

B O A R D O F S T U D I E S
NEW SOUTH WALES

2007

**HIGHER SCHOOL CERTIFICATE
EXAMINATION**

Metal and Engineering

General Instructions

- Reading time – 5 minutes
- Working time – 2 hours
- Write using black or blue pen
- Board-approved calculators may be used
- Write your Centre Number and Student Number at the top of pages 9 and 13

Total marks – 80

Section I Pages 2–6

15 marks

- Attempt Questions 1–15
- Allow about 15 minutes for this section

Section II Pages 9–15

35 marks

- Attempt Questions 16–19
- Allow about 45 minutes for this section

Section III Pages 17–18

30 marks

- Attempt TWO questions from Questions 20–22
- Allow about 1 hour for this section

Section I

15 marks

Attempt Questions 1–15

Allow about 15 minutes for this section

Use the multiple-choice answer sheet for Questions 1–15.

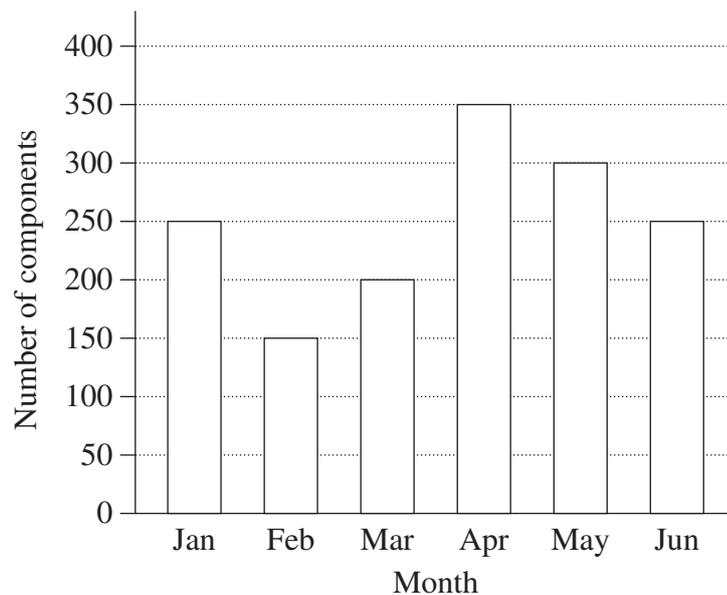
- 1 What is the main advantage of cordless power tools over electric mains supply power tools?
 - (A) Greater portability
 - (B) Lightness in weight
 - (C) Ease of maintenance
 - (D) Greater access to confined spaces

- 2 What type of engineering drawing shows the overall arrangement of components?
 - (A) Detail drawing
 - (B) Assembly drawing
 - (C) Geometric drawing
 - (D) Perspective drawing

- 3 What type of gauge is used to measure small spaces, such as the clearance required between two parts?
 - (A) Feeler
 - (B) Pitch
 - (C) Radius
 - (D) Thread

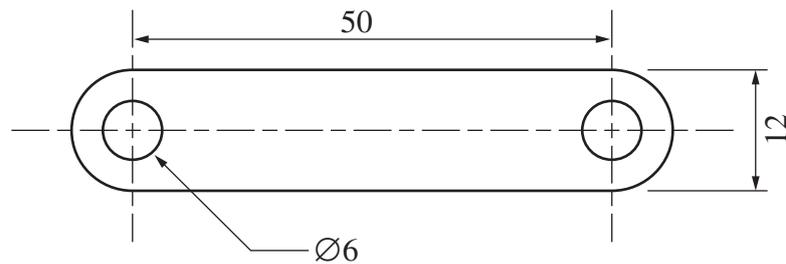
- 4 Who has the primary responsibility for occupational health and safety (OHS) in the workplace?
 - (A) Unions
 - (B) Employees
 - (C) Employers
 - (D) WorkCover

- 5 What document lists and details the functions and duties of an individual employee in a workplace?
- (A) Résumé
 - (B) Job description
 - (C) Mission statement
 - (D) Performance appraisal
- 6 The graph shows a company's production of components over a six-month period.



- What is the average monthly production of components over this six-month period?
- (A) 250
 - (B) 275
 - (C) 300
 - (D) 325
- 7 Which tool is most appropriate for rotating a $\text{Ø}50$ mm threaded pipe into a fitting?
- (A) Pliers
 - (B) Vice grips
 - (C) Stillson wrench
 - (D) Shifting spanner

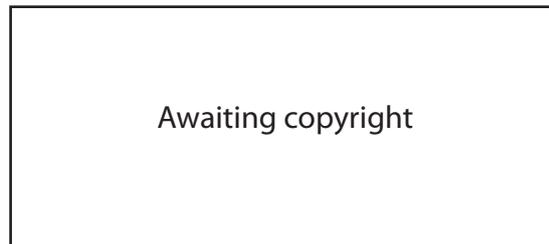
- 8 A steel strap is to be manufactured to the specifications shown on the diagram.



NOT TO SCALE
All dimensions in mm

What is the minimum length of steel that must be cut to manufacture each strap?

- (A) 50 mm
 - (B) 56 mm
 - (C) 62 mm
 - (D) 74 mm
- 9 Part of a 0–25 mm micrometer is shown.



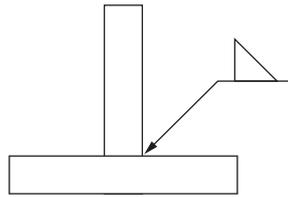
What is the reading indicated on the micrometer?

- (A) 0.12 mm
 - (B) 0.62 mm
 - (C) 1.12 mm
 - (D) 1.62 mm
- 10 A person has been injured at work and needs to take seven days off.

Under which part of an Industrial Award is the person entitled to be paid for the time off work?

- (A) Sick leave
- (B) Recreation leave
- (C) Leave without pay
- (D) Workers' compensation

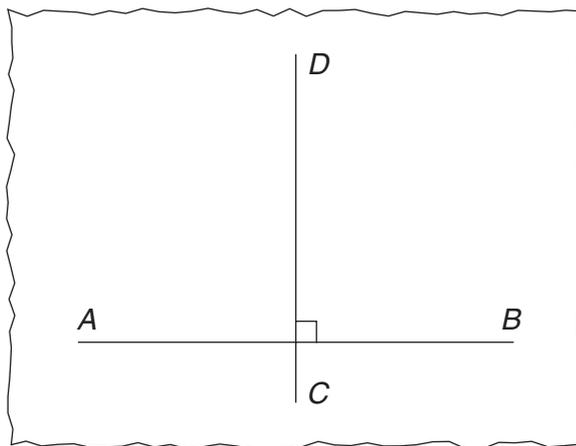
11 A technical drawing symbol is shown.



What does the symbol indicate?

- (A) Fillet weld all around the joint
- (B) Fillet weld on both sides of the joint
- (C) Fillet weld on the arrow side of the joint
- (D) Fillet weld on the opposite side of the joint to the arrow

12 The sketch below shows a piece of sheet steel with irregular edges.



SCALE: FULL SIZE

Line *AB* is already drawn. From the list below, select the most appropriate marking out tools that could be used to construct the line *CD* perpendicular to *AB*.

- (A) Engineers square, scribe
- (B) Combination square, scribe
- (C) Jenny calipers, steel rule, scribe
- (D) Spring dividers, steel rule, scribe

- 13** Who does the term *internal customer* describe?
- (A) The person who owns the workplace
 - (B) The person responsible for initiating production in the workplace
 - (C) The person who is the end user of the product outside the workplace
 - (D) The person responsible for the next stage of production in the workplace
- 14** John notices a liquid spill from a container on a workshop floor. He also notices a dangerous goods sign on the container.
- Which of the following procedures would be most appropriate for John to follow?
- (A) Interpret the sign, isolate the spill, and clean the spill
 - (B) Isolate the spill, report to supervisor, and clean the spill
 - (C) Interpret the sign, isolate the spill, and report to supervisor
 - (D) Report to supervisor, interpret the sign, and isolate the spill
- 15** Which of the following is demonstrated when quality systems are introduced in mass production techniques?
- (A) Variation is minimised
 - (B) Variation is eliminated
 - (C) Production is increased
 - (D) Production is more efficient

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Centre Number

Section II

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Student Number

35 marks

Attempt Questions 16–19

Allow about 45 minutes for this section

Detach page 19, and use Drawing 2007–1, SHAFT SUPPORT BEARING, to answer Questions 16 and 17.

Answer the questions in the spaces provided.

Marks

Question 16 (10 marks)

Refer to Drawing 2007–1 to answer parts (a) to (f).

(a) What type of engineering drawing is shown? **1**

.....

(b) What is the distance given from the end of Item 3 to the centre of the Ø3 oil hole? **1**

.....

(c) What does the $\frac{3.2}{\nabla}$ symbol represent? (Refer to location D4) **1**

.....

(d) Calculate the total height of the SHAFT SUPPORT BEARING after manufacture. Show working. **2**

.....

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.....

Question 16 continues on page 10

Question 16 (continued)

- (e) Name the diagonal lines found in Section A—A of the drawing (refer to location C5), and explain what they represent. 2

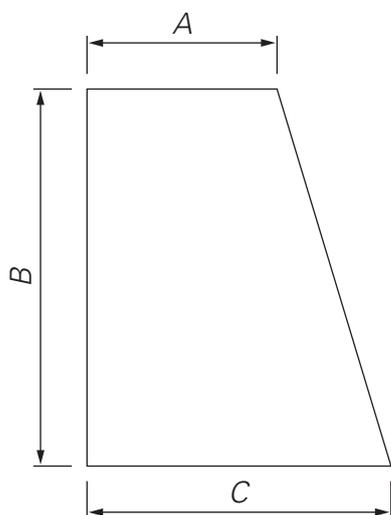
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- (f) A sketch of Item 4 – MINOR WEBS is made to assist manufacture. 3

Using information from Drawing 2007–1, calculate the sizes of the dimensions A, B, and C.



<i>Dimension</i>	<i>Size (mm)</i>
<i>A</i>	
<i>B</i>	
<i>C</i>	

MINOR WEBS
NOT TO SCALE

End of Question 16

Question 17 (9 marks)

Refer to Drawing 2007–1 to answer parts (a) and (b).

- (a) Why would a vernier caliper be an appropriate tool to measure the internal diameter of Item 3 – ROUND BAR? **2**

.....

- (b) Complete the table. Refer to Item 3 – ROUND BAR. **3**

<i>Nominal size</i>	/	44
<i>Basic size</i>	/	44.00
<i>Diameter</i>	Upper limit	
	Lower limit	
	Tolerance	

- (c) Explain why making an item with a large tolerance is cheaper and easier than one with a small tolerance. **4**

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Centre Number

Section II (continued)

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Student Number

Question 18 (9 marks)

Please turn over

Question 18 (9 marks)

A portable power tool is shown.



- (a) State the full name of the portable power tool. **1**
.....
- (b) Outline the safety checks that need to be carried out on this tool before use. **2**
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- (c) List and justify personal protective equipment (PPE) required to be worn when using this tool. **3**
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- (d) Accidents which result in injury when using power tools need to be reported to the appropriate authority. **3**

Explain why accident reports are important.

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Question 19 (7 marks)

Hacksaws are used to cut metal to length.



- (a) Propose a method for protecting the surface finish of a piece of metal held in a bench vice for hacksawing. **1**

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- (b) Suggest techniques that prevent the breakage of hacksaw blades. **3**

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- (c) Explain how you would select and fit a new hacksaw blade. **3**

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Section III

30 marks

Attempt TWO questions from Questions 20–22

Allow about 1 hour for this section

Answer each question in a SEPARATE writing booklet. Extra writing booklets are available.

In your answers you will be assessed on how well you:

- demonstrate relevant knowledge and understanding
 - communicate ideas and information, using precise industry terminology and appropriate workplace examples
 - organise information in a well-reasoned and cohesive response
 - solve proposed issues or problems
-

Question 20 (15 marks)

You are required to make one bracket, as shown.



Propose a written job procedure to make this bracket. In your response, refer to:

- the type and size of material required
- a sequence of steps for manufacture, detailing specific tools and equipment
- quality checking procedures.

NOTE: Only marking-out tools, hand tools, bench vice, drill bits and a bench drill are available.

Please turn over

In your answers you will be assessed on how well you:

- demonstrate relevant knowledge and understanding
 - communicate ideas and information, using precise industry terminology and appropriate workplace examples
 - organise information in a well-reasoned and cohesive response
 - solve proposed issues or problems
-

Question 21 (15 marks)

Industrial housekeeping includes maintaining a clean, safe and tidy workplace.

Explain the importance of industrial housekeeping in a metal and engineering workplace.

In your response, provide examples of industrial housekeeping, and describe the costs and benefits to employers and employees.

Question 22 (15 marks)

Analyse the contribution of WorkCover (NSW) and workplace OHS committees in reducing accidents in the manufacturing and engineering industries.

In your response, outline the roles of each body, their legislative requirements and their impact on safety.

End of paper

Metal and Engineering

Detach this sheet and use Drawing 2007–1 to answer Questions 16 and 17.

Please turn over

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