



Victorian Certificate of Education 2010

SUPERVISOR TO ATTACH PROCESSING LABEL HERE

STUDENT NUMBER

Figures

Words

Letter

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VCE VET ENGINEERING STUDIES CERTIFICATE II

Written examination

Wednesday 17 November 2010

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	2	2	15
C	1	1	15
D	8	8	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 35 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

How many kilowatts is equal to 4000 watts?

- A. 4
- B. 40
- C. 400
- D. 40000

Question 2

Which one of the following materials is a good insulator of current?

- A. PVC
- B. carbon
- C. bronze
- D. nichrome

Use Figure 1 to answer Questions 3 and 4.

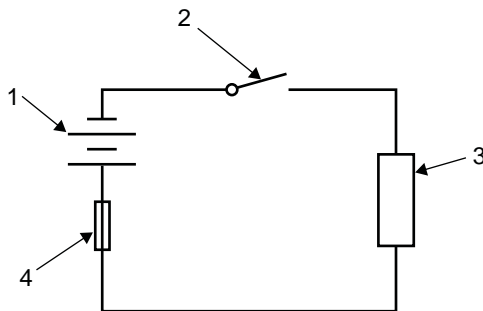


Figure 1

Question 3

In Figure 1, the symbol labelled '2' represents a

- A. load.
- B. switch.
- C. power source.
- D. circuit protection device.

Question 4

Which number in Figure 1 shows the load?

- A. 1
- B. 2
- C. 3
- D. 4

Question 5

In a simple circuit, one of the main purposes of the circuit protection device is to

- A. disconnect the load when it is not operating.
- B. provide a safe voltage for the circuit.
- C. prevent over-loading of the circuit.
- D. consume electricity efficiently.

Question 6

A 240-volt circuit has 8 amps flowing through it.

The resistance of the circuit is

- A. 24 ohms.
- B. 30 ohms.
- C. 36 ohms.
- D. 42 ohms.

Question 7

A parallel circuit is different to a series circuit in that it has

- A. fewer current paths.
- B. a single current path.
- C. more than one current path.
- D. no current path.

Question 8

Which of the following is a device that uses the magnetic effect of an electric current?

- A. LED
- B. light globe
- C. electric motor
- D. electric strip heater

Question 9

Fuses operate by using the _____ effect of an electric current.

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

Question 10

In Figure 2, the ammeter shown is used to measure the circuit current.

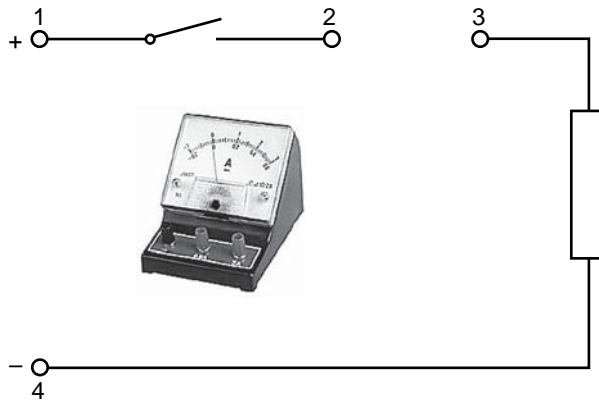


Figure 2

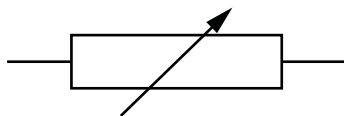
For the ammeter to read correctly, the positive and negative leads of the ammeter should be connected across

- A. 1 and 4 and leave the switch open.
- B. 2 and 3 and leave the switch open.
- C. 1 and 4 and close the switch.
- D. 2 and 3 and close the switch.

Question 11

Resistance is the property of a material that _____ current flow.

- A. assists
- B. opposes
- C. increases
- D. doubles

Question 12

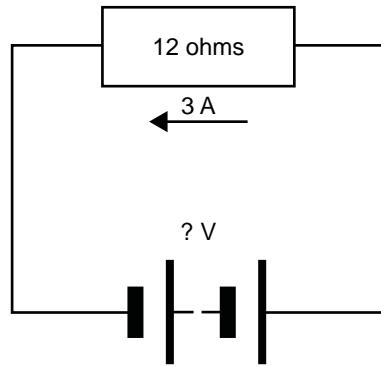
Which electrical component is represented by the symbol shown above?

- A. fixed resistor
- B. power resistor
- C. carbon resistor
- D. variable resistor

Question 13

What are the upper and lower values of a 15 ohm resistor with a 10% tolerance?

- A. 10 to 20 ohms
- B. 13.5 to 16.5 ohms
- C. 14 to 16 ohms
- D. 14.5 to 15.5 ohms

Question 14**Figure 3**

What is the supply voltage of the circuit shown in Figure 3?

- A. 12 V
- B. 24 V
- C. 36 V
- D. 48 V

Question 15

When measuring the value of an unknown low voltage supply, always start with the voltmeter set to the _____ range.

- A. lowest
- B. continuity
- C. resistance
- D. highest

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 clamp.

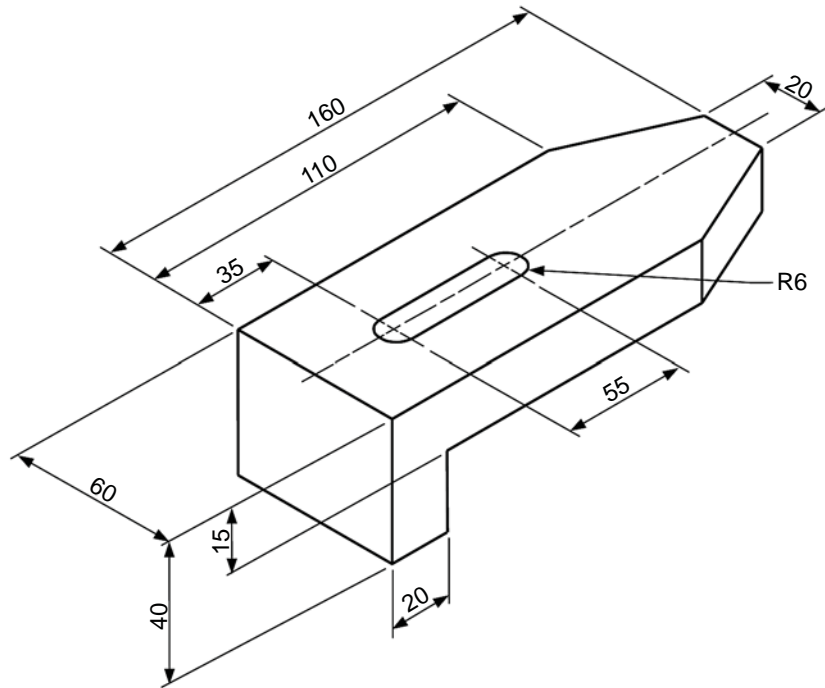
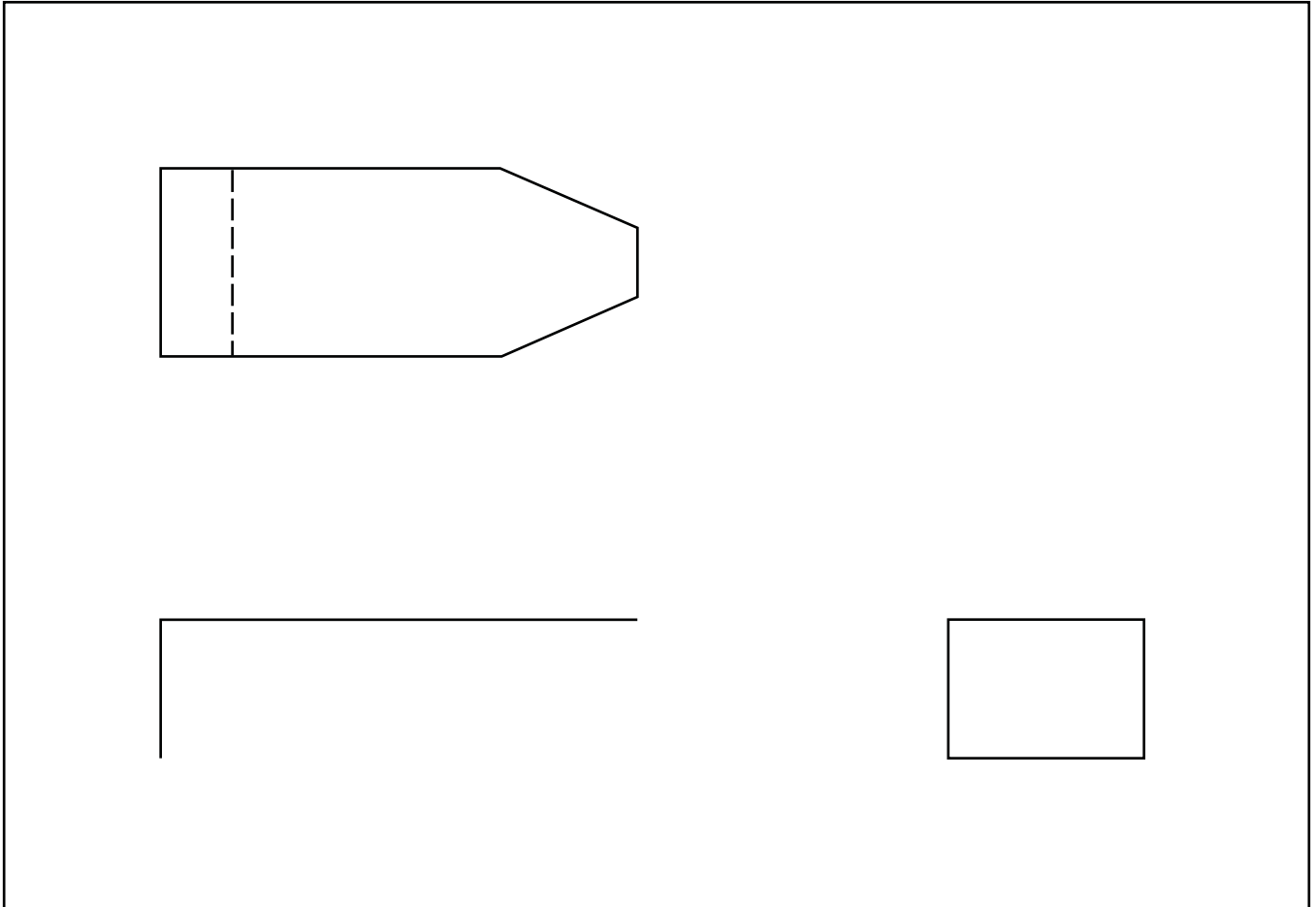


Figure 1

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

- Use conventional drawing systems.
- Show views in third-angle projection.
- Show all hidden detail.
- Dimension the **position** and **size** of the **slot only**. (Do not dimension the clamp itself.)



4 marks

Question 2

Figure 2 shows an assembly drawing of a parallel clamp.

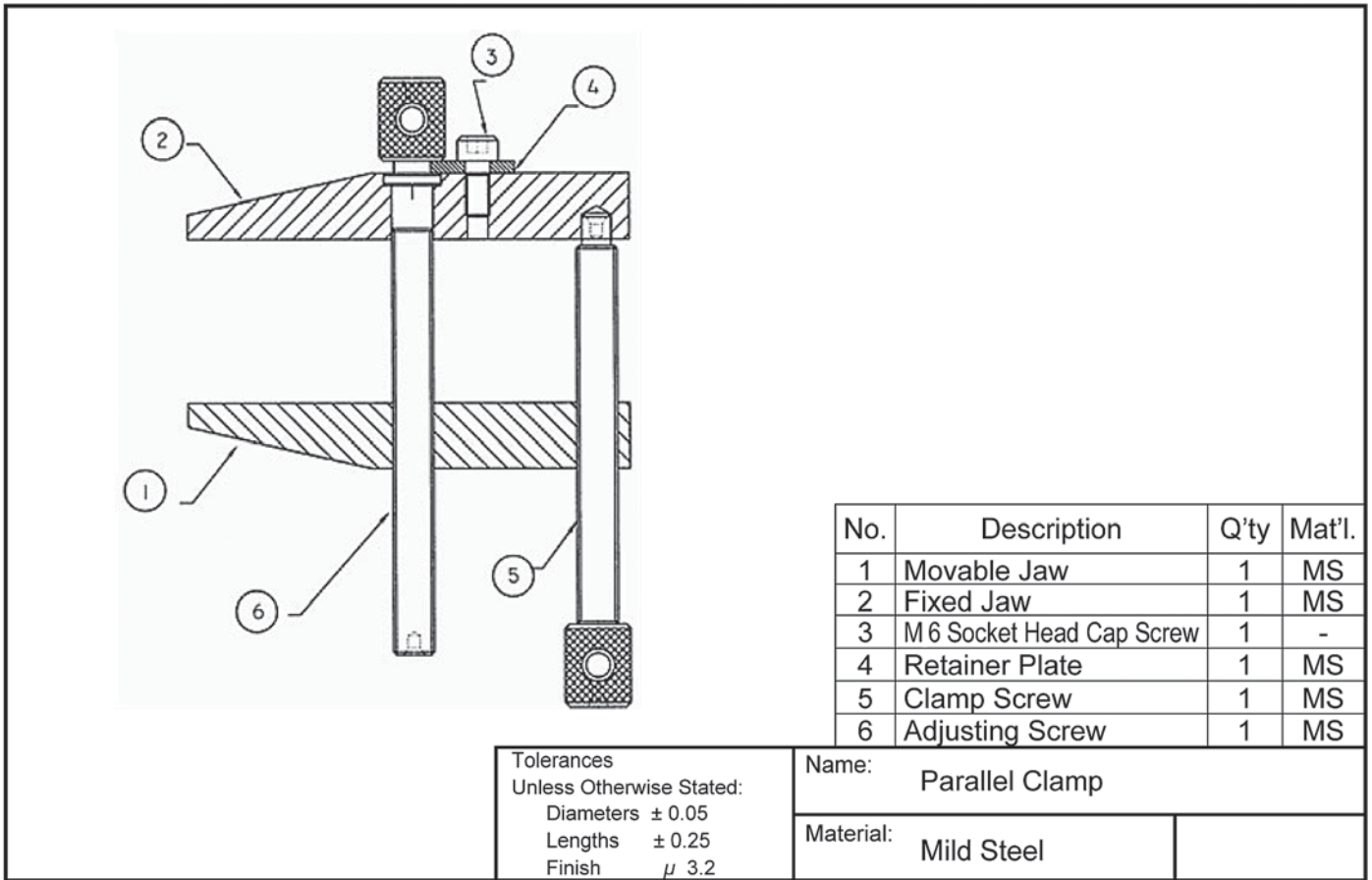


Figure 2

Figure 3 shows a detailed drawing of the fixed jaw from the parallel clamp.

Question 2 relates to the drawing shown in Figure 3.

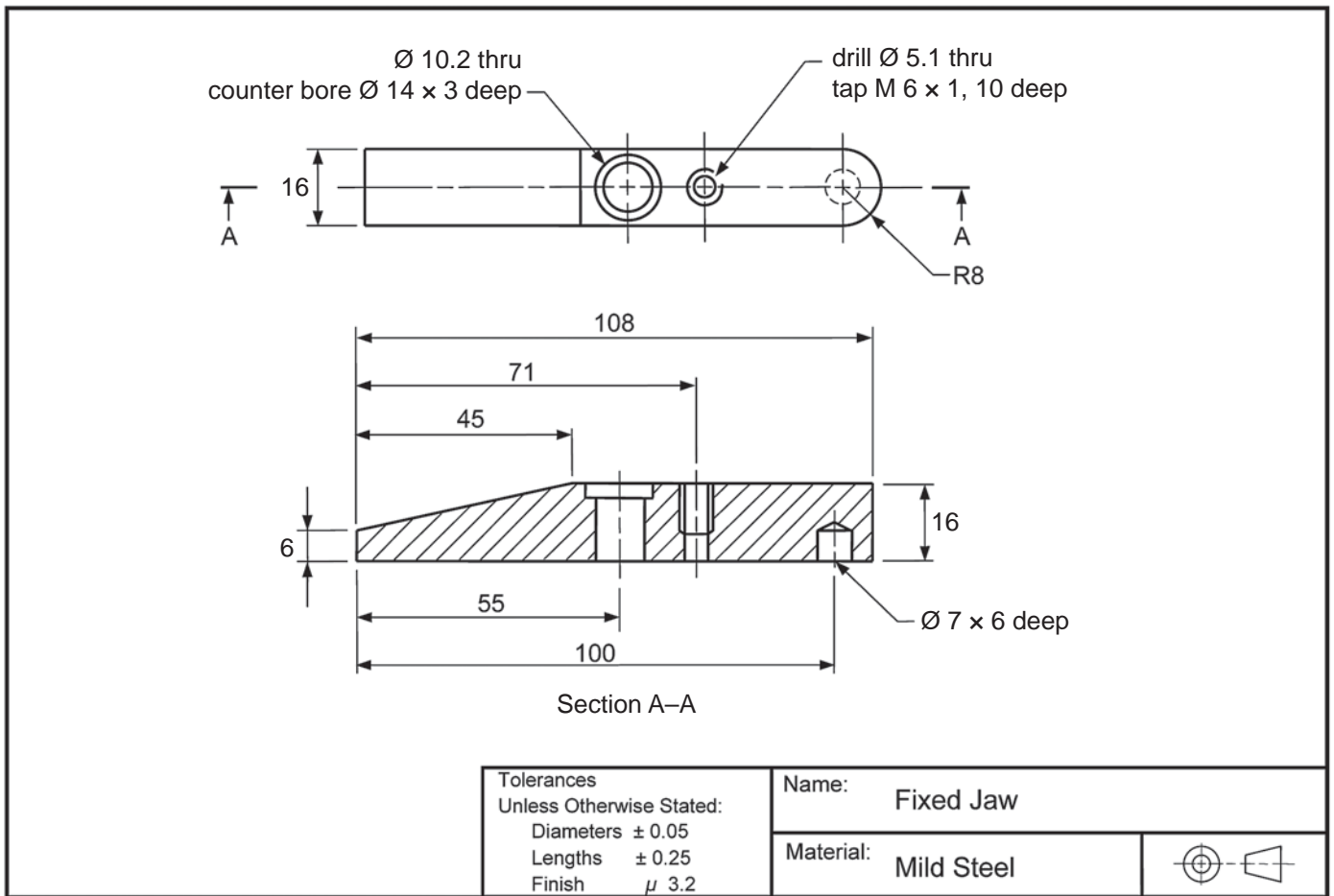


Figure 3

- a. What does R8 mean?

1 mark

The side view of the jaw in Figure 3 shows it drawn with 45° lines.

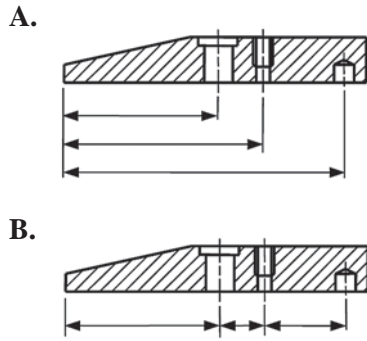
- b. What do these lines indicate?

1 mark

- c. How deep is the counter-bored hole?

1 mark

The positions of the holes in the fixed jaw have been dimensioned from one end as shown in sketch A. Sketch B shows incorrect dimensioning.



- d. Explain why using dimensioning as shown in sketch B could lead to inaccuracies in the positioning of the holes.

2 marks

- e. What is the tolerance of the diameters in Figure 3?

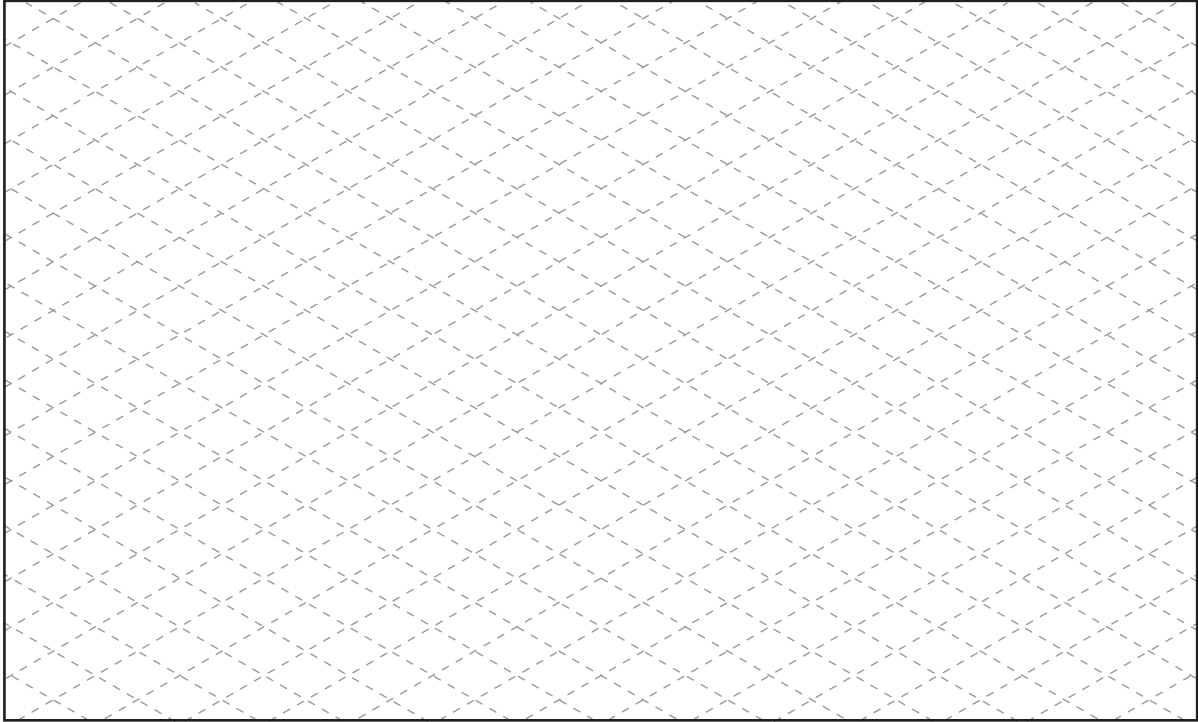
1 mark



- f. What does this symbol mean?

1 mark

- g. In the space provided below, sketch an isometric view of the fixed jaw shown in Figure 3.
(Do not dimension the drawing.)



4 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).

Question 1

Figure 1 shows a detailed drawing of the retainer plate from the parallel clamp in Section B.

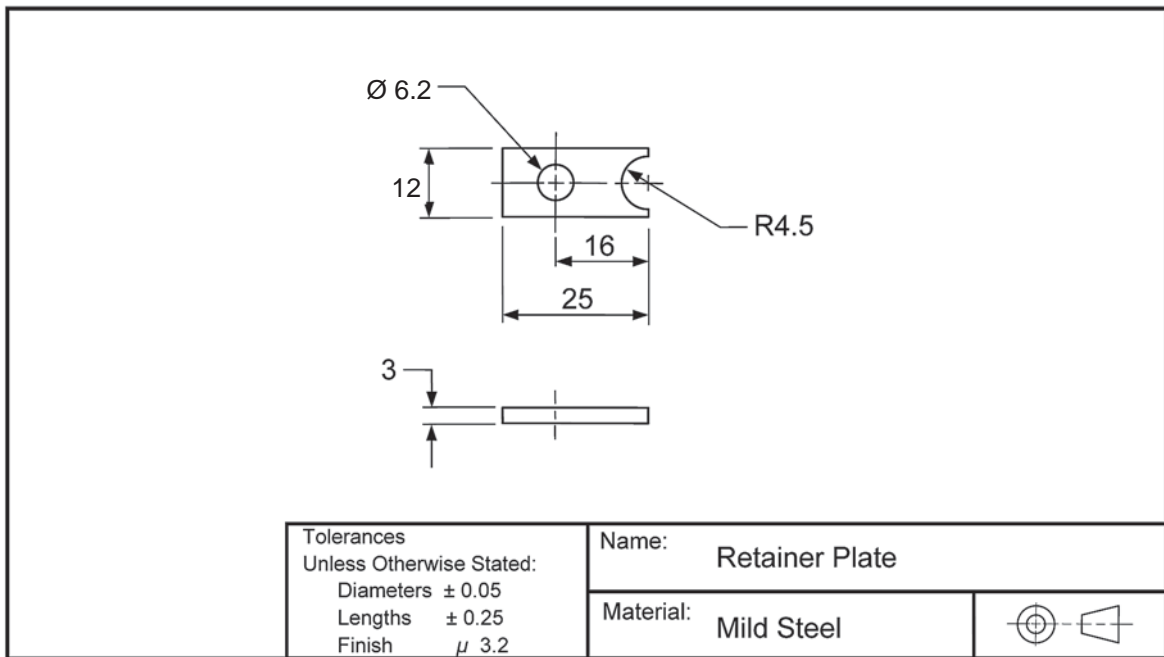
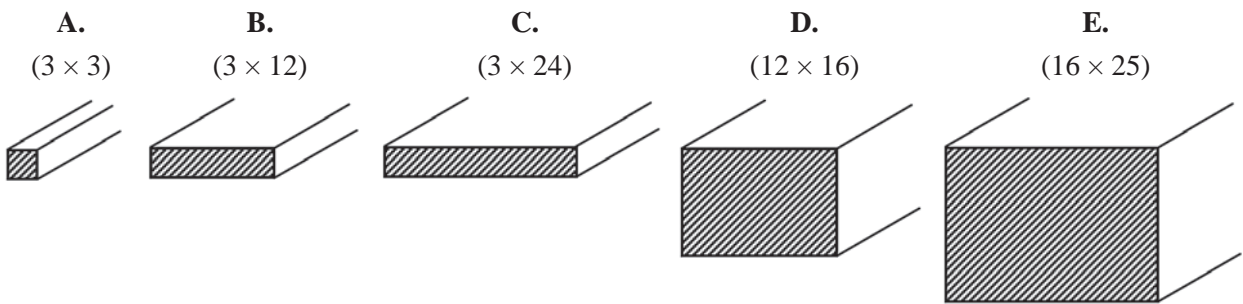


Figure 1

a. Choose the material cross section that is best suited for making the retainer plate.



1 mark

b. Describe how the 'R4.5' at the end of the retainer plate can be accurately made.

2 marks

Figure 2 shows a detailed drawing of the clamp screw from the parallel clamp in Section B.

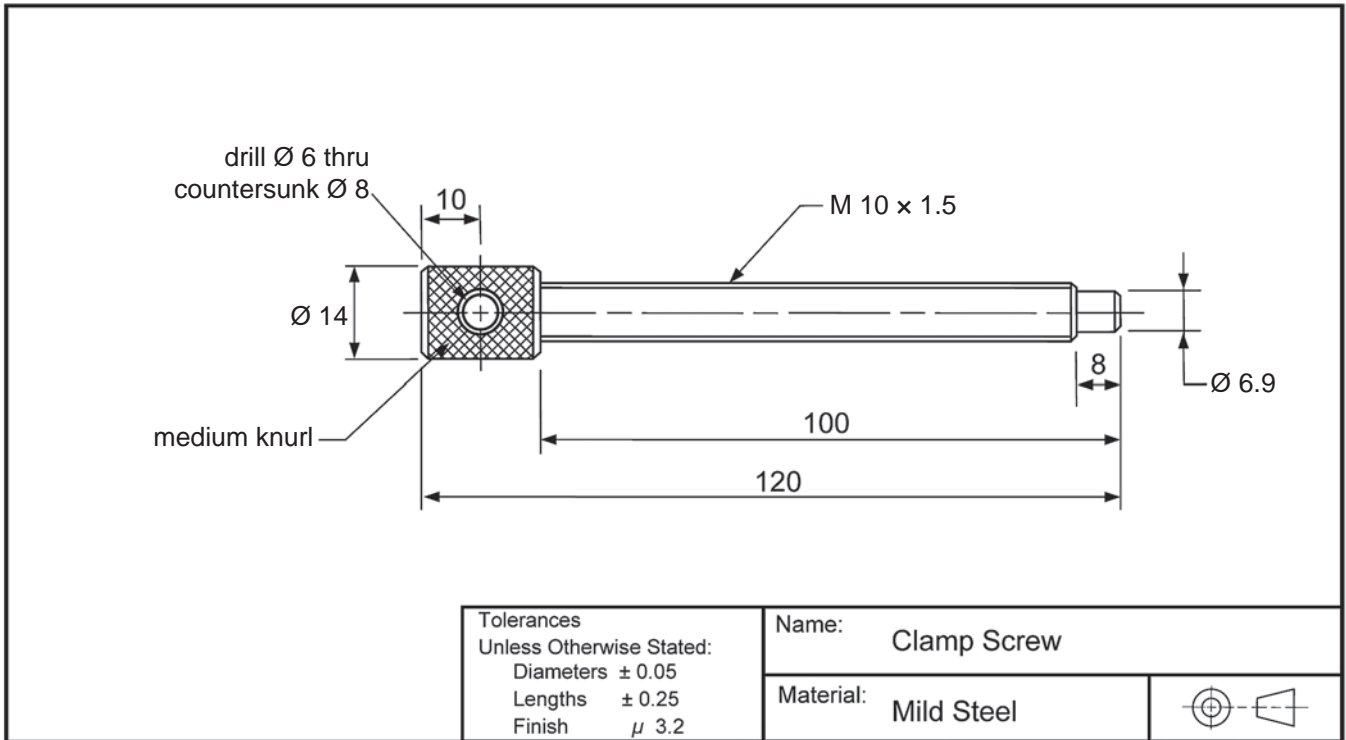


Figure 2

c. List six tools that are required to make the clamp screw. (Do not include measuring tools.)

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

3 marks

d. What is the purpose of the $\varnothing 6$ hole that is drilled through the head of the clamp screw?

1 mark

e. Describe how the clamp screw in Figure 2 would be held in the lathe when machining the major diameter of the thread.

2 marks

Figure 3 shows the holes that are required in the fixed jaw of the parallel clamp.

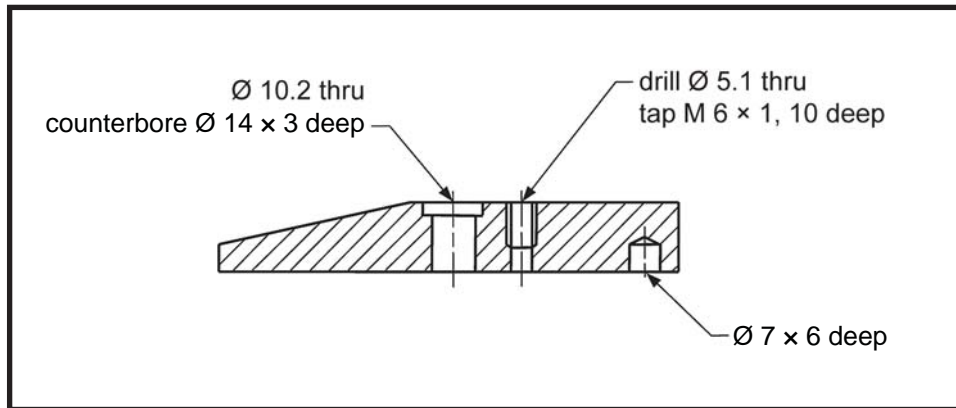


Figure 3

f. Complete the operations, in sequence, for the **holes** that are required in the fixed jaw.

Sequence	Operation
1	drill $\text{\O} 10.2$ thru
2	
3	
4	tap M 6 \times 10 deep
5	

3 marks

The taper on the parallel clamp jaw has been marked out and will be held in the machine vice for milling, as shown in Figure 4.

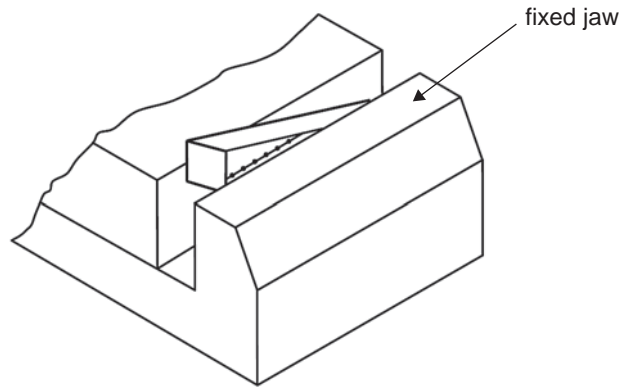


Figure 4

- g. Describe how the marked out line can be set approximately 2 mm above and parallel to the fixed jaw of the machine vice.

2 marks

The retainer plate is secured to the fixed jaw using a socket head cap screw as shown in Figure 5.

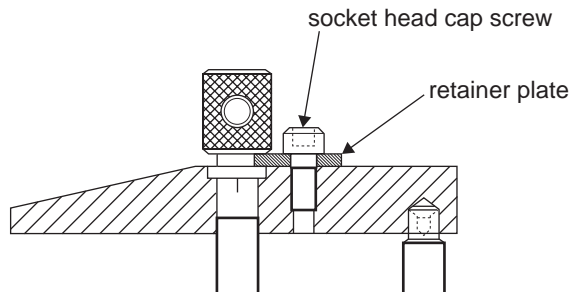


Figure 5

This was found to interfere with a person's fingers when the clamp was adjusted.

- h. Suggest an alternative fastener which will overcome this problem.

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

Figure 1 shows a stack of steel coils.

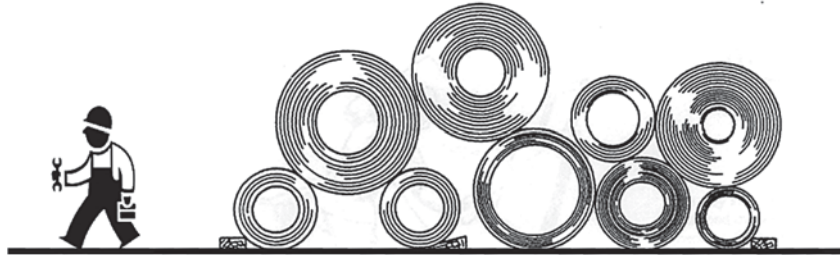


Figure 1

Identify **two** problems or dangers that could arise from stacking the steel coils in this way.

2 marks

A tradesperson is installing air lines along a 6 m high roof in a new factory. A forklift is available and there is a licensed co-worker to operate the forklift.

Question 2

Select the correct method to raise the tradesperson safely to the working height.

- A.
stand on forks
- B.
stand on a pallet
- C.
stand in a safety cage
- D.
stand in a large timber box



1 mark

Question 3

A.



B.



Which of the photos shows the correct method of lifting a box? (Explain your answer.)

1 mark

Question 4

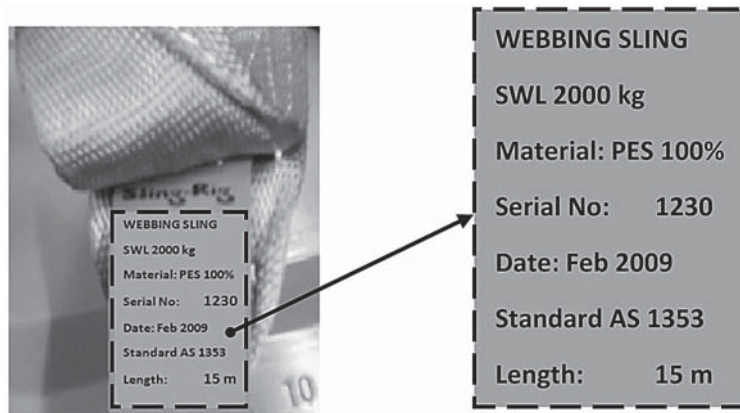


Figure 2

What is the maximum load permitted to be lifted using the sling shown in Figure 2?

1 mark

Question 5



Figure 3

Why is the sling shown in Figure 3 unsafe to use?

1 mark

Question 6

Figure 4 shows a person who is pushing a loaded trolley along an aisle way.



Figure 4

Identify two potential safety hazards that are associated with this task.

1. _____

2. _____

2 marks

Question 7

The first step before lifting an object is to **size up the load**. You then decide that it is too heavy to shift the load by yourself.

List two ways for you to safely lift/shift the load.

1. _____

2. _____

2 marks

CONTINUES OVER PAGE

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

MSDS – Material Safety Data Sheet

Product Name: Light Cutting Oil



1. HAZARDS IDENTIFICATION

Hazardous substance. Dangerous goods.

2. FIRST AID MEASURES

- Eye contact: Flush eyes with clean water for 15 minutes while lifting eyelids and get prompt medical attention.
- Skin contact: Wash with soap and water thoroughly. If adverse effects persist get prompt medical attention. Launder contaminated clothing before reuse.
- Inhalation: Remove to fresh air. If breathing becomes difficult get prompt medical attention.
- Ingestion: DO NOT INDUCE VOMITING! Call Poisons Control Centre, physician or hospital emergency room immediately.

3. FIREFIGHTING METHODS

- Flash point: 148° C
- Fire extinguishing media: water fog, foam, carbon dioxide, dry chemical.
- Special firefighting procedure: Wear self-contained positive pressure breathing apparatus and protective clothes. Cool containers with a water fog. Do not use forced water stream as this could cause the fire to spread.

4. STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Persons not wearing protective equipment should be excluded from area of spill until clean up has been completed. Dike or contain spill and absorb with inert materials (sand, sawdust, absorbent sweeping compounds, rags, etc.). Place contaminated material into an approved chemical waste container. Prevent run-off to sewers, streams or other bodies of water. If run-off occurs, notify proper authorities as required, that a spill has occurred.

5. HANDLING AND STORAGE

Precautions to be taken:

- Handling: Use with adequate ventilation and proper protective equipment.
- Do not use or store near fire, sparks or flame. Do not puncture or incinerate container. Exposure to temperatures above 50° C may cause container to vent, rupture or burst.

Other precautions:

- Keep container closed tightly when not in use.
- Store in a cool place away from oxidising agents.

6. DISPOSAL CONSIDERATION

Waste disposal:

- Do not allow into any sewers, drains or waterways.
- Recover or recycle if possible. Any disposal must be in accordance with applicable State, Territory and/or Local Government Regulations.

Container disposal:

Do not pressurise, cut, heat or weld containers. Empty product containers may contain product residue. Do not reuse empty containers without commercial cleaning or reconditioning.

Question 8 relates to the MSDS shown on the opposite page.

Question 8

- a. What might happen to the light cutting oil container if the temperature rises above 50° C?

1 mark

- b. What should you do if you accidentally get light cutting oil in your eyes?

1 mark

- c. What is the minimum temperature at which the light cutting oil will ignite?

- A. 50° C
- B. 125° C
- C. 148° C
- D. 188° C
- E. 235° C

1 mark

- d. A spill of light cutting oil has spread across a storeroom floor and ignited.
What could happen if a 'forced water stream' is used to try and put the fire out?

1 mark

- e. List two inert materials which can be used to clean up spillage of light cutting oil.

1. _____

2. _____

1 mark

Total 15 marks

**END OF SECTION D
TURN OVER**

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).

Questions 1 and 2 relate to the manufacture of a G clamp.

Figure 1 shows an assembly drawing of a G clamp.

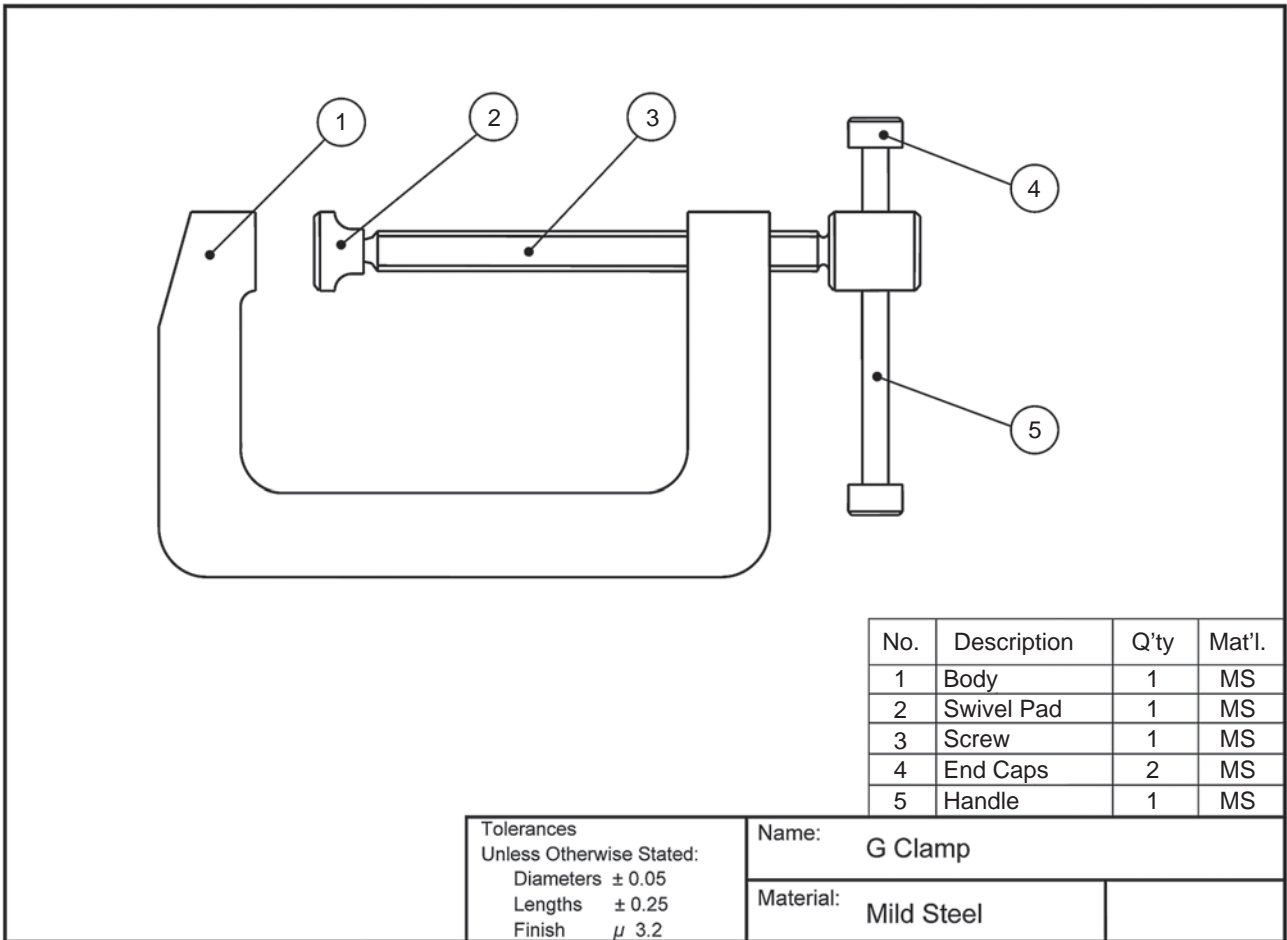


Figure 1

A detailed drawing of the G clamp screw is shown in Figure 2.

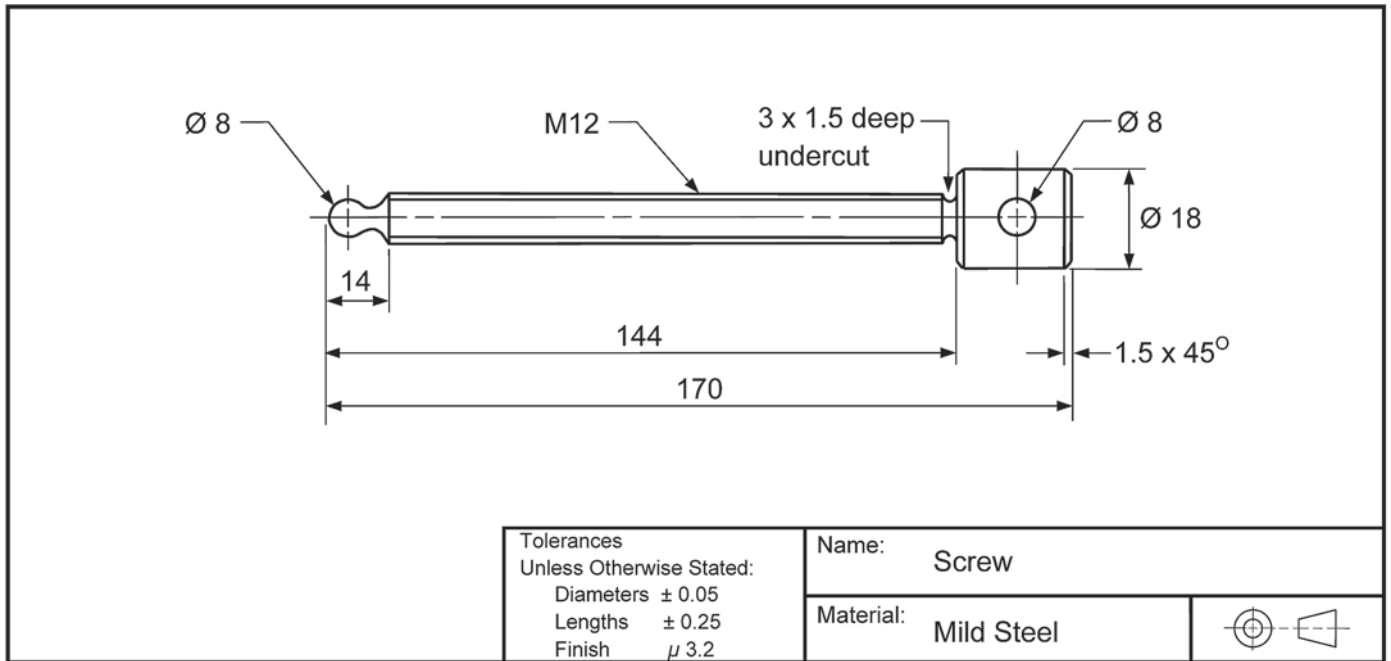


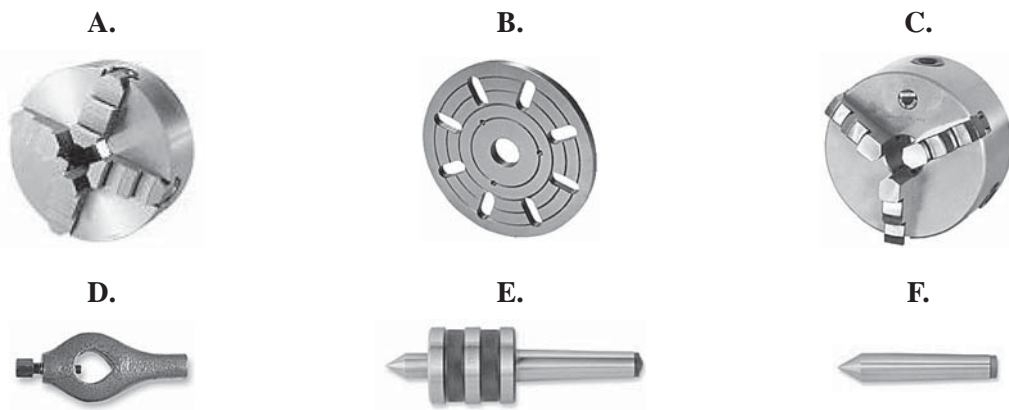
Figure 2

Question 1 relates to the manufacture of the screw shown in Figure 2.

Question 1

The screw will be held in the lathe using a 3 jaw chuck and supported by a live centre.

a. Choose the two lathe parts you will need for this setup.



2 marks

b. List two ways of setting the lathe cutting tool on centre height.

1. _____
2. _____

2 marks

c. What will happen if the lathe cutting tool is set above centre height?

_____ 1 mark

d. What is the main purpose of grinding a nose radius on lathe cutting tools?

_____ 1 mark

The major diameter for the thread is being turned to size. The tool shown in Figure 3 is being used to measure the diameter.



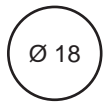
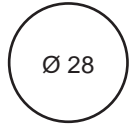
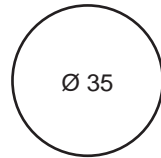


Figure 3

e. What is the name of the measuring tool shown in Figure 3?

_____ 1 mark

f. Tick (✓) **all** the diameters which can be measured using the measuring tool shown in Figure 3.

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

1 mark

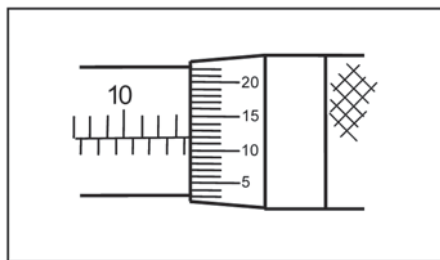


Figure 4

g. What is the reading on the measuring tool shown in Figure 4?

_____ 1 mark

The cross-slide is used to move the lathe cutting tool in for the final cut.
Figure 5 shows a picture of a lathe.

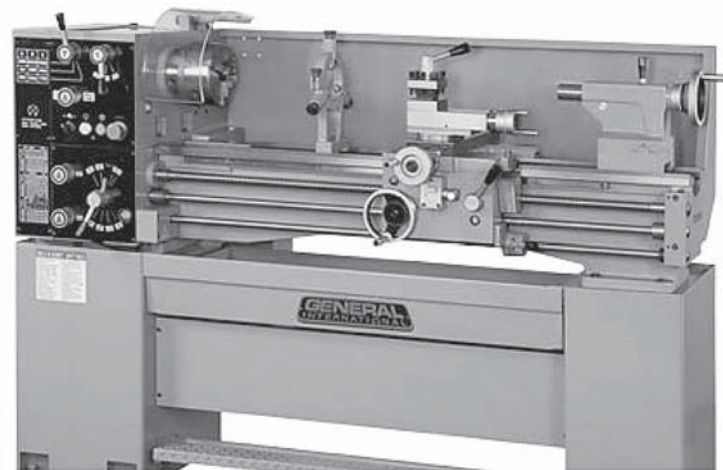
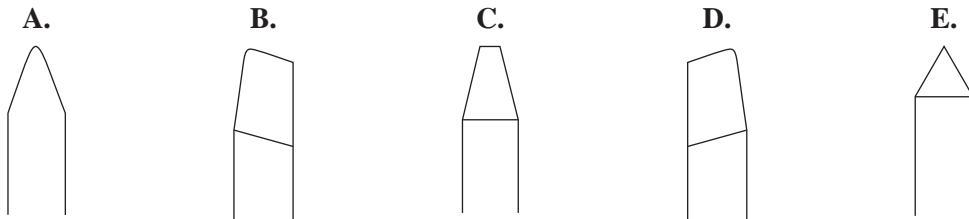


Figure 5

- h.** In Figure 5 indicate, with an arrow, the part which winds the cross-slide in.

1 mark

- i.** Which tool is best suited to machine the undercut in the screw?



1 mark

ISO METRIC COARSE THREADS							
NOTE:—All dimensions in mms							
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 6

- j. Use the thread chart shown in Figure 6 to determine the pitch of the thread on the screw shown in Figure 2.

1 mark

A detailed drawing of the G clamp body is shown in Figure 7.

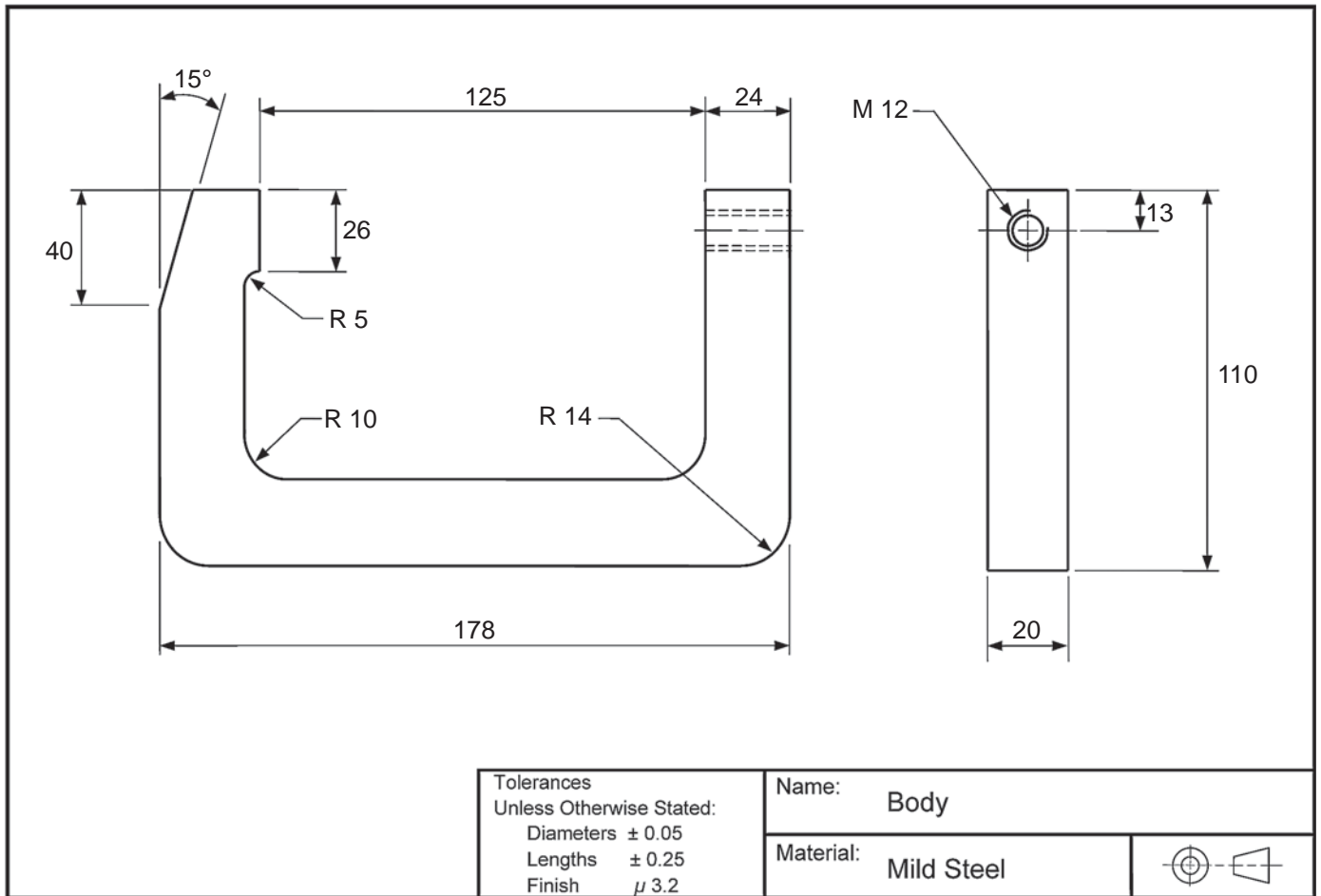


Figure 7

Question 2 relates to the G clamp body shown in Figure 7.

Question 2

The G clamp body will be marked out on the material as shown in Figure 8.

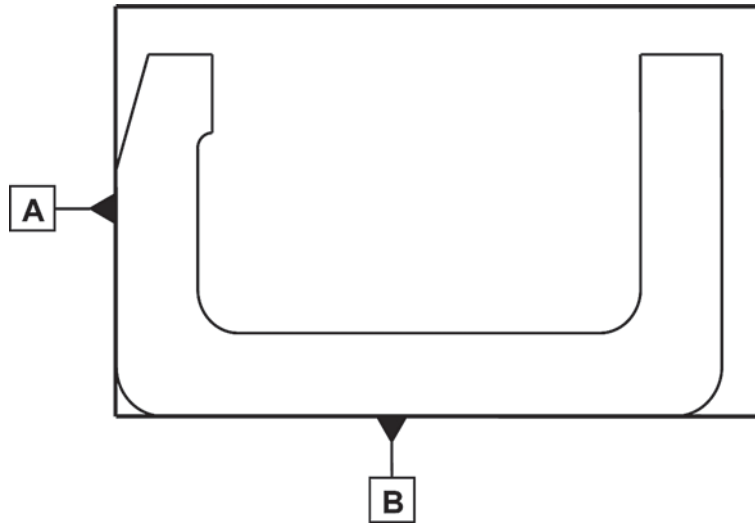


Figure 8

Before marking out, the faces A and B are machined so that they are square to each other.

- a. What is the name given to faces A and B in Figure 8?

1 mark

- b. The tool shown in Figure 9 will be used to mark out the G clamp body.



Figure 9

- i. What is the name of the tool shown in Figure 9?

- ii. Which part of the G clamp body will be marked out using the tool shown in Figure 9?

1 + 1 = 2 marks

c. The outline will be lightly punched with a prick punch.

i. What is the name of this process?

ii. What is the reason for doing this?

1 + 1 = 2 marks

d. A bandsaw will be used to cut out the inside of the body (shown hatched in Figure 10).

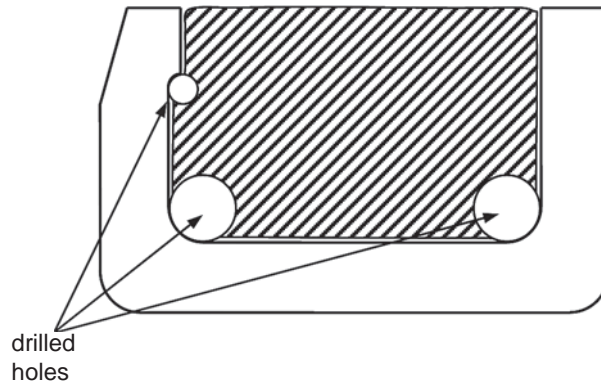


Figure 10

i. Why have holes been drilled in the corners before bandsawing?

Figure 11 shows the bandsaw being used.

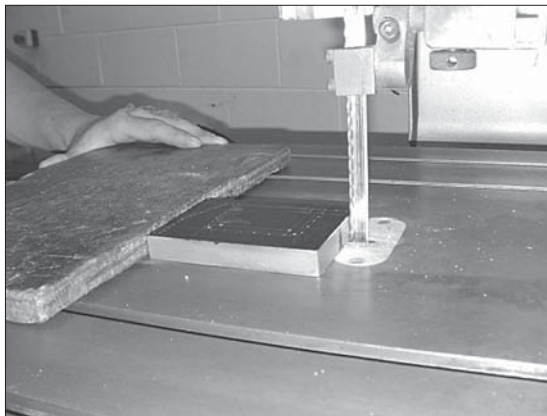


Figure 11

ii. What is the main reason for using the timber pusher?

The bandsaw in Figure 11 has been set up incorrectly.

iii. Describe what is wrong with this bandsaw setup.

1 + 1 + 1 = 3 marks

- e. An 18 mm diameter end mill will be used to mill the inside of the G clamp body.
Calculate the RPM of the end mill, using a cutting speed of 35 m/min. (Show all working.)
($RPM = 320 v/d$)

2 marks

- f. Figure 12 shows the G clamp body held for machining the inside shape.

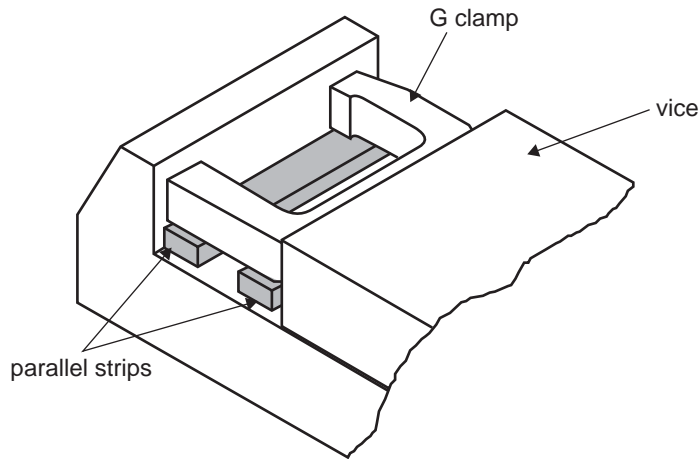


Figure 12

The inside shape of the G clamp body **cannot** be correctly machined using this setup. Explain why.

2 marks

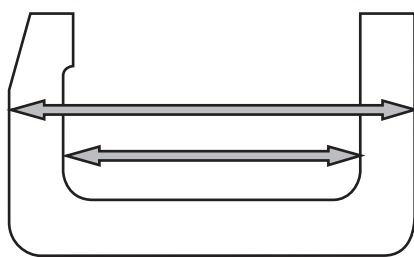


Figure 13

- g. What is the name of the measuring tool that can be used to accurately measure the inside and outside of the body as shown in Figure 13?

1 mark

The hole for the M12 thread has been marked on the G clamp body and is ready for drilling as shown in Figure 14.

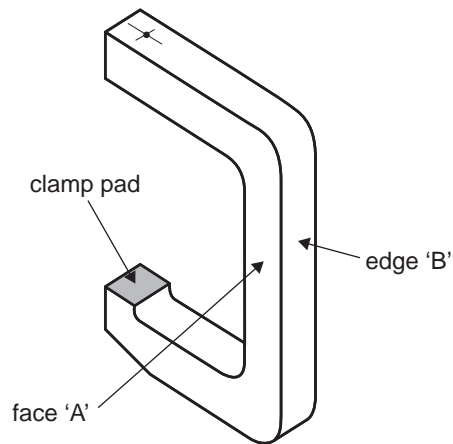


Figure 14

The hole needs to be drilled square to the body so that the screw lines up central with the clamp pad.

- h.** Describe how face 'A' and edge 'B' are **held and set up** to ensure that the hole is drilled square to the body.

2 marks

- i.** If the hole is drilled square to the body, the thread will automatically be tapped square because it will follow the hole.

- A.** True
B. False

1 mark

Figure 15 shows a sheet-metal toolbox.

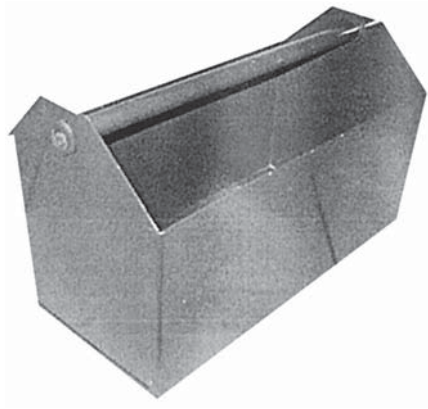


Figure 15

Question 3 relates to the manufacture of the toolbox.

Question 3

The following list shows different thicknesses of mild steel that are available to fabricate the toolbox.

- a. Select the most suitable material thickness for the toolbox.
 - A. 0.5 mm
 - B. 1.5 mm
 - C. 3.0 mm
 - D. 4.5 mm
 - E. 5.0 mm

1 mark

- b. List **two** advantages of fabricating the toolbox from aluminium instead of mild steel.

2 marks

Figure 16 shows a detailed drawing of the end of the toolbox.

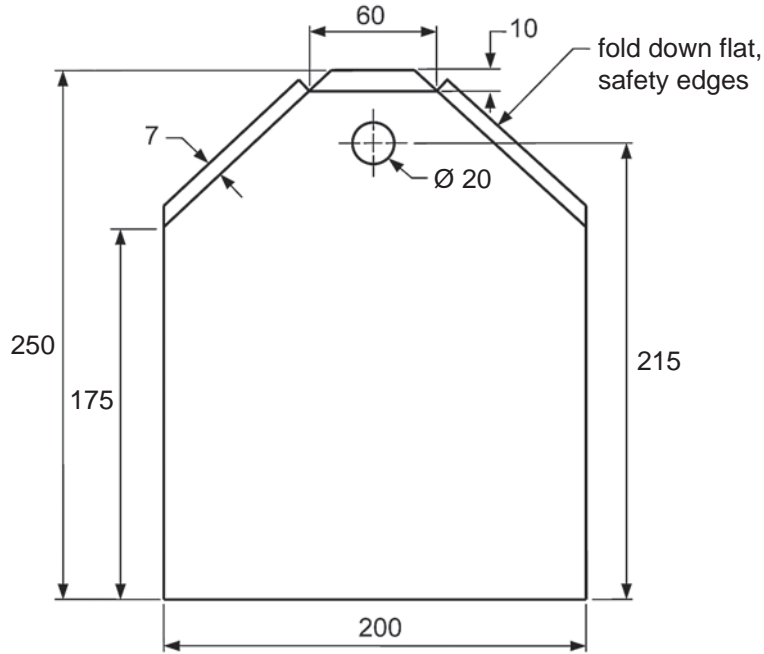


Figure 16

c. Name two tools that are required to mark out the end of the toolbox as shown in Figure 16.

1. _____
2. _____

2 marks

d. What is the purpose of the safety edges shown in Figure 16?

1 mark

e. Which tool would be most suitable for cutting the Ø 20 holes in the ends of the toolbox?

A.



B.



C.



D.



1 mark

Figure 17 shows a detailed drawing of the base of the toolbox.

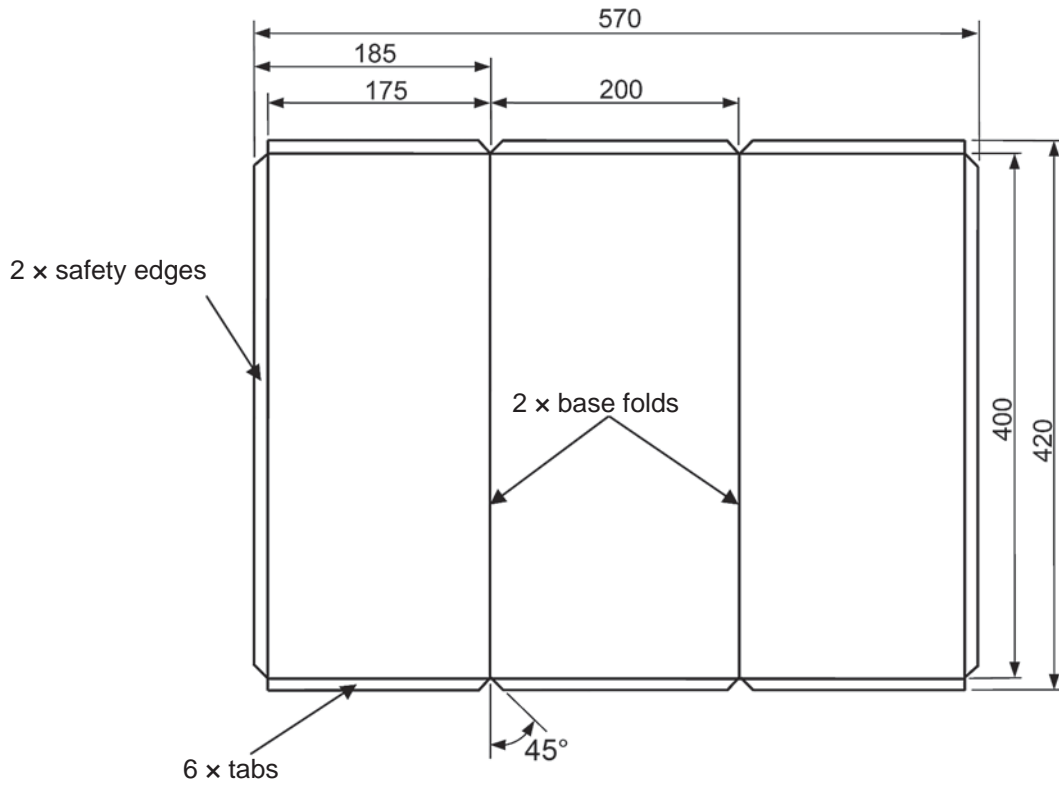


Figure 17

f. What is the purpose of the 45° notches on the ends of the tabs?

1 mark

Figure 17 shows three types of edges which need to be folded. They are

- the two base folds
- the two safety edges
- the six tabs.

g. List the **correct sequence** for folding these edges.

Firstly fold these edges _____

Secondly fold these edges _____

Thirdly fold these edges _____

2 marks

After folding, the base and the ends of the toolbox need to be attached together.

h. List two different ways that the mild steel base and the ends can be attached.

1. _____

2. _____

2 marks

Total 40 marks