

STUDENT NUMBER Letter

VCE VET ENGINEERING STUDIES

Written examination

Tuesday 20 November 2018

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	20	20	20
B	24	24	80
			Total 100

- Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners, rulers, one scientific calculator, 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 correction fluid/tape.

Materials supplied

- Question and answer book of 23 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.
- Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.
- 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 – Multiple-choice questions**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.

Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

Question 1

'Red tagging' is usually a part of which 5S step?

- A. Set
- B. Sort
- C. Shine
- D. Standardise

Question 2

Which one of the following represents a 10 mm thread on an engineering drawing?

- A. $\varnothing 10$
- B. M10
- C. T10
- D. R10

Question 3

A 6 m length of pipe is being cut into 60 mm long pieces.

If the width of the saw blade is 3 mm, what is the maximum number of pieces that can be cut?

- A. 85
- B. 90
- C. 95
- D. 100

Question 4

Which one of the following statements about manual lifting is true?

- A. Only use mechanical lifting aids as a last resort.
- B. Always use two people if the load exceeds 10 kg.
- C. Bend over and use the back muscles to lift the load off the ground.
- D. The person lifting the load should keep it as close as possible to their body.

Question 5

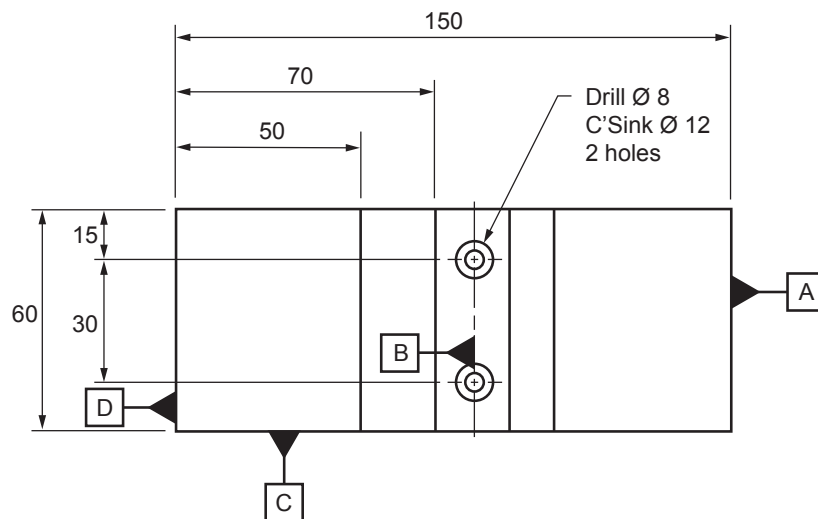
The acronym EPA stands for

- A. Environment Prevention Actions.
- B. Environment Protection Authority.
- C. Environment Performance Agency.
- D. Environment Permanent Association.

Question 6

Sectional views on drawings are used to show

- A. hidden detail.
- B. how parts fit together.
- C. the position of all holes.
- D. the materials that parts are made from.

Question 7

Which letter on the drawing above shows the datum?

- A. A
- B. B
- C. C
- D. D

Question 8

In the 5S system, Set in order has two main components. The first component is finding the best location for everything.

The second component is

- A. making a list of what has been kept.
- B. removing everything else from the area.
- C. visually marking where everything belongs.
- D. holding a meeting to let everyone know where things are.

Question 9

Which one of the following lifting accessories is best suited to lifting an engine out of a car with a block and tackle?

- A. eye bolt
- B. plate clamp
- C. hydraulic jack
- D. strong magnet

Question 10

Which of the following are environmental hazards in the workplace?

- A. noise and stress
- B. gases and lifting
- C. traffic and chemicals
- D. electricity and office equipment

Question 11

A cleaning solution requires a ratio of 1:3, chemical to water.

How much chemical is required for a cleaning solution made with 9 L of water?

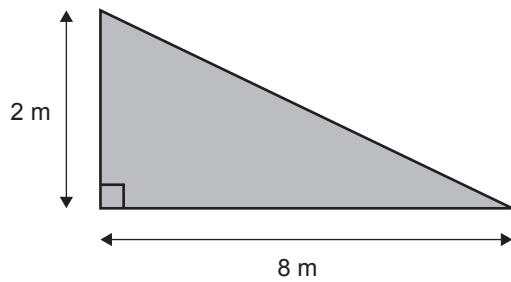
- A. 1 L
- B. 3 L
- C. 6 L
- D. 9 L

Question 12

A bin full of steel shafts weighs 117.6 kg.

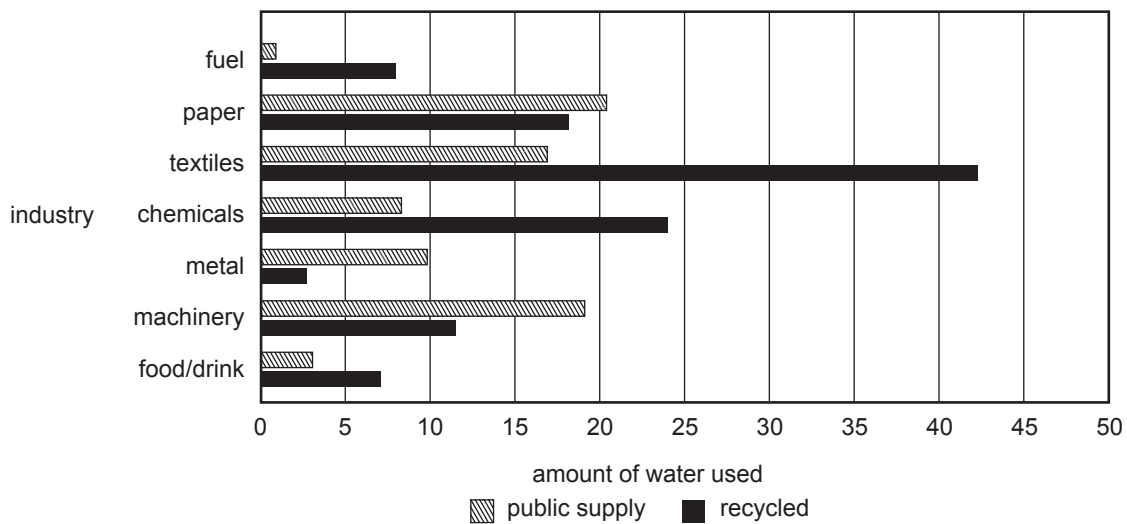
If the bin weighs 28 kg when empty and one steel shaft weighs 1.4 kg, how many steel shafts are in the bin?

- A. 104
- B. 94
- C. 84
- D. 64

Question 13

What is the area of the triangle shown above?

- A. 2 m²
- B. 4 m²
- C. 8 m²
- D. 16 m²

Question 14

According to the bar chart shown above, which industry used the most water from the public supply?

- A. food/drink
- B. textiles
- C. paper
- D. metal

Question 15

Which one of the drawing symbols shown below represents a fillet weld?



A.

B.

C.

D.

Question 16

Amanda works in a company that is implementing the 5S system. A cleaning schedule has just been introduced and all team members have been assigned specific cleaning tasks.

The 5S step that has been implemented is

- A. Sort.
- B. Sustain.
- C. Set in order.
- D. Standardise.

Question 17

In the safety hierarchy of control, which one of the following is the highest priority?

- A. substitution
- B. engineering control
- C. administrative control
- D. wear personal protective equipment (PPE)

Question 18

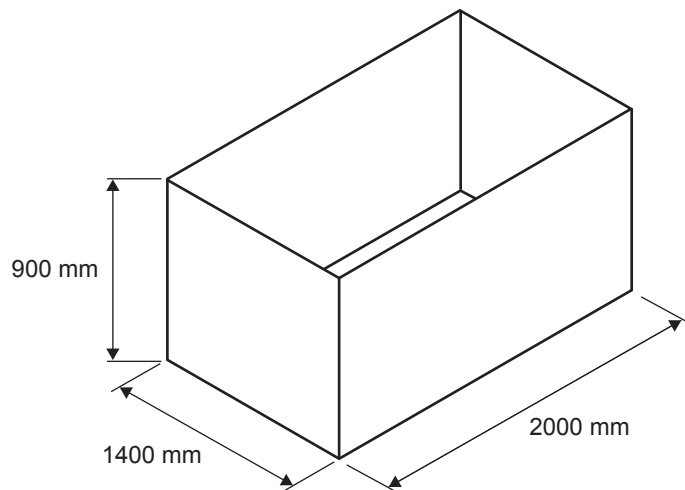
Which item of PPE is most likely to be worn as a requirement in warehouses where forklifts are frequently used?

- A. hearing protection
- B. high-visibility vest
- C. safety glasses
- D. gloves

Question 19

In Victoria, the legislation that applies to all workplaces and is aimed at reducing pollution is the

- A. *Environment Protection Act 1970.*
- B. *Environment Legislative Act 1986.*
- C. *Environmental Regulations Act 2005.*
- D. *Environmental Sustainability Act 2010.*

Question 20

What is the volume of the bin shown above?

- A. 0.025 m³
- B. 0.25 m³
- C. 2.52 m³
- D. 25.2 m³

SECTION B

Instructions for Section B

Answer **all** questions in the spaces provided.
All dimensions are in millimetres (mm) except where specified.
Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

Question 1 (9 marks)

Figure 1 shows part of a workshop where the 5S system is going to be implemented.



Figure 1

- a. Identify one issue relating to safety and one issue relating to the 5S system in the work area shown above. 2 marks

Safety issue _____

5S issue _____

- b. What is the first step in applying the 5S system to this area? 1 mark

- c. Give two recommendations for what could be done to this area in order to fulfil the 5S step Set in order. 2 marks

1. _____

2. _____

d. What are two considerations when deciding where each item should be stored in the workshop? 2 marks

1. _____
2. _____

e. Once the 5S system has been implemented, what are two actions that could be applied to sustain it? 2 marks

1. _____

2. _____

Question 2 (3 marks)

An operator spends most of the work day machining stub axles. Each stub axle weighs 4 kg. A stub axle is shown in Figure 2.

After machining, the operator stores each stub axle in the storage bin shown in Figure 3, which is on the ground behind him.

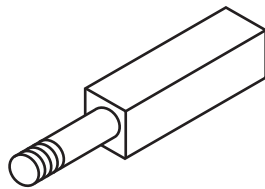


Figure 2

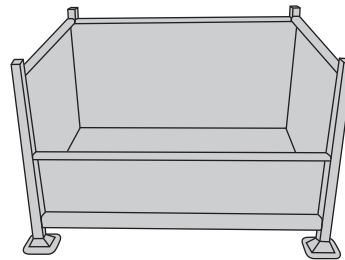


Figure 3

a. Describe two specific safety hazards associated with this process of machining and storage. 2 marks

1. _____

2. _____

b. Other than wearing the correct personal protective equipment (PPE), suggest **one** improvement that would reduce the risks associated with the safety hazards described in **part a.** 1 mark

- _____
- _____
- _____

Question 3 (2 marks)

Give two possible consequences for companies identified as having breached government environmental legislation.

1. _____

2. _____

Question 4 (2 marks)

The indexing head shown in Figure 4 weighs 38 kg. It needs to be lifted off the floor and transferred onto the milling machine table.



Figure 4

Describe two ways in which the indexing head could be safely moved from the floor to the milling machine table.

1. _____

2. _____

Question 5 (3 marks)

Describe the **best** way to visually mark the location of each item listed in the table below when implementing the 5S system.

Item	Best way to visually mark
set of spanners	
portable welder stored on the floor	
small boxes of bolts on a shelf	

Question 6 (1 mark)

What resource is being wasted in a company that has air leaks in its compressed air pipes?

Question 7 (1 mark)

In what way does a typical factory contribute to greenhouse gas emissions?

Question 8 (2 marks)

List two things that should be checked on a sling before it is used.

1. _____

2. _____

Question 9 (6 marks)

Figure 5 shows a metal slide.

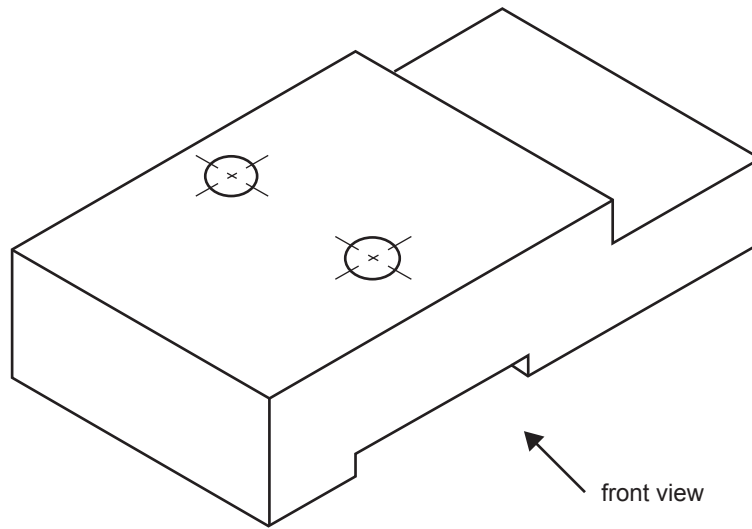
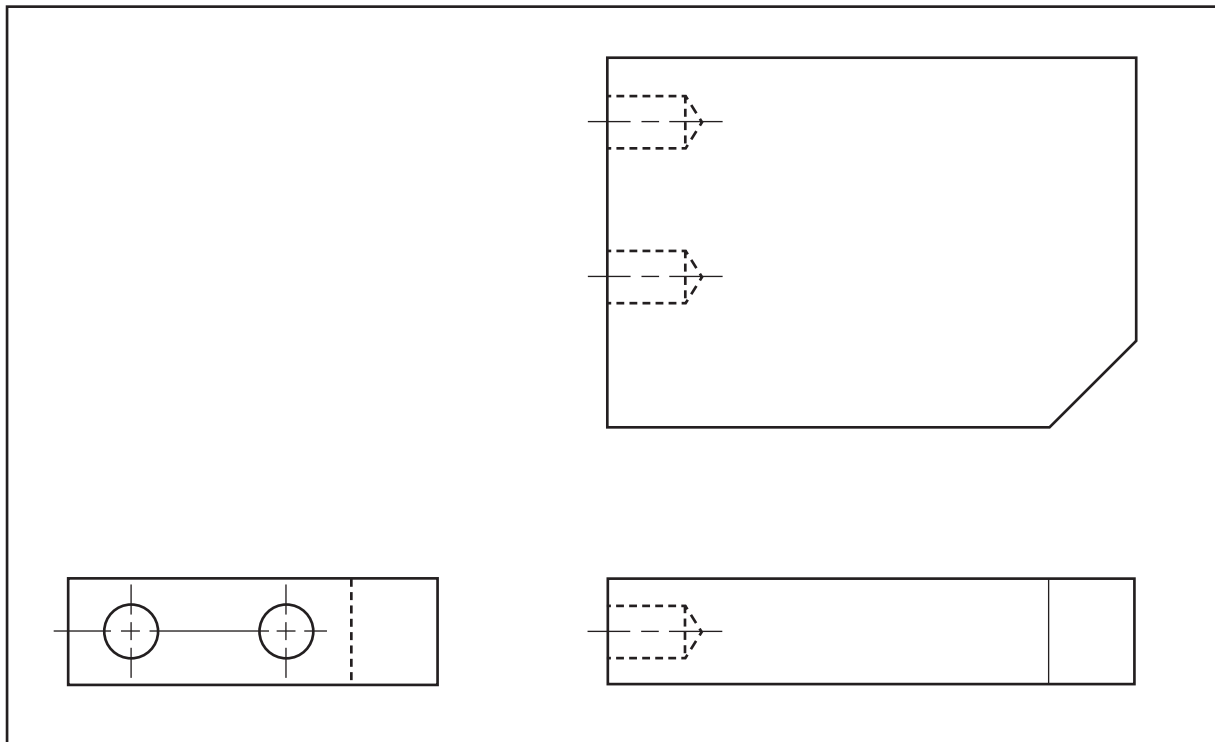


Figure 5

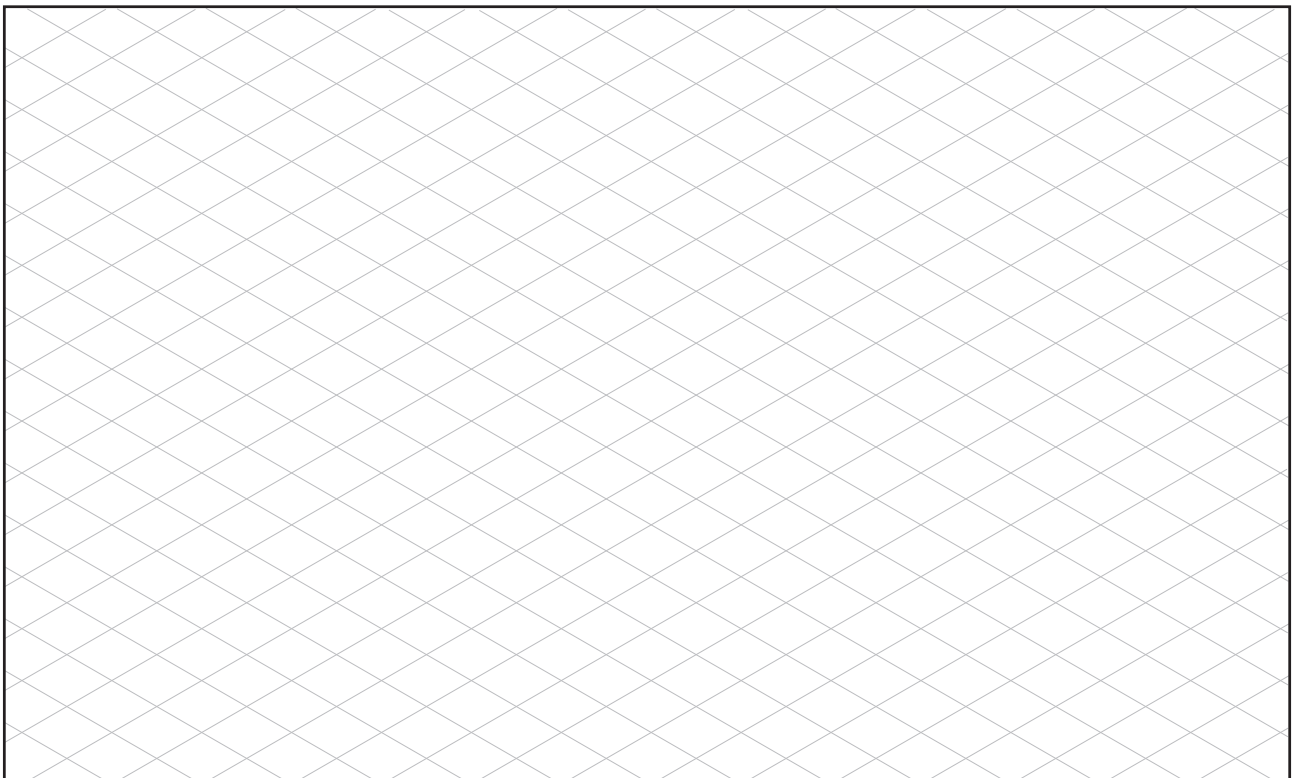
Sketch the metal slide shown in Figure 5 in third-angle projection in the space provided below. Show **three** views (top, front and side), including all centre lines and hidden lines.

Question 10 (5 marks)

Figure 6 shows a brass block.

**Figure 6**

Sketch the brass block shown in Figure 6 in isometric view in the space provided below. The isometric view should clearly show the edge where the holes are and all centre lines.



Question 11 (3 marks)

List three actions that should be taken daily by workers in a typical engineering workshop to keep the area clean and organised under the 5S system.

1. _____
2. _____
3. _____

Question 12 (3 marks)

The Sort step of the 5S system is being applied to a work area.

Give three options for what could be done with items that are not required in the immediate work area.

1. _____
2. _____
3. _____

Question 13 (2 marks)

Figure 7 is a graph showing the number of acceptable components versus rejected components produced by a company over a one-week period.

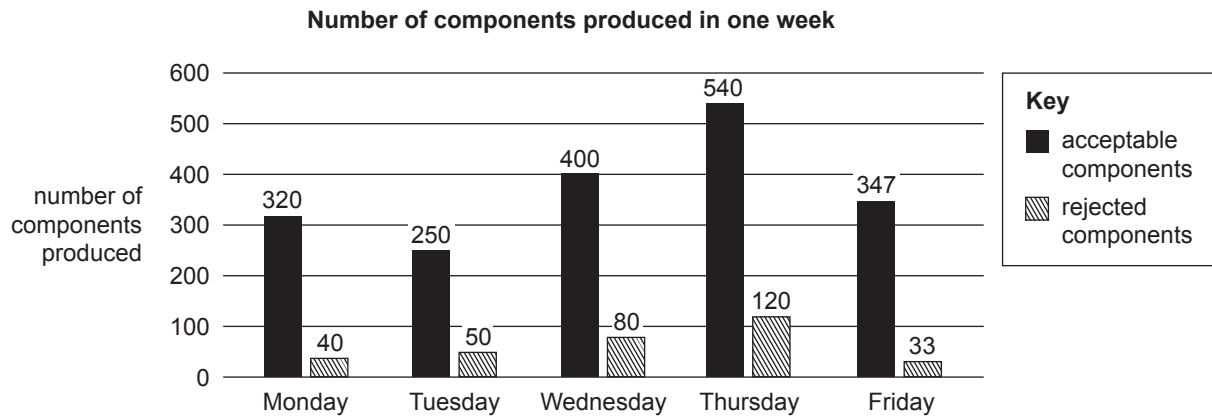


Figure 7

What is the percentage of rejected components manufactured for the week according to the data in Figure 7? Show your working.

Question 14 (6 marks)

Figure 8 shows a metal rubbish skip that is to be manufactured by a company.

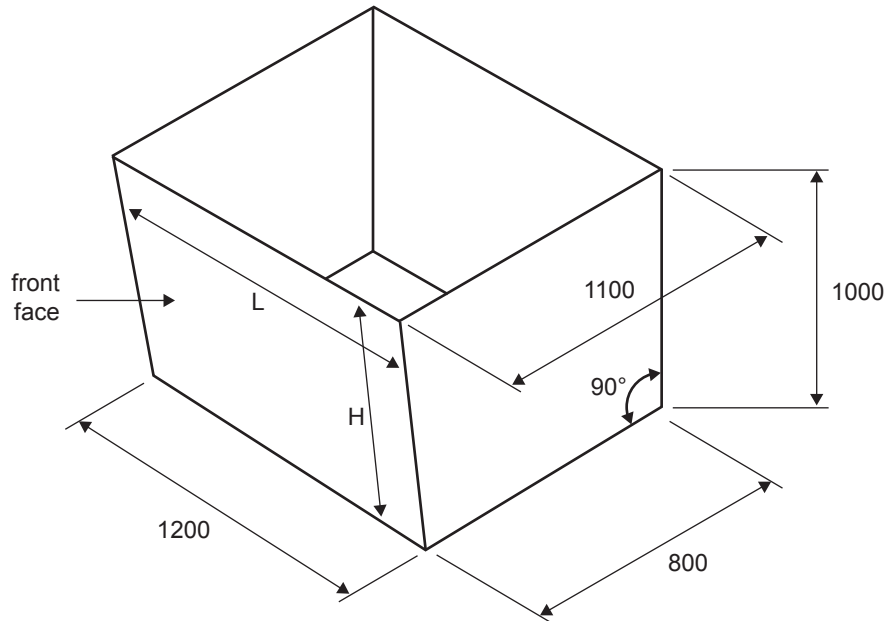


Figure 8

- a. Calculate the size ($L \times H$) of the metal plate required to make the front face, which is angled and not vertical. 2 marks

- b. The outside of the skip is to be painted.
 Calculate the surface area of the outside of the skip in square metres (four side faces only; do not include the bottom face). Show your working. 3 marks

- c. During construction, the plates will be lifted onto a plasma cutter with a crane.
 Name an accessory that can be used with the crane to safely lift the plates. 1 mark

Question 15 (4 marks)

The drawing shown in Figure 9 has been incorrectly dimensioned.

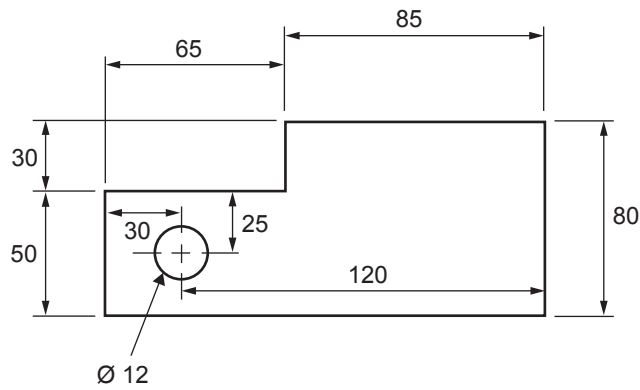
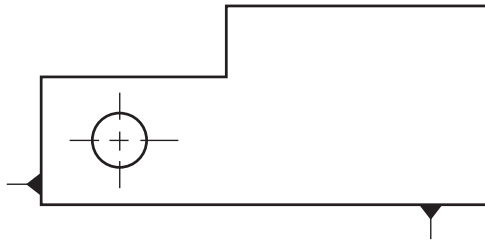


Figure 9

Complete the drawing below so that it is correctly dimensioned from the two datums indicated by the black triangles, according to the Australian Standards for technical drawing.



Question 16 (4 marks)

The table below shows the data collected for the number of hours of machine downtime for a lathe and a mill over a six-month period.

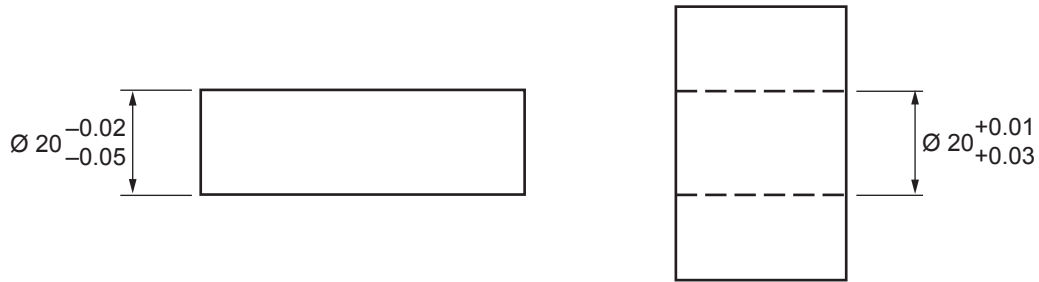
Machine	Jan.	Feb.	Mar.	Apr.	May	June
CNC lathe	6	9	7	5	5	3
CNC mill	4	7	3	6	7	4

Use the data provided to draw a bar chart showing the combined monthly machine downtime for the lathe and the mill on the grid below.

Machine downtime January–June 2018

Question 17 (2 marks)

Figure 10 shows a shaft and a hole dimensioned to produce a clearance fit between the two.

**Figure 10**

According to the tolerances, what are the minimum and maximum clearances between the shaft and the hole?

Minimum _____

Maximum _____

Question 18 (4 marks)

Welding is subject to safety hazards as well as environmental hazards.

Provide one safety hazard and one environmental hazard of welding. For each hazard, include a precaution that should be taken when welding.

Safety hazard _____

Precaution _____

Environmental hazard _____

Precaution _____

Question 19 (3 marks)

a. What does the term ‘sustainable resource’ mean?

1 mark

b. Give an example of a natural resource that is sustainable and a natural resource that is not sustainable.

2 marks

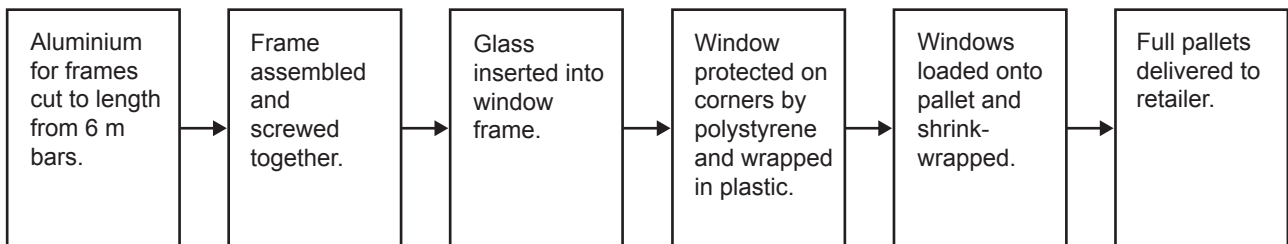
Sustainable natural resource _____

Non-sustainable natural resource _____

Question 20 (3 marks)

C-Thru is a company that manufactures small aluminium shed windows for a retailer, who then sells these windows to the public.

The current manufacturing process is shown below. This process does not include any environmentally sustainable practices.



Three levels from the waste hierarchy of control are given in the table below.

Suggest one action that could be taken by C-Thru for each waste hierarchy level to implement environmentally sustainable practices.

Waste hierarchy level	Suggested action
re-use	
recycle	
reduce	

Question 21 (3 marks)

Replacing incandescent light globes with light-emitting diodes (LEDs) will minimise energy usage.

Describe three other actions a typical manufacturing company can take to reduce energy usage.

1. _____

2. _____

3. _____

Question 22 (3 marks)

a. In relation to the use of chemicals, what does SDS stand for? 1 mark

b. Give two pieces of information commonly found in an SDS. 2 marks

1. _____

2. _____

Question 23 (3 marks)

Figure 11 shows the layout of a factory site.

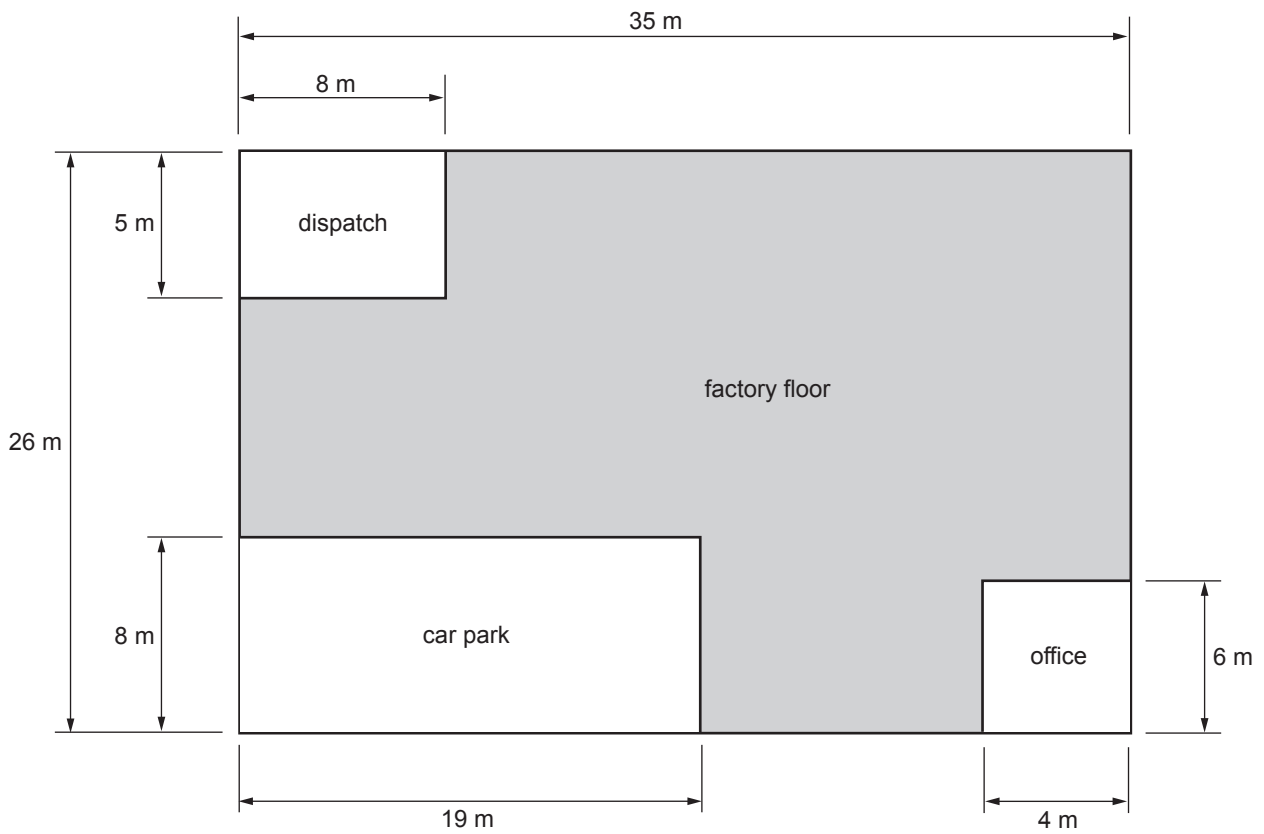


Figure 11

Calculate the shaded area of the factory floor in Figure 11. Show your working.

Question 24 (3 marks)

The pallet shown in Figure 12 is to be moved from the storage area to the operations area of a factory.



Figure 12

Source: Gearstd/Shutterstock.com

- a. Name a mechanical aid that could be used to move the pallet and does not require the operator to have a licence. 1 mark
-
- b. Describe two potential hazards when moving the pallet shown in Figure 12 from the storage area to the operations area of the factory and suggest how each hazard can be controlled. 2 marks

Hazard	Control