VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

Victorian Certificate of Education 2006

SUPERVISOR TO ATTACH PROCESSING LABEL HERE

STUDENT NUMBER

									Letter
Figures									
Words									

VCE VET ENGINEERING STUDIES CERTIFICATE III

Written examination

Wednesday 15 November 2006

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	4	4	15
C	12	12	30
D	6	6	40
			Total 100

- Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners and rulers.
- 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 21 pages with a formula sheet on page 21.
- 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 answer**s 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
Opposition to electric current is called
A. conductance.
B. amperage.
C. voltage.
D. resistance.

Question 2
A battery is **not** designed to provide a source of electrical
A. current.
B. power.
C. resistance.
D. voltage.

Question 3
Current passing through a copper conductor will cause a
A. magnetic field around the conductor.
B. chemical reaction within the conductor.
C. decrease in conductor temperature.
D. reduction in conductor resistance.

Question 4
The most suitable application for a small solar cell array would be
A. a power source for a domestic oven.
B. an Uninterruptable Power Supply (UPS) in hospitals.
C. a battery charger for use in remote areas.
D. a device for measuring high temperatures.

Question 5
An alternator converts
A. radiant energy to electrical energy.
B. chemical energy to electrical energy.
C. electrical energy to radiant energy.
D. mechanical energy to electrical energy.

Question 6

A capacitor is a device which is capable of storing an electric

A. current.
B. resistance.
C. voltage.
D. charge.

Question 7

An inductor opposes change in electrical

A. current.
B. resistance.
C. voltage.
D. displacement.

Question 8

A power resistor has 68R stamped on its body.
This indicates a resistance of

A. 0.68 Ω.
B. 6.8 Ω.
C. 68 Ω.
D. 680 Ω.

Question 9

A 2.2 k ohm resistor has tolerance of 10%.
Its acceptable resistance range is from

A. 1100 to 3300 Ω.
B. 1980 to 2420 Ω.
C. 2090 to 2310 Ω.
D. 2178 to 2222 Ω.

Question 10

A watt is the unit for electrical

A. resistance.
B. voltage.
C. current.
D. power.

Question 11

Rotation in an electric motor is caused by the

A. magnetic effect of the current.
B. chemical effect of the current.
C. heating effect of the current.
D. physiological effect of the current.

Question 12

An ammeter is always inserted

A. in series with electrical components.

B. in parallel with electrical components.

C. across the power supply.

D. across the power-consuming devices.

Question 13

The fusible element of a HRC fuse is usually made from

A. steel.

B. copper/silver.

C. nicrome.

D. lead.

Question 14

A fuse 'blows' because

A. excessive current melts a fusible element.

B. excessive current short-circuits a fusible element.

C. normal rated current melts a fusible element.

D. normal rated current short-circuits a fusible element.

Question 15

The function of a diode is to

A. prevent forward current flow.

B. prevent reverse current flow.

C. provide forward bias in a circuit.

D. provide reverse bias in a circuit.

END OF SECTION A

SECTION B – VBN 773 Produce engineering sketches and drawings

Instructions for Section B

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

Question 1

Sketch a simple shaft with a hole in one end. You **must** include and label the following line types.

- dimension line
- centre line
- hidden line

1 + 3 = 4 marks

Question 2

In the diagram below some of the drawing symbols are identified by name, the others are blank. Select the name from the list which follows and place it below the appropriate blank symbol.

- J weld
- bead
- square
- fillet

							
_____	_____	_____	vee	bevel	u	_____	plug slot

4 marks

Question 3

Below is an exploded isometric drawing of a striker unit. You are required to sketch a **fully sectioned**, **front view** assembly drawing of the parts shown below. The sketch should be from view A.

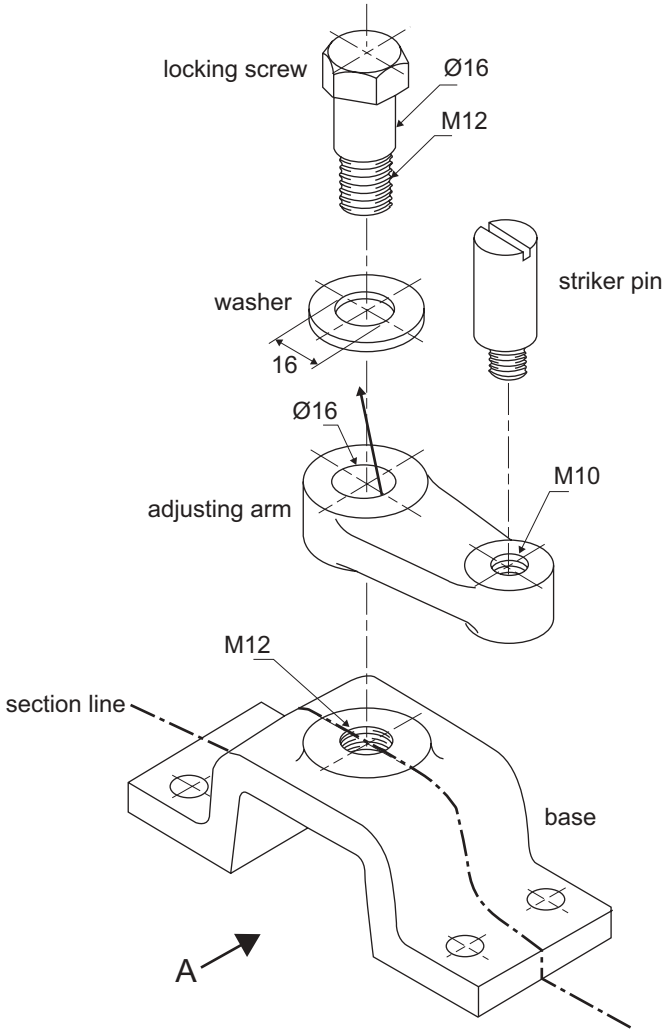
You **must** use the base as drawn on page 7 as the start of your sketch.

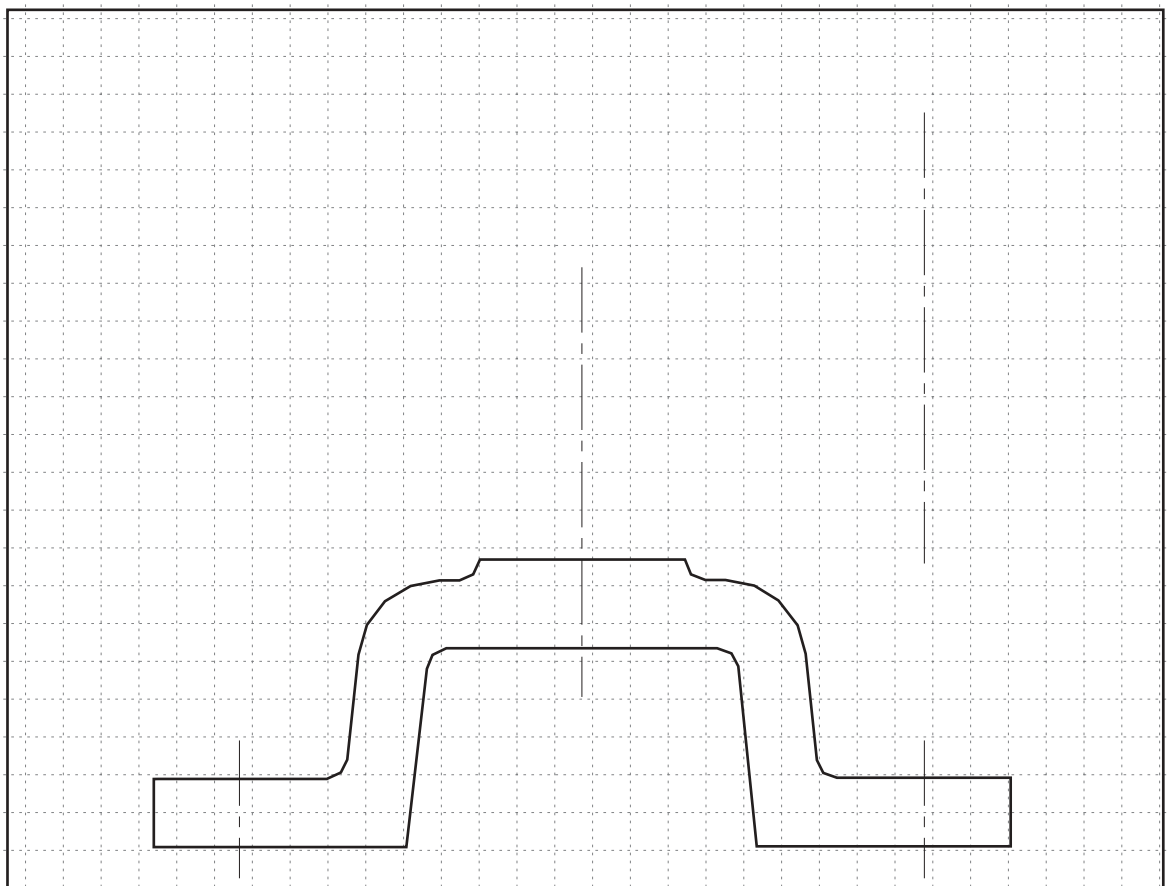
Your sketch must be as viewed from the direction labelled A on the isometric drawing.

Use conventional orthogonal drawing systems.

Draw to proportioned scaling.

Use the centre lines to assist in completing your task.





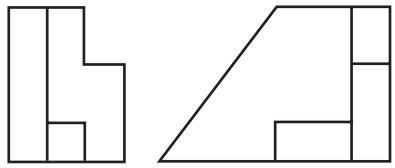
ITEM

1	BASE	1	C.I.
2	ADJUSTING ARM	1	C.I.
3	LOCKING SCREW	1	M.S.
4	STRIKER PIN	1	M.S.
5	WASHER	1	M.S.
	DESCRIPTION	QTY.	MAT'L

STRIKER UNIT

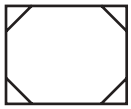
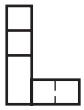
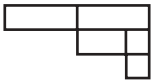
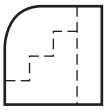
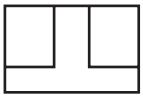
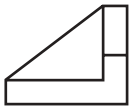
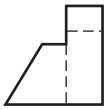
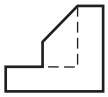
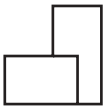
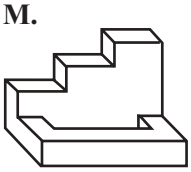
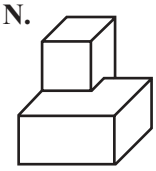
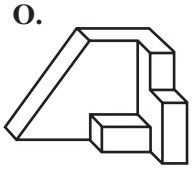
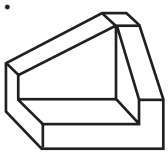
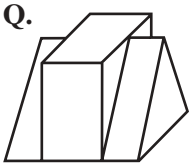
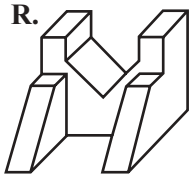
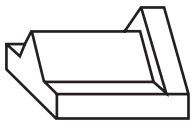
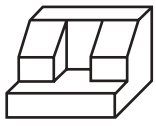
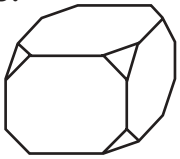
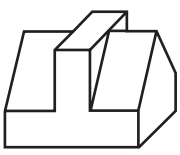
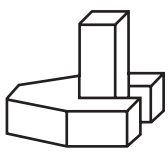
5 marks

Question 4



A component has been drawn using 3rd-angle projection. The side view and front view of the component are shown above. From the options (A–X) below identify the top view **and** the pictorial view of the component.

Top view _____ Pictorial view _____

A. 	**B.** 	**C.** 	**D.** 
E. 	**F.** 	**G.** 	**H.** 
I. 	**J.** 	**K.** 	**L.** 
M. 	**N.** 	**O.** 	**P.** 
Q. 	**R.** 	**S.** 	**T.** 
U. 	**V.** 	**W.** 	**X.** 

2 marks

Total 15 marks

END OF SECTION B

SECTION C – VBN 787 Apply mathematical principles to engineering designs

Instructions for Section C

Answer **all** questions in the spaces provided. Where a question is worth more than one mark you **must** show your working. Where applicable, answers must be given to two decimal places.

Question 1

a. What is the square root of 36?

1 mark

b. What is the cube root of 125?

1 mark

Question 2

Make the following conversions.

i. Convert 1.250 inches to mm _____

ii. Convert 11.22 pounds to kg _____

iii. Convert 40 square feet to square metres _____

iv. Convert 26 cubic feet to cubic metres _____

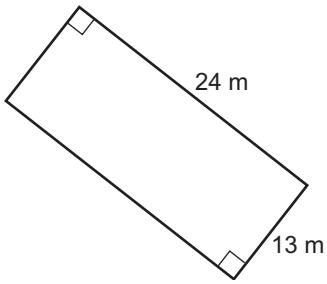
v. Convert 77 degrees Fahrenheit to degrees Celsius _____

1 + 1 + 1 + 1 + 1 = 5 marks

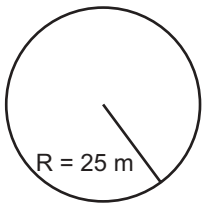
Question 3

Find the area of the following shapes.

i.



ii.

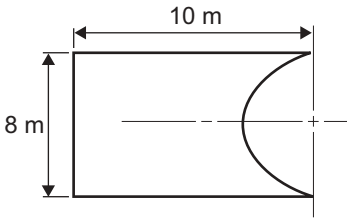


1 + 1 = 2 marks

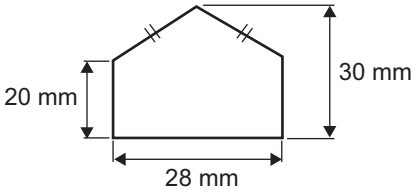
Question 4

The diagrams below show two different shapes. Calculate the area of each of the shapes.

i.



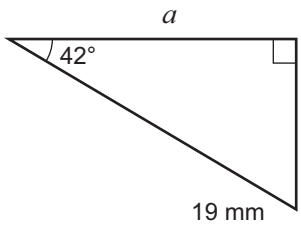
ii.



2 + 2 = 4 marks

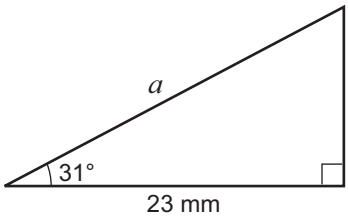
Question 5

a. Find the value of pronumeral *a* in this diagram.



2 marks

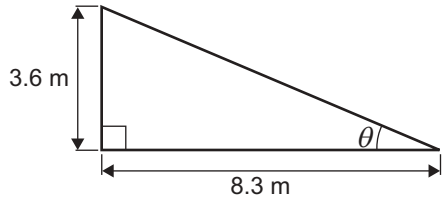
b. Find the value of the pronumeral *a* in this diagram.



2 marks

Question 6

Find the size of the angle marked θ in this triangle.



2 marks

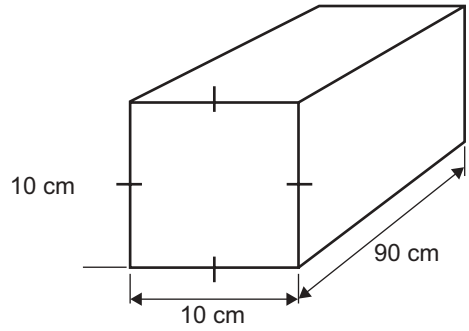
Question 7

Convert 40° to radians.

1 mark

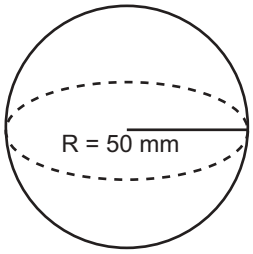
Question 8

a. Find the volume of the square bar to the nearest whole number.



1 mark

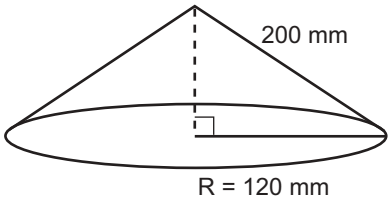
b. Find the volume of the sphere to the nearest whole number.



1 mark

Question 9

We are given the slant height and radius of the following cone. What is the curved surface area of the cone? Give your answer to the nearest whole number.



1 mark

Question 10

Factorise the following using the common factor method.

$a^2b + b^2a$

1 mark

Question 11

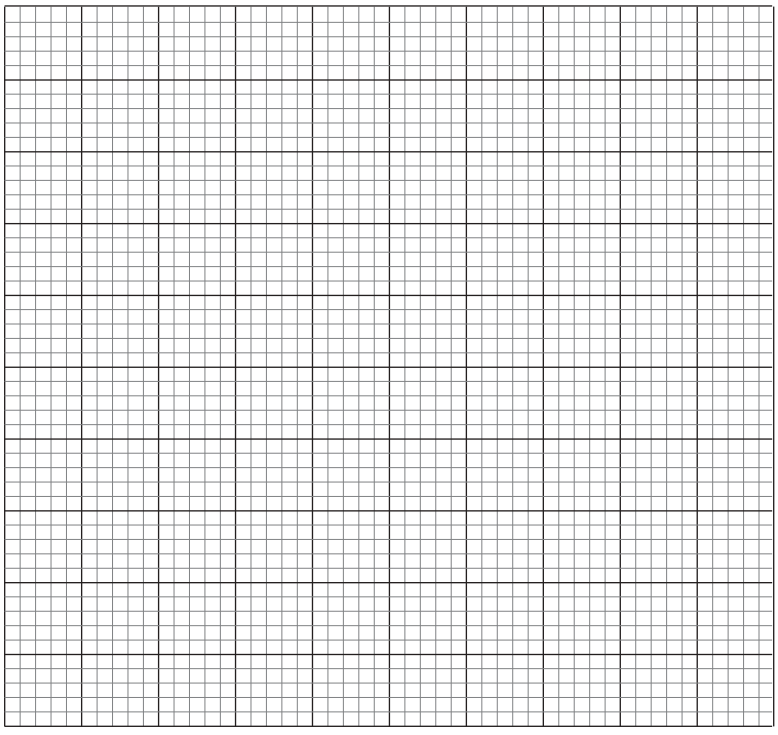
a. Complete values of y for the equation $y = x + 2$ in the table below.

x	–3	–2	–1	0	1	2	3
y							

2 marks

b. Using the graph paper below, draw and label a set of axes for the above data. Mark the scale on the axes.

Plot the points. Join the points with a straight line.



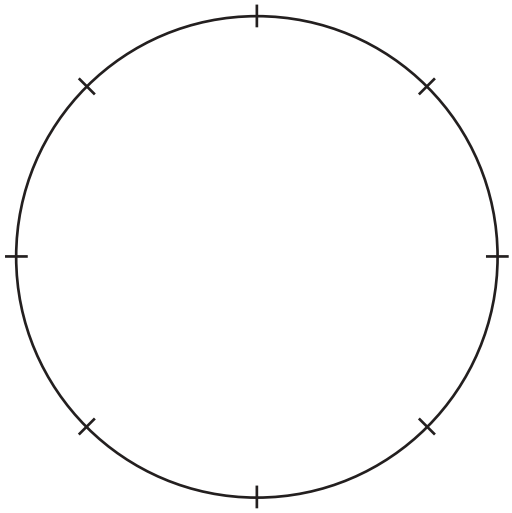
2 marks

Question 12

A local engineering workshop produces a number of different items per day. The items and the quantity of each are shown below.

- pistons – 220 items
- pump housings – 188 items
- pump shafts – 176 items
- drive couplings – 136 items

Draw a pie chart using the circle below to represent this production diagrammatically.



2 marks

Total 30 marks

END OF SECTION C
TURN OVER

SECTION D – VBN 788 Design and prototype components and/or small structures using engineering design principles

Instructions for Section D

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

You have been requested to design and manufacture a flat-based device to firmly and safely clamp a 2 metre length of 60 mm (outside diameter) pipe. Figure 1 below shows the end view of the pipe.

The device is to be portable, stable and able to be fitted to a collapsible table.

You have also been requested to manufacture the collapsible table for your pipe clamp. The design of the collapsible table has been started for you in Figure 2 on page 17.

Question 1

Sketch a 2D assembly design of a suitable **pipe clamp**. Design your device around the drawing of the pipe shown below (Figure 1) and provide overall conventional dimensions on your diagram. You have access to a full range of bar stock to use in your design.

This bar stock includes

- round bright and black mild steel 6 mm to 25 mm diameter
- square bright and black mild steel 6 mm to 25 mm
- 6 mm to 25 mm thick bright mild steel plate in 50 mm and 100 mm widths.

You may use standard items such as screws, nuts and bolts as required.

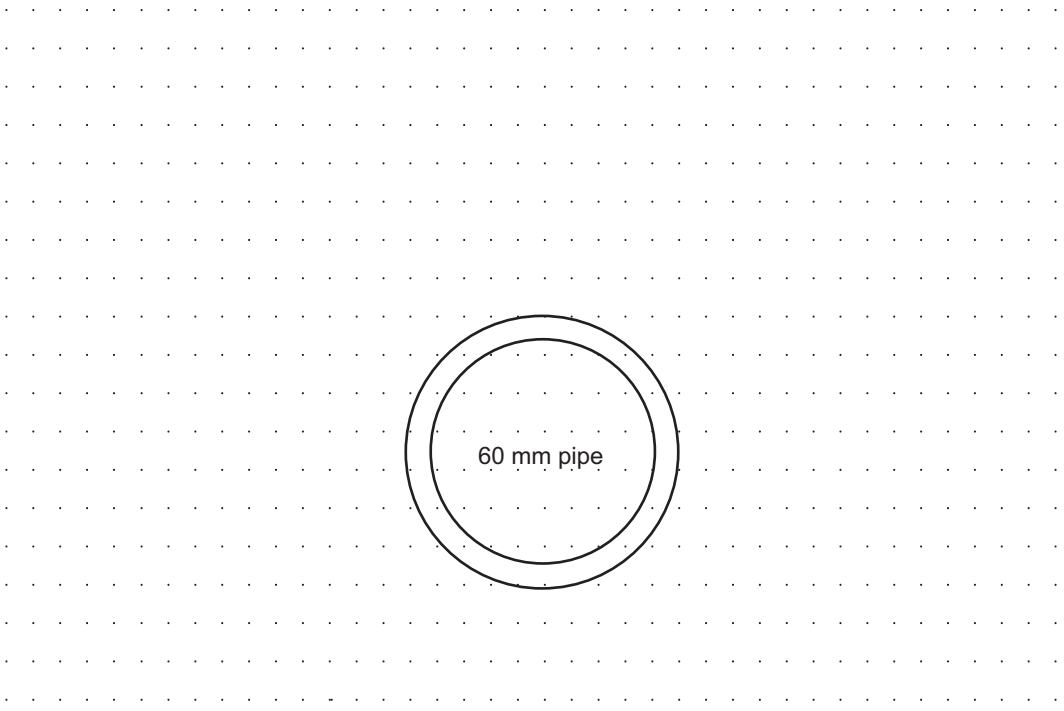


Figure 1

sketch – 10 marks

dimensions – 6 marks

Question 2

The collapsible table is not yet stable. Design a device that locks the legs in place. When you manufacture this device you will have additional materials to select from including

- square and round tubing
- angle iron
- sheet materials (steel, stainless steel, and sheetmetal)
- timber.

Draw your locking device on the legs shown in Figure 2 below.

Do **not** redraw your design of the pipe clamp.

Collapsible table

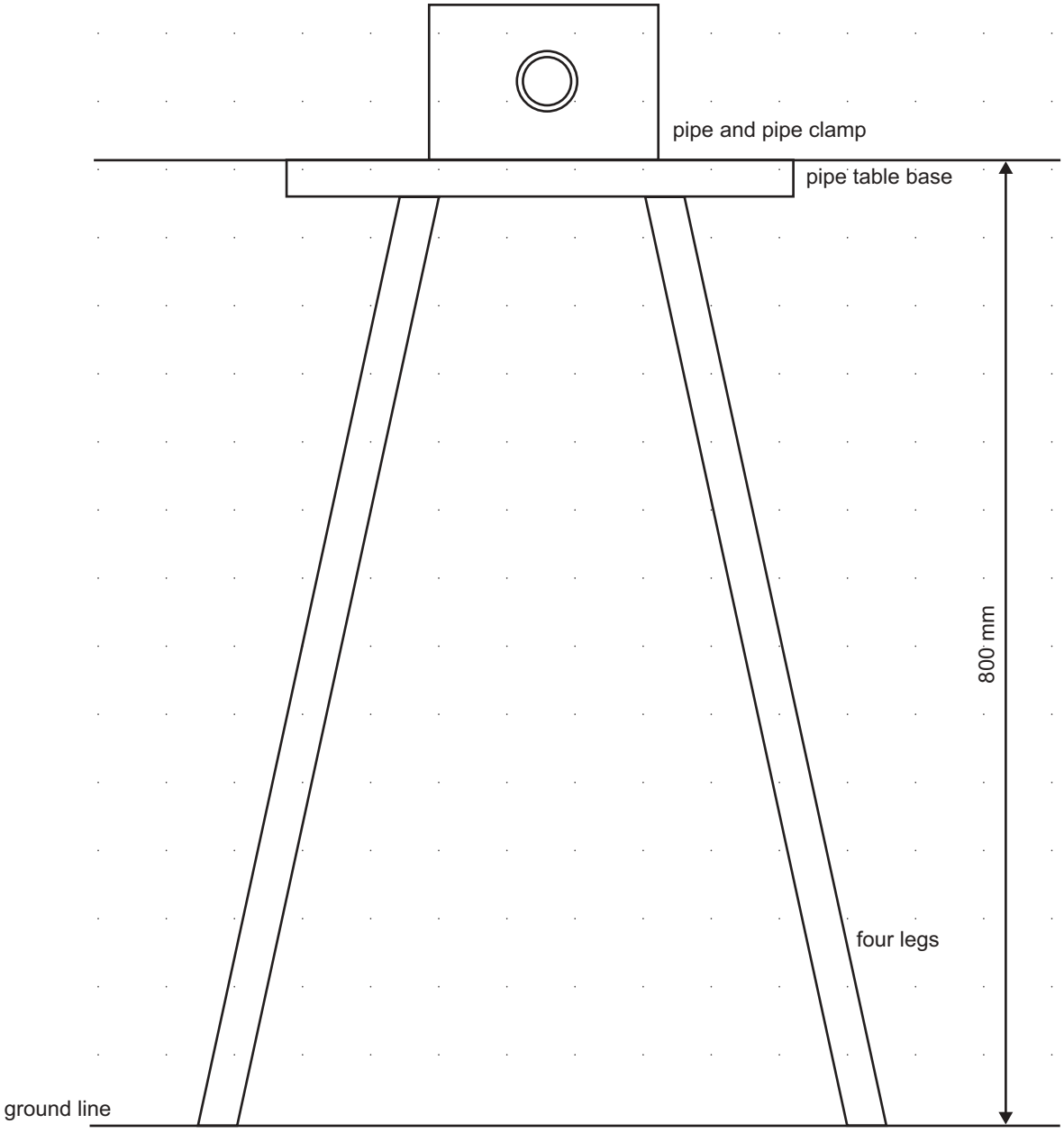


Figure 2

6 marks

You are now required to manufacture your **pipe clamp** and **portable stand** prototypes. To do this you will need to complete the following material cutting list.

Question 3

In the table below list **two** parts from the sketch of the **pipe clamp** (Figure 1) and **two** parts from the sketch of the **collapsible table** (Figure 2). Name the material, from the available stock, required to manufacture the part. For each part you must detail shape, length and size of material required.

cutting list	**part number**	**part name**	**shape**	**length**	**size**
pipe clamp	Part 1				
pipe clamp	Part 2				
collapsible table	Part 1				
collapsible table	Part 2				

4 marks

Question 4

Describe how you would manufacture **two** components from your designs. One of the components must be from the **pipe clamp** and the other from the **portable stand**.

Describe four main operations for the manufacture of each component. List all tools and processes. Use the tables below for your planning. Use NA (not applicable) where you think a certain column or equipment is not required for an operation.

Component 1 – Pipe clamp Part name/number _____

Op. No.	Operation description	Type of machine	Work holding method	Equipment	Type of cutter
1					
2					
3					
4					

Component 2 – Collapsible table Part name/number _____

Op. No.	Operation description	Type of machine	Work holding method	Equipment	Type of cutter
1					
2					
3					
4					

4 + 4 = 8 marks

Question 5

Select **two** different pieces of equipment used to manufacture the two components in Question 4. List a **safety precaution** when using the equipment described.

Equipment 1 (pipe clamp) _____

Safety precaution _____

_____

Equipment 2 (collapsible table) _____

Safety precaution _____

_____

2 marks

Question 6

Describe how you would join the **pipe clamp** to the **collapsible table** using quick removable devices. You may use sketches in your answer.

_____

_____

_____

_____

_____

_____

4 marks

Total 40 marks

END OF SECTION D

Data/formula

Area of a circle = πr^2

Area of triangle = $\frac{1}{2}$ × base × height

Volume of a sphere = 1.333 πr^3

Area of the curved surface of a cone = πrl

END OF QUESTION AND ANSWER BOOK