



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

**2001**

**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 page 9

**Total marks – 80**

**Section I** Pages 2–8

**15 marks**

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

**Section II** Pages 9–17

**35 marks**

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

**Section III** Pages 19–21

**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.

Select the alternative A, B, C or D that best answers the question. Fill in the response oval completely.

**Sample:**  $2 + 4 =$  (A) 2 (B) 6 (C) 8 (D) 9  
A  B  C  D

If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

A  B  C  D

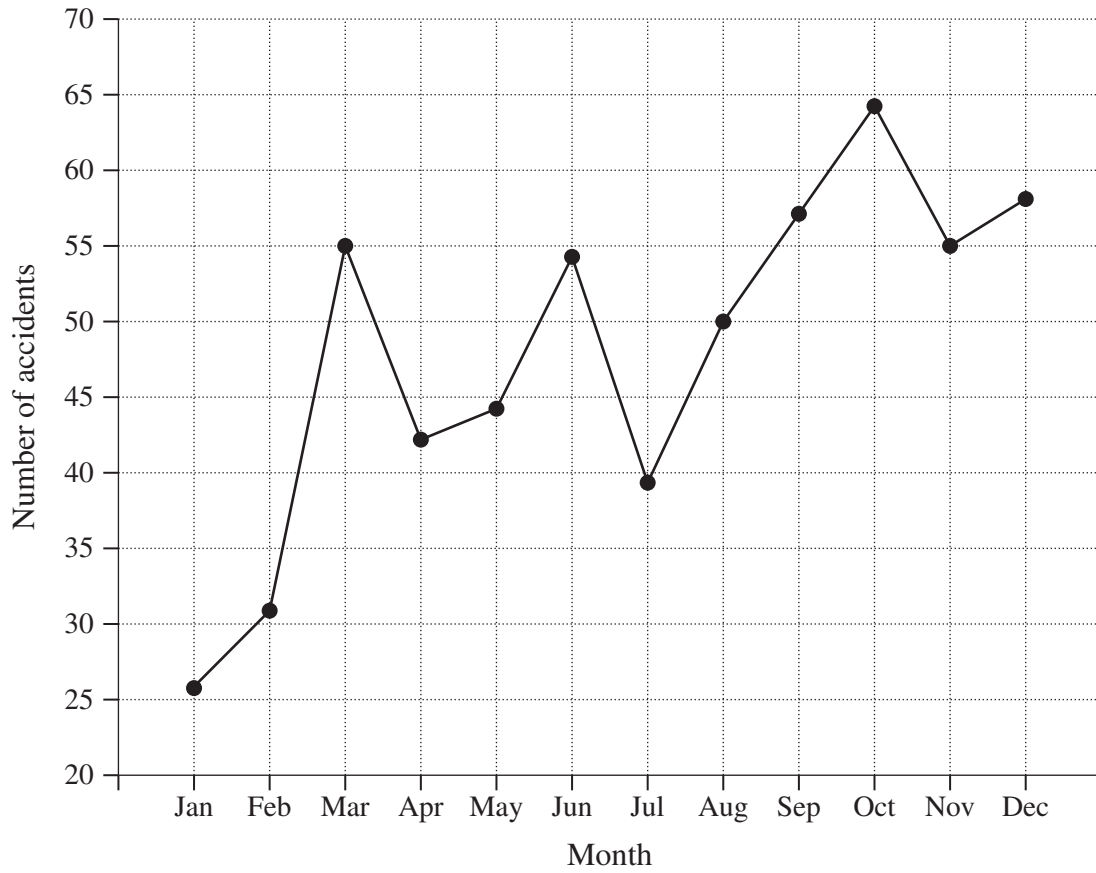
If you change your mind and have crossed out what you consider to be the correct answer, then indicate the correct answer by writing the word *correct* and drawing an arrow as follows.

A  B  C  D   
*correct* ↖

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- 1** What does the Mission Statement of an engineering company describe?
- (A) The company's business plan
  - (B) The underlying purpose of the company
  - (C) The company's mission in the local community
  - (D) How the company intends to spread its message
- 2** John arrives at his workplace to find a machine with a safety tag attached. The tag states DO NOT OPERATE.
- What is the correct procedure John should follow to operate the machine?
- (A) Remove the safety tag himself.
  - (B) Have the tag removed by the person who put it there.
  - (C) Leave the safety tag on the machine and operate the machine.
  - (D) Have the tag removed by the Occupational Health and Safety (OH&S) Committee.
- 3** You do not understand an instruction given to you by your workplace supervisor.
- What is the best way to deal with this problem?
- (A) Ask another worker.
  - (B) Ask the supervisor to clarify the instructions.
  - (C) Interrupt the supervisor while he/she is talking to you.
  - (D) Commence the task and work out the problem yourself.
- 4** What is the most important responsibility of an employer in regard to safety?
- (A) To ensure that all equipment is safe and operational
  - (B) To ensure that employees clean up after themselves
  - (C) To ensure that a worker, if injured on the job, is paid adequate compensation
  - (D) To ensure that all employees are trained/updated on OH&S procedures and policies

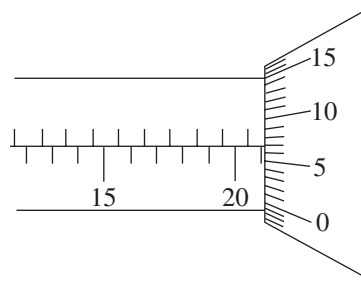
5 The safety statistics for a company are shown in the graph.



According to this graph, how many accidents occurred in the period March – May?

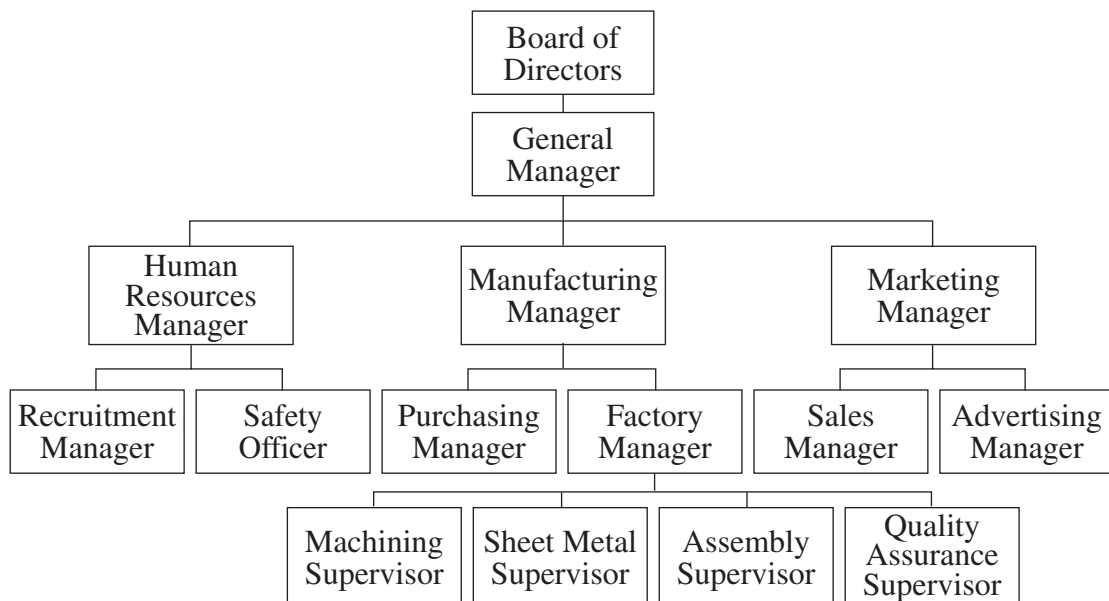
- (A) 128
- (B) 137
- (C) 141
- (D) 147

- 6 The sketch shows a reading on a metric micrometer.



What reading is shown?

- (A) 7.21  
 (B) 20.17  
 (C) 21.07  
 (D) 21.57
- 7 The organisational chart of an engineering company is shown.



To which person is the factory manager directly responsible?

- (A) General Manager  
 (B) Purchasing Manager  
 (C) Sheet Metal Supervisor  
 (D) Manufacturing Manager

- 8 A hole is to be drilled to the following specifications

$$\begin{array}{r} \text{\textcircled{O}}16.000 \quad +0.050 \\ \quad \quad \quad -0.025 \end{array}$$

What is the tolerance allowed for the hole?

- (A) 0.075  
(B) 0.75  
(C) 15.975  
(D) 16.050
- 9 Using the table, select an appropriate tapping drill size for an M6 × 1 thread.

METRIC ISO COARSE			
<i>Diameter</i>	<i>Pitch</i>	<i>Tapping drill sizes</i>	
		<i>Preferred</i>	<i>Alternative</i>
mm	mm	mm	mm
2.0	0.40	1.65	1.6
2.5	0.45	2.1	2.05
3.0	0.50	2.55	2.5
3.5	0.60	2.95	2.9
4.0	0.70	3.4	3.3
4.5	0.75	3.8	3.7
5.0	0.80	4.3	4.2
6.0	1.00	5.1	5.0
7.0	1.00	6.1	6.0
8.0	1.25	6.9	6.8

- (A) 4.2 mm  
(B) 4.3 mm  
(C) 5.0 mm  
(D) 6.0 mm

**10** A client has asked an engineering firm to manufacture a precision component.

What is the best way for the client to accurately describe the component to the engineering firm?

- (A) Over the telephone
- (B) By providing a sketch
- (C) In a face-to-face conversation
- (D) By providing an engineering drawing

**11** An industrial award includes which of the following details?

- (A) The rights and responsibilities of employer groups
- (B) The rights and responsibilities of employee groups
- (C) Minimum wages, working conditions and public holidays
- (D) Minimum wages, hours of work and sick leave rights

**12** What is the purpose of a job description?

- (A) To outline the function and duties of the job
- (B) To outline the working hours and duties of the job
- (C) To outline conditions of employment for the worker
- (D) To outline the terms of the employment contract for the worker

**13** The reading on a metric micrometer is 6.73 mm.

What will be the new reading after one complete turn of the thimble in a clockwise direction?

- (A) 6.23 mm
- (B) 6.98 mm
- (C) 7.23 mm
- (D) 7.73 mm

- 14** What is the advantage of a vernier micrometer compared to an ordinary micrometer?
- (A) A vernier micrometer weighs less.
  - (B) A vernier micrometer is easier to read.
  - (C) A vernier micrometer has a greater range of measurement.
  - (D) A vernier micrometer has greater accuracy of measurement.

- 15** The Metal Industry Award classifies workers over a range from C1 to C14.

The C10 classification describes which of the following?

- (A) Senior engineer
- (B) Entry level worker
- (C) Qualified tradesperson
- (D) Advanced skill tradesperson



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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

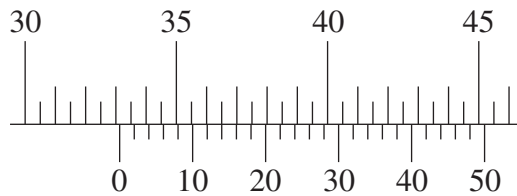
Answer the questions in the spaces provided.

Marks

Question 16 (5 marks)

(a) Determine the reading on the vernier scale illustrated.

1

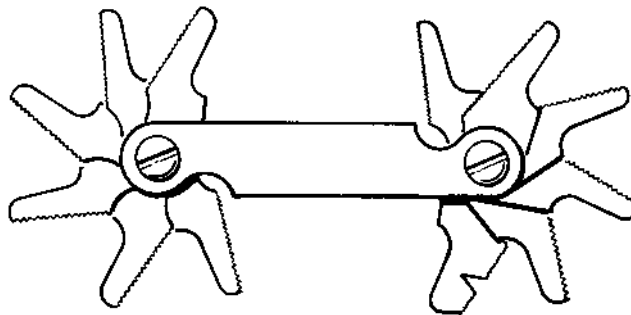


Reading ..... mm

(b) Name and give an appropriate use for the following gauges.

(i)

2

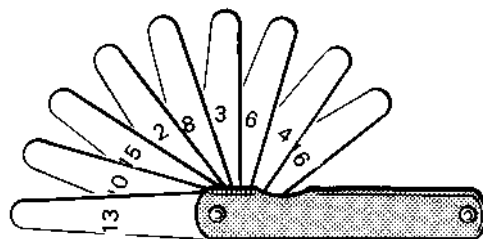


Name .....

Use .....

(ii)

2



Name .....

Use .....

Use the support bracket drawing No 2001–7 on page 17. Please detach page 17 to answer Questions 17 and 18.

**Question 17** (17 marks)

(a) Drawing 2001–7 includes a pictorial drawing of the finished product. **1**  
What type of pictorial drawing is used?

.....

(b) What is the main function of a pictorial drawing? **1**

.....

(c) Drawing 2001–7 also includes an engineering drawing. **1**

What is another name given to this type of drawing?

.....

(d) What angle of projection is used for this engineering drawing? **1**

.....

(e) What drawing standard is used for drawing 2001–7? **1**

.....

(f) Drawing 2001–7 is a B issue. Explain what this means. **1**

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(g) Refer to location D5. What does NTS indicate? **1**

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(h) Refer to location B2. Explain what is meant by the notation R3 MIN (TYP). **2**

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**Question 17 continues on page 11**

Question 17 (continued)

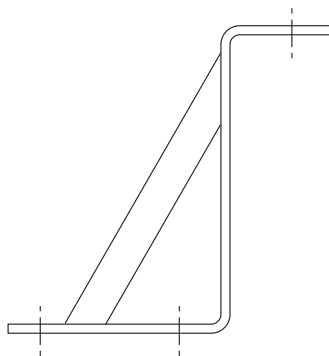
- (i) Refer to location A2. The hole is dimensioned 2

$$\begin{array}{r} \text{Ø}15.00 \quad +0.05 \\ \quad \quad \quad -0.00 \end{array}$$

Explain why the tolerance is incorrectly written.

.....  
.....  
.....  
.....

- (j) The brace is to be fillet-welded to the bracket body. On the sketch provided, mark the correct symbol and position for this operation. 2



- (k) Refer to location C1. Why is the thickness of material shown as 8? 1

.....  
.....

- (l) Refer to location C2. Calculate the minimum length of material required to manufacture the bracket body. 3

Show working.

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.....  
.....  
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End of Question 17

**Question 18** (7 marks)

- (a) A 300 mm length of 25 × 5 mm mild steel is to be used to produce the brace, Item 2, on drawing 2001-7. **5**

Outline a procedure that could be followed, and the tools that would be required, to mark out and then produce the brace.

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- (b) Choose TWO of the tools used to produce the brace. List a routine safety inspection that could be carried out on each tool. **2**

Tool 1 .....

Inspection .....

.....

Tool 2 .....

Inspection .....

.....

**Question 19** (6 marks)

A hand-held angle grinder is to be used to remove scale from the surface of a piece of metal.

**6**

Outline the personal safety requirements to be followed when using this tool. Identify some common faults or defects that would make the angle grinder unsafe to use.

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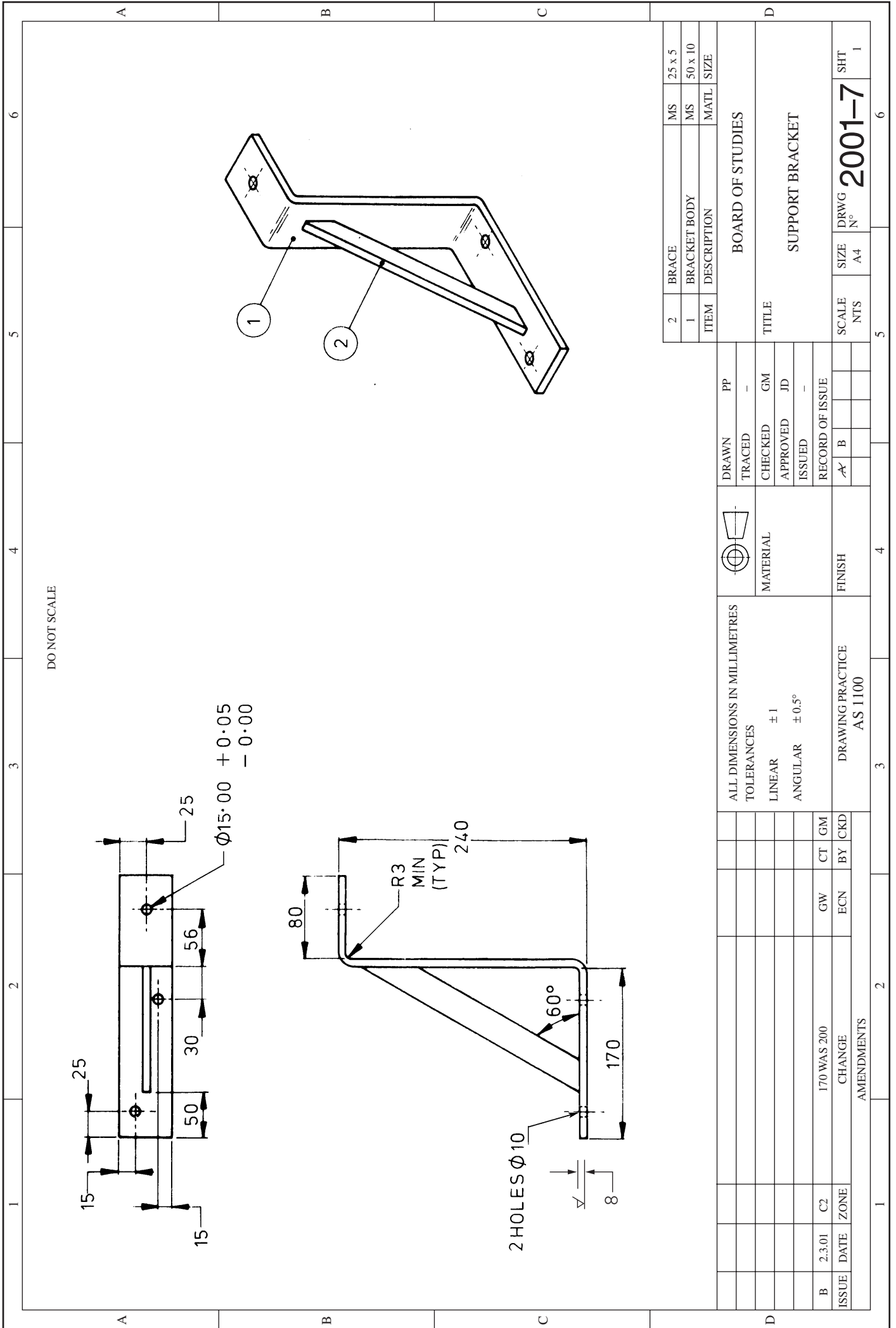
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Please detach this page and use it to answer Questions 17 and 18.



DO NOT SCALE

2	BRACE	MS	25 x 5
1	BRACKET BODY	MS	50 x 10
	ITEM DESCRIPTION	MATL	SIZE

DRAWN		PP
TRACED		-
CHECKED		GM
APPROVED		JD
ISSUED		-
RECORD OF ISSUE		
A	B	

ALL DIMENSIONS IN MILLIMETRES	
TOLERANCES	
LINEAR	± 1
ANGULAR	± 0.5°
DRAWING PRACTICE AS 1100	
FINISH	

ISSUE	DATE	ZONE	AMENDMENTS
B	2.3.01	C2	170 WAS 200
			CHANGE
			BY CKD
			ECN
			GW
			CT
			GM

BOARD OF STUDIES	
TITLE	
SUPPORT BRACKET	
SCALE	SIZE
NTS	A4
DRWG N°	2001-7
SHT	1

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## Metal and Engineering

### Section III

30 marks

Attempt TWO questions from Questions 20–22

Allow about 1 hour for this section

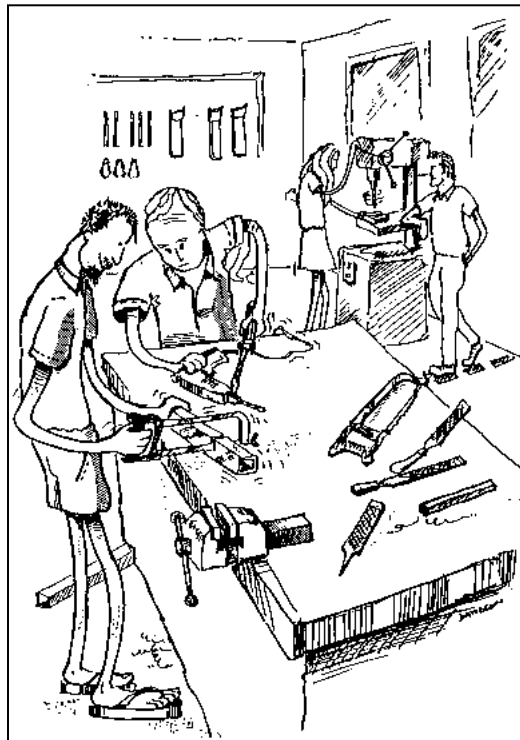
Answer each question in a SEPARATE writing booklet. Extra writing booklets are available.

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)

The cartoon illustrates examples of unsafe work practices in an engineering workplace.



You are required to assist in a safety audit of the engineering workplace shown.

List some obvious unsafe practices.

Discuss how a workplace OH&S committee might reduce or eliminate these unsafe practices.

Evaluate the implications for employers and employees of not addressing these unsafe practices.

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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)

Identify a range of recently introduced metal and engineering technologies.

Analyse their impact on the metal and engineering industries' ability to supply quality goods and services, reduce costs, improve production techniques, reduce pollution and improve quality of life.

**Question 22** (15 marks)

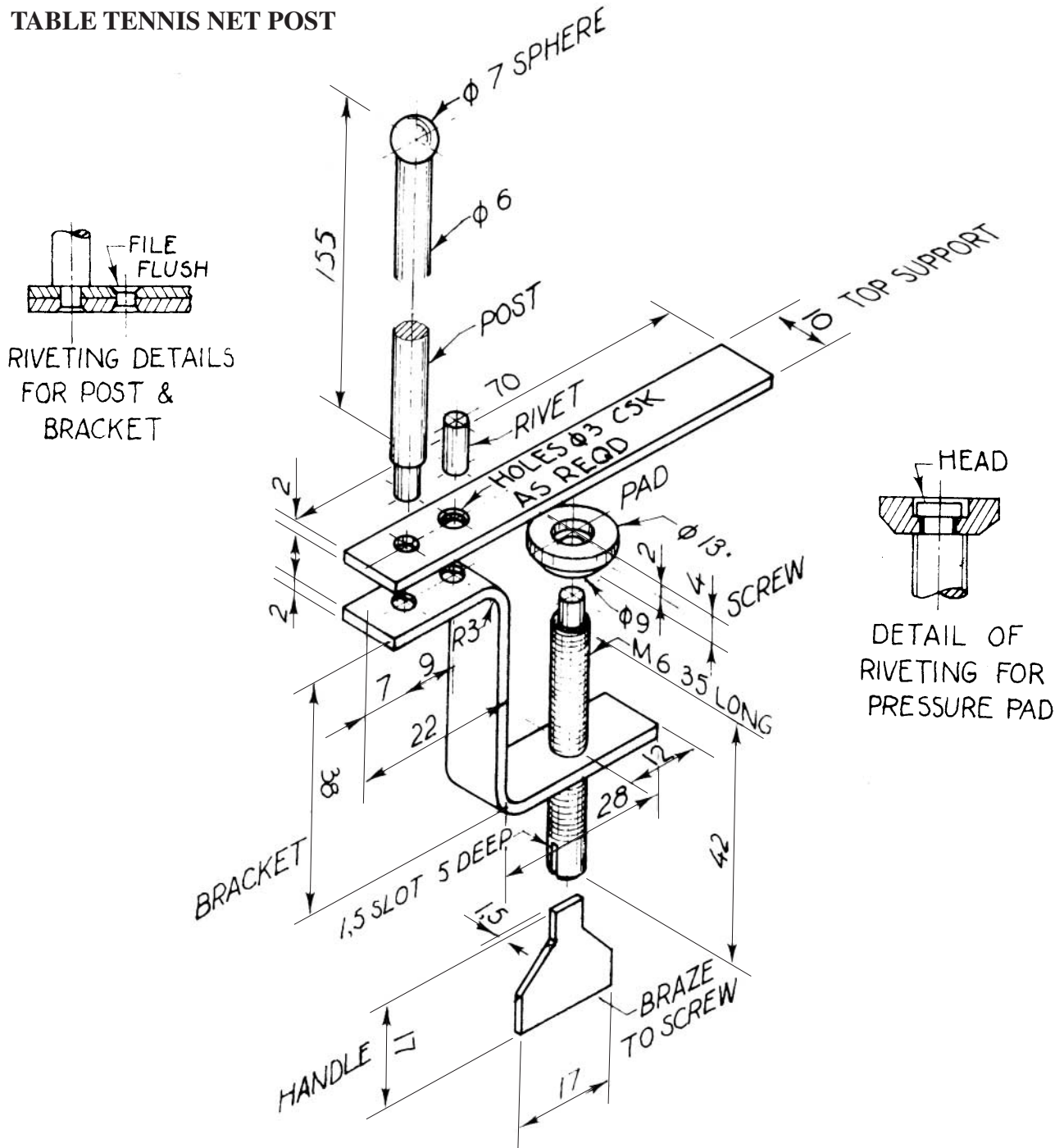
A small engineering firm has been asked to manufacture a table tennis net post as shown on drawing 2001–8 on page 21.

Plan a sequence of activities that identifies the appropriate tasks required to produce the bracket.

Outline and justify a quality assurance system that will ensure that the brackets, when manufactured, will fit correctly with other parts of the assembly.

**Question 22 continues on page 21**

**TABLE TENNIS NET POST**



7	Post	BMS	1
6	Rivet	Stock	1
5	Top support	BMS	1
4	Pad	BMS	1
3	Bracket	BMS	1
2	Screw	BMS	1
1	Handle	BMS	1
ITEM	DESCRIPTION	MATL	REQ'D

TABLE TENNIS NET POST



REF.: NSW HSC 2001

SCALE

SIZE

DRWG

NTS

A4

NO.

**2001-8**

End of paper

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