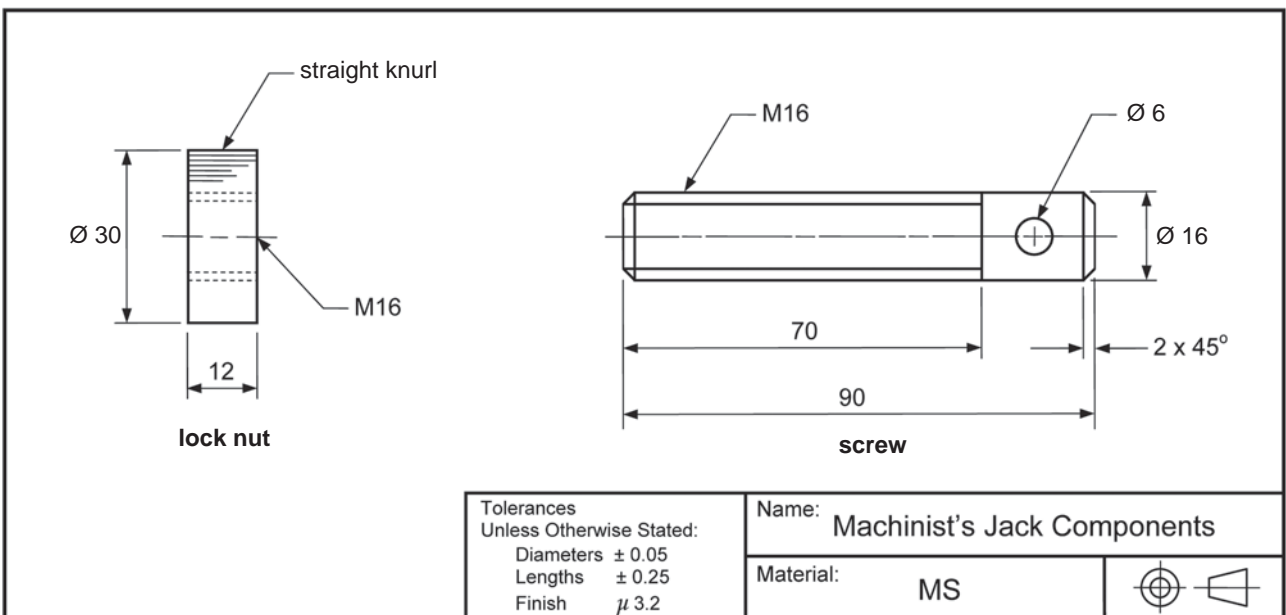


Figure 2

Question 1

The lock nut will be made from a length of bar and will be parted off when completed.

- a. From the following list, select the material best suited for making the lock nut.
- A. Ø 32 aluminium
 - B. Ø 35 aluminium
 - C. Ø 32 mild steel
 - D. Ø 16 mild steel
 - E. Ø 30 MS tube
 - F. Ø 30 brass

1 mark

- b. What work-holding method would you use to hold the material for the lock nut in a lathe?

1 mark

The following lists the operations to make the lock nut. They are **not** in sequence.

- drill hole
- turn outside diameter
- face and centre end
- knurl
- part off
- tap thread

- c. Complete the table below showing the operations in correct sequence and tools required for each operation.

Sequence	Operation	Tools
1		
2		
3	knurl	knurling tool
4		
5	tap thread	M16 tap, tap wrench
6		

4 marks

Question 2

The raw material for the screw is being measured with a rule as shown in Figure 3.

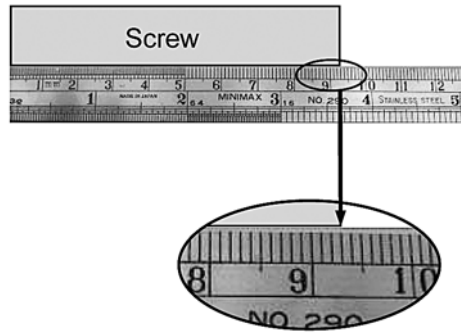


Figure 3

- a. i. How long is the raw material for the screw?

- ii. Why has the raw material for the screw been cut off longer than the length shown on the drawing?

1 + 1 = 2 marks

Figure 4 shows the position of the centre line for the Ø 6 hole in the screw.

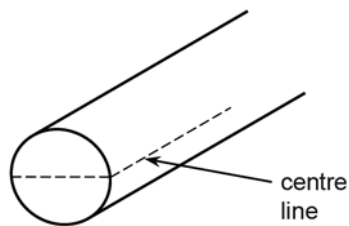


Figure 4

- b. How should the screw be held for marking out the centre line?

1 mark

Figure 5 shows a vernier height gauge that will be used to mark the centre line of the $\text{\O} 6$ hole in the screw as shown in Figure 4.

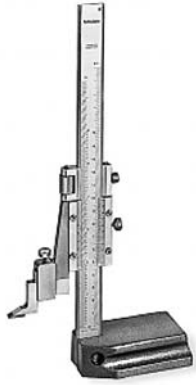


Figure 5

- c. Describe how the vernier height gauge can be accurately set to the centre of the screw.

2 marks

Figure 6 shows the position of the $\text{\O} 6$ hole in the screw marked out.

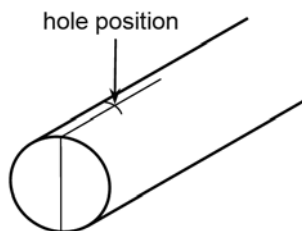


Figure 6

- d. What needs to be done to the hole position before drilling to make sure the drill does not move off the marked position?

1 mark

Before drilling the hole, you need to set up the screw so that the centre line on the end of the screw is vertical, as shown in Figure 7.

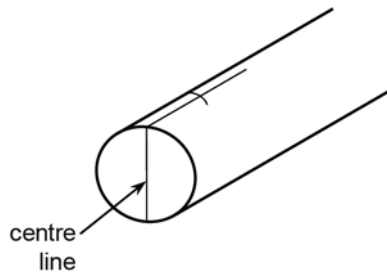


Figure 7

e. i. What will happen if this centre line is not set up vertically before drilling?

ii. What tool can be used to set this centre line vertically?

1 + 1 = 2 marks

The spanner shown in Figure 8 will be used to tighten the nut when assembling the machinist's jack.



Figure 8

f. What type of spanner is it?

1 mark

Total 15 marks

SECTION D – VBN 777 Handle engineering materials in a safe and proper manner

Instructions for Section D

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

Question 1

Which one of the signs shown below would you most expect to find at a bench grinder?

A.



B.



C.



D.



E.



1 mark

Question 2

Which one of the signs shown below would you expect to find around an oxy-acetylene welding set?

A.



B.



C.



D.



E.



1 mark

Question 3

You need to make a 600 mm long axle from 25 mm square bar. The material you will be using is currently 4 metres long and is stored in vertical racks 10 metres away from the saw.

- a. List **two** precautions you need to take when carrying the 4 metre bar to the saw to avoid injury to yourself and others.

1. _____

2. _____

2 marks

- b. Describe a possible safety hazard when handling the end of the cut bar immediately after it has been sawn.

1 mark

- c. The cut bar will be set up in a vice on a milling machine for machining. The vice weighs 25 kg and is currently on a bench.

Describe one safe method of placing the vice onto the milling machine table.

2 marks

Question 4

Why should you always use a piece of wood on the lathe bed when changing chucks?

1 mark

Question 5

An eye bolt is shown below.



Which of the following articles is most likely to use an eye bolt as a lifting accessory?

- A. vice
- B. electric motor
- C. 2 metre long steel bar
- D. large piece of sheet metal
- E. timber box

1 mark

Question 6

A two-person lift is being used to carry a 1.8 m × 1.0 m piece of sheet metal through a machine shop.

List two hazards that exist for the two people who are lifting.

1. _____

2. _____

2 marks

Question 7

Before lifting a load manually, you need to 'size up the load'.

Give two examples of what you would do when 'sizing up the load'.

1. _____

2. _____

2 marks

Question 8

You are given the responsibility of buying a forklift which will be used to load and unload crates from inside a 20 metre shipping container.

Forklift motors can be any of the following.

- diesel
- electric
- petrol
- LPG

Which sort of forklift motor would be the most suitable in the situation above? Explain your answer.

Type of motor _____

Explanation _____

2 marks

Total 15 marks

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

Instructions for Section E

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

Question 1

Figure 1 shows an isometric drawing of an angle plate.

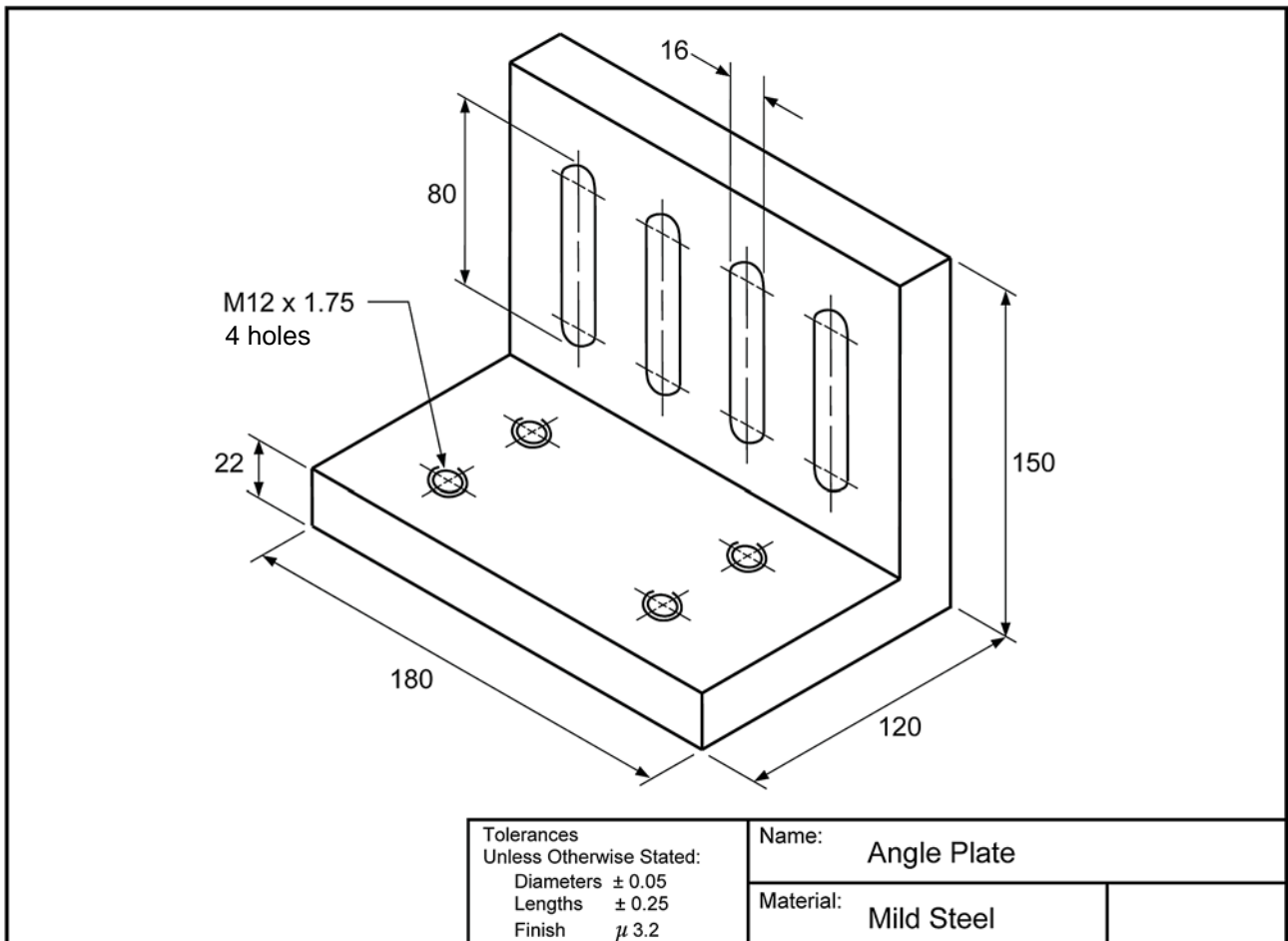


Figure 1

- a. State one common use for an angle plate in engineering.

1 mark

Three marking-out tools that could be used to mark out the angle plate are shown below.

- b. Name each of the tools shown and describe what they could be used for when marking out the angle plate.



Tool _____

Use _____



Tool _____

Use _____



Tool _____

Use _____

6 marks

Figure 2 shows a metric thread chart.

I.S.O. METRIC COARSE THREADS							
<i>NOTE:—All dimensions in mm</i>							
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

- c. Use this chart to work out what size holes need to be drilled for the threaded holes in the angle plate.

1 mark

The drill being used for the tapped holes is shown in Figure 3.



Figure 3

- d. What is the name of this drill?

1 mark

The drill being used for the holes needs to be sharpened on a bench grinder.

e. Which photo shows the work rest correctly adjusted?

A.



B.



C.



1 mark

When drilling the holes, swarf can form long strands that spin around close to the operator. This is a safety hazard.

f. Describe how to prevent these long strands of swarf from forming while drilling the holes.

1 mark

Figure 4 shows two tools that are commonly used with drills.



Figure 4

g. Describe what each tool is used for.

drill sleeve _____

drill drift _____

2 marks

- h.** Use the nomogram shown in Figure 5 to calculate the approximate rpm for a Ø 16 hole drilled in the angle plate.

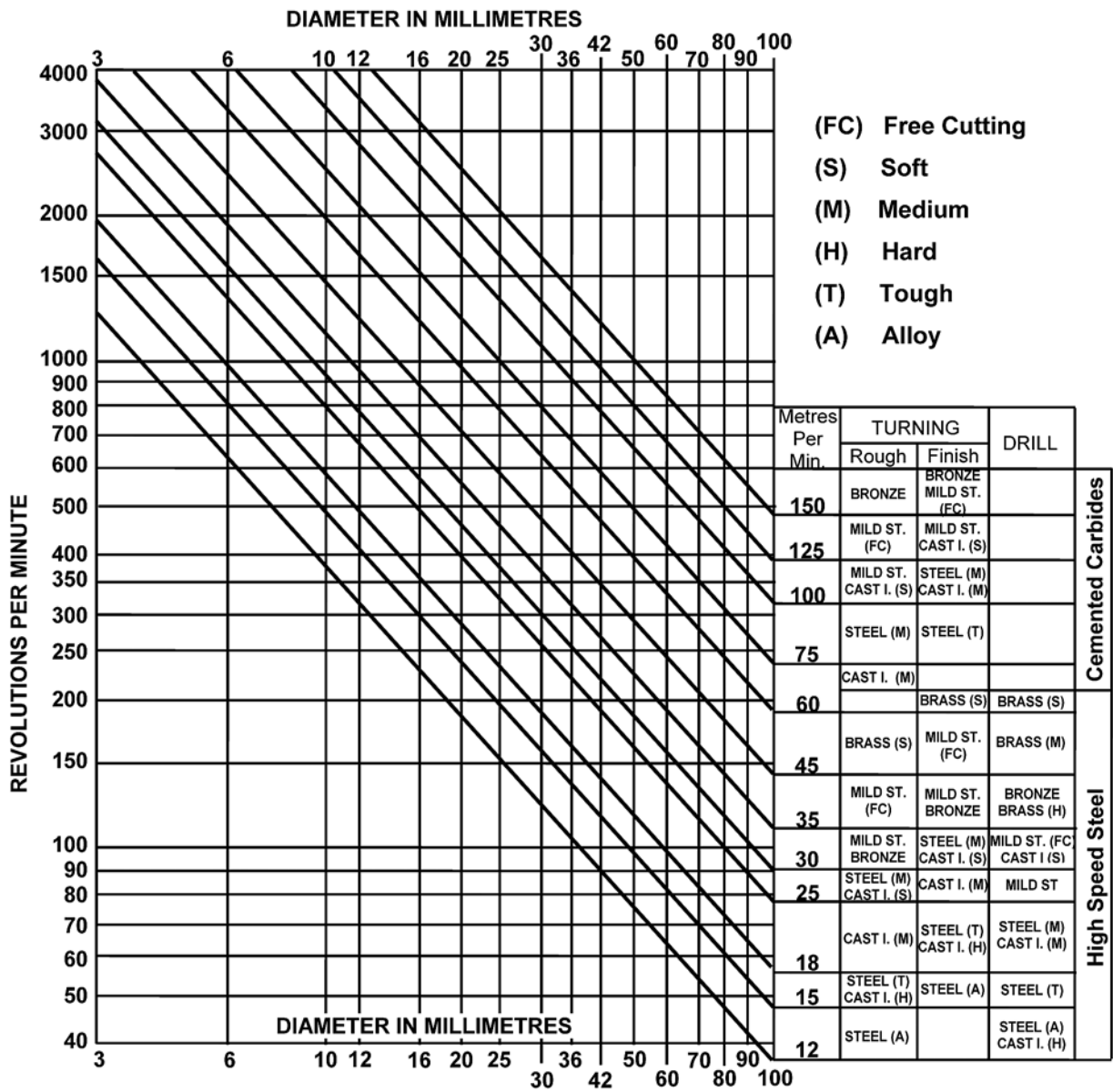


Figure 5

rpm

2 marks

Before tapping, the drilled holes will be countersunk.

- i. From the tools shown below, select the tool that is most suitable to countersink the holes.

A.



B.



C.



D.



E.



1 mark

A slot drill will be used to mill the slots in the angle plate.

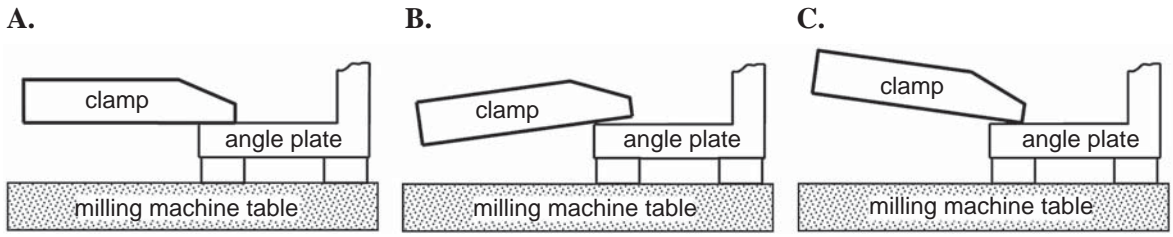
- j. Indicate with an arrow the correct direction of rotation of the slot drill.



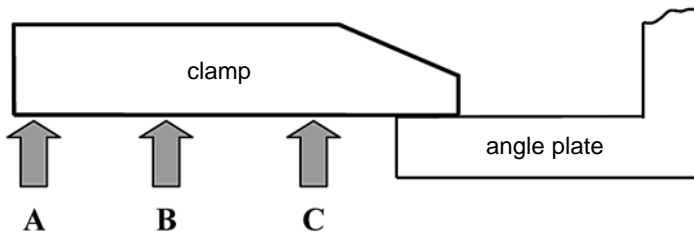
1 mark

k. The angle plate will be clamped to the milling machine table to mill the slots.

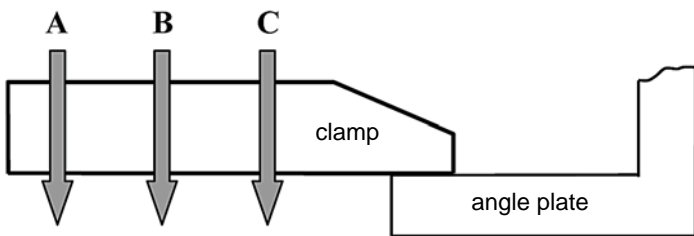
i. Which diagram shows the correct position of the clamp?



ii. Which arrow shows the best position of the **packing** for maximum clamping pressure?



iii. Which arrow shows the best position of the **bolt** for maximum clamping pressure?



1 + 1 + 1 = 3 marks

When milling, you will use the tool shown in Figure 6 to measure the length of the slots.

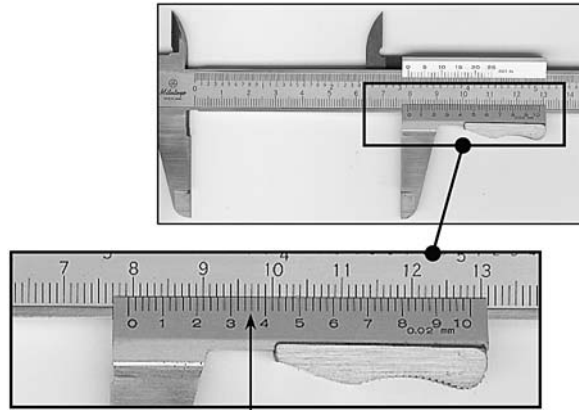


Figure 6

- l. i.** What is the name of the measuring tool shown?

- ii.** What is the reading on the measuring tool?

1 + 1 = 2 marks

After milling, you will need to file a 1 mm chamfer around the outside.

- m.** Which of the files shown below will be most suitable for this?

A. warding file



B. flat file



C. square file



D. round file



E. needle file



1 mark

Question 2

Figure 7 shows a drawing of a spindle.

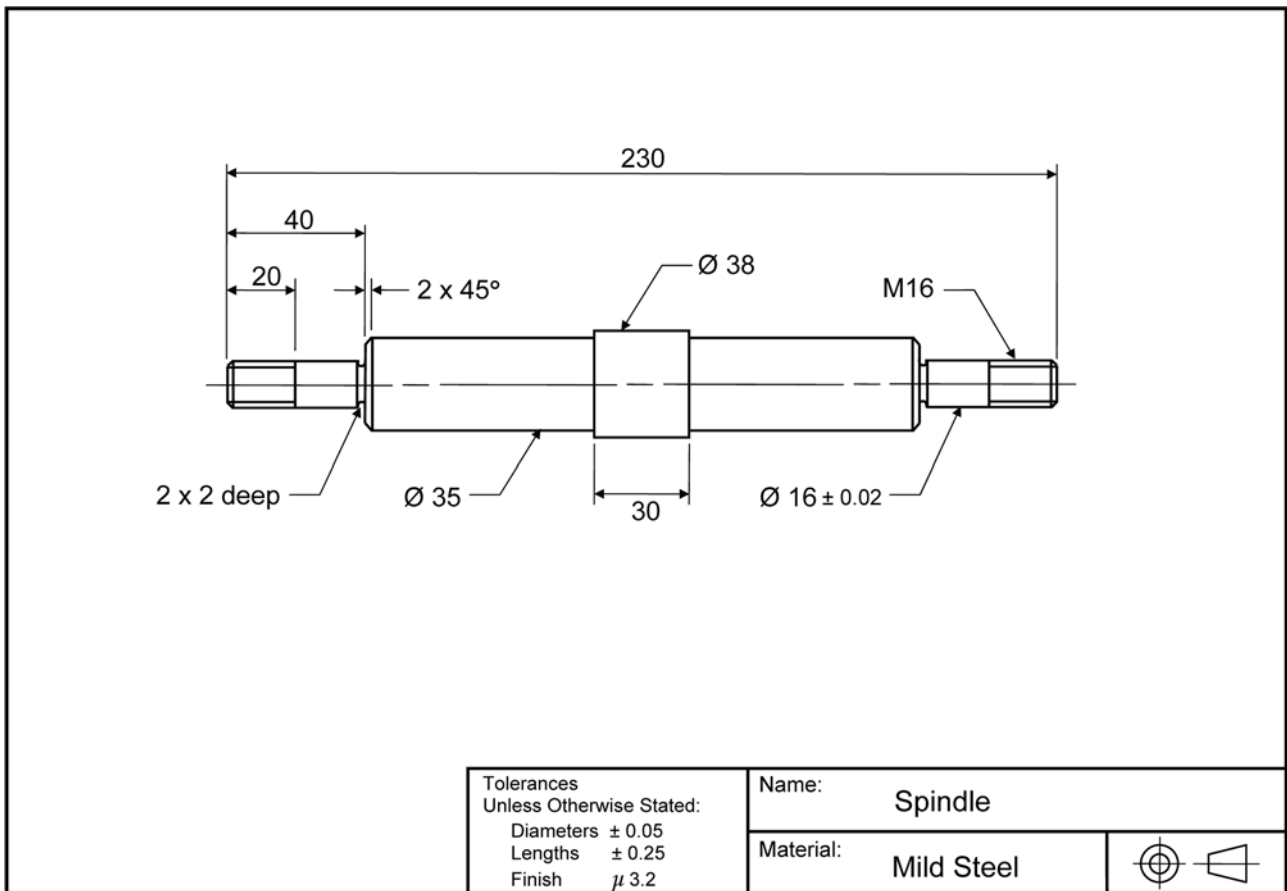
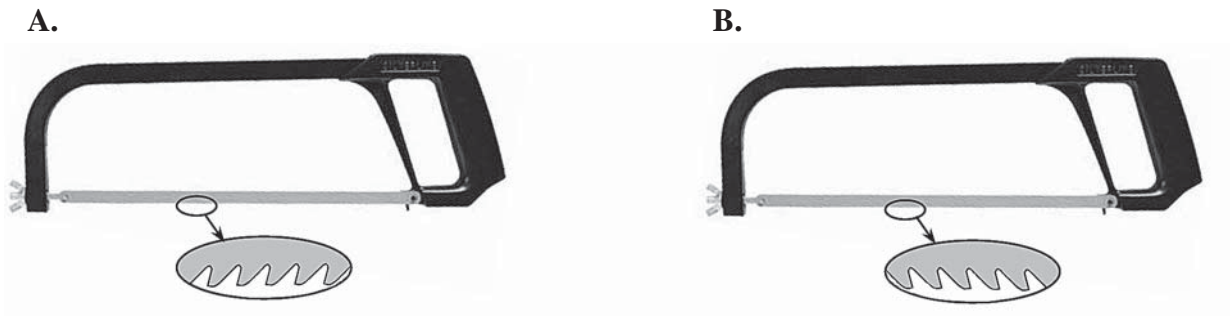


Figure 7

The material for the spindle will be cut from a 1 metre long bar using a hacksaw.

a. Which sketch shows the hacksaw blade correctly fitted? Give a reason for your answer.



1 mark

b. What length should the material be cut for the spindle?

1 mark

Figure 8 shows the material to make the spindle. In Figure 8 the material is **incorrectly** held in a vice for hacksawing.

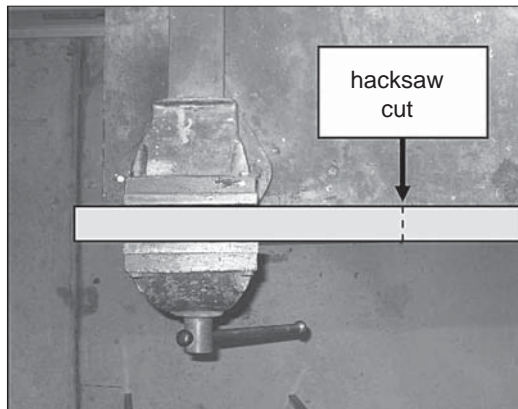


Figure 8

c. i. Explain what is wrong with the way the material is being held in the vice.

ii. What could happen if the material is hacksawed as shown in **Figure 8**?

1 + 1 = 2 marks

Figure 9 shows the spindle set up in the lathe to start turning the diameters.

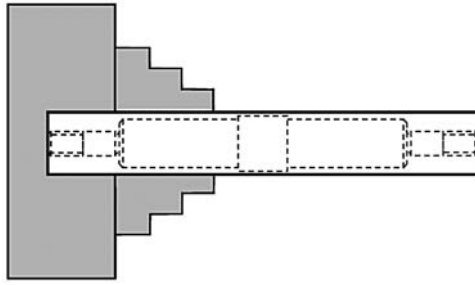


Figure 9

- d. What should be done to the set up to keep the spindle running true and more rigid when being turned?
 (You may describe below or sketch your answer on Figure 9 above.)

1 mark

- e. Calculate the rpm to turn the 16 mm diameter using a cutting speed of 35 m/min ($\text{rpm} = \frac{320v}{d}$).
 Show all working out.

2 marks

- f. For the same cutting speed, the larger the diameter, the faster the rpm should be set on the lathe.
A. true
B. false

1 mark

- g.** Explain what is wrong with the way the cutting tool has been set up in Figure 10.

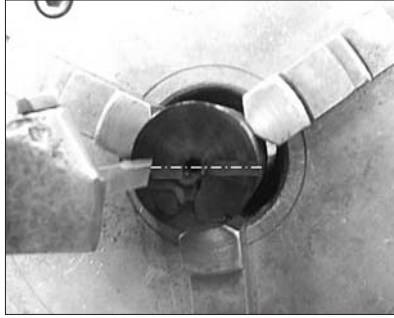


Figure 10

1 mark

- h.** Describe how the $2 \times 45^\circ$ chamfers are made.

2 marks

A micrometer will be used to accurately measure the diameters of the spindle.

- i.** Give two examples of what could cause inaccurate readings when using a micrometer.

2 marks

The die shown in Figure 11 will be used to cut the M16 threads on the spindle.



Figure 11

- j. i. Figure 12 shows the die ready to cut the thread. Complete the sketch to show how the spindle should be prepared before using the die.

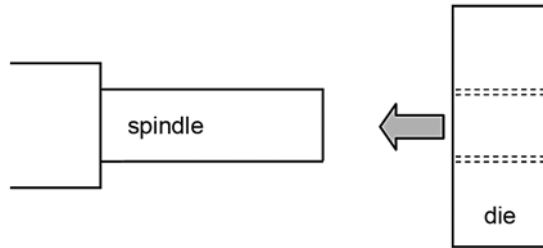


Figure 12

- ii. Does it matter which way the die is facing when cutting the thread? (Explain your answer.)

1 + 2 = 3 marks

Figure 13 shows a nut that will be used on the ends of the spindle.

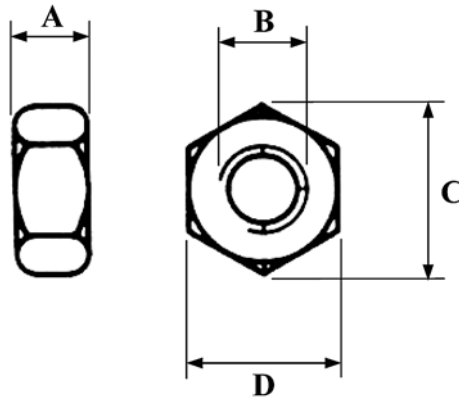


Figure 13

- k. Which letter indicates the spanner size required for the nut?

1 mark

Total 40 marks

