BOARD OF STUDIES
NEW SOUTH WALES

2005

HIGHER SCHOOL CERTIFICATE EXAMINATION

Metal and Engineering

Total marks – 80

(**Section I**) Pages 2–7

15 marks
• Attempt Questions 1–15
• Allow about 15 minutes for this section

(**Section II**) Pages 9–16

35 marks
• Attempt Questions 16–20
• Allow about 45 minutes for this section

(**Section III**) Pages 17–18

30 marks
• Attempt TWO questions from Questions 21–23
• Allow about 1 hour for this section

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

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.
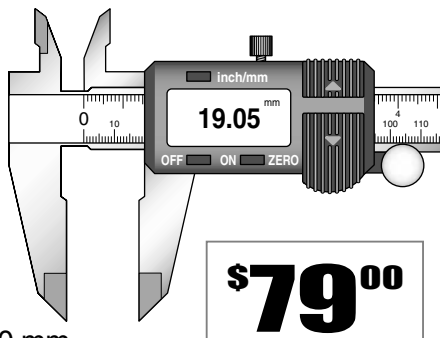
correct

A ✖   B ✖   C ◯   D ◯

1 Which of the following features of a tool identifies it as a *measurement* tool?

(A) It can be adjusted.

(B) It has moveable jaws.

(C) It has graduations on it.

(D) It is a precision instrument.

2 What is the first step that should be taken before a measurement is made with a 0–25 mm micrometer?

(A) Hold the micrometer square to the work.

(B) Check that the graduated sleeve is zeroed.

(C) Set the micrometer lock mechanism correctly.

(D) Adjust the ratchet mechanism for correct tension.

3 Which of the following is a workplace responsibility of the employer?

(A) To make decisions on behalf of the OHS committee

(B) To make sure employees are responsible for accidents

(C) To ensure that all plant, equipment and systems are safe

(D) To impose penalties on employees who misuse plant, equipment and systems

4 What skill is necessary for effectively receiving verbal communications?

(A) Speaking clearly

(B) Reading carefully

(C) Listening attentively

(D) Interpreting drawings accurately

5 A particular steel contains 8% by weight of nickel.

What is the weight of nickel in 240 kg of this steel?

(A) 0.192 kg

(B) 1.92 kg

(C) 19.2 kg

(D) 192 kg

6 An advertisement for vernier calipers is shown.

Digital vernier calipers

inch/mm

19.05 mm

0 10

100 110
4

OFF ON ZERO

$**79**⁰⁰

Simple and easy to use with digital readout
• Accurate to 1/100 mm
• Metric or Imperial measurement

To what accuracy can these vernier calipers read?

(A) 0.01 mm

(B) 0.05 mm

(C) 0.10 mm

(D) 1.00 mm

7 Which of the following workplaces require an OHS committee to be formed?

(A) All workplaces

(B) All engineering workplaces

(C) All workplaces where there are apparent dangers

(D) All workplaces where there are more than twenty employees

8 Which of the following best describes when personal protective equipment should be worn?

(A) When necessary to prevent injury

(B) When working with flammable liquids

(C) When working in an industrial workshop

(D) When carrying out highly dangerous work

9   A pressure gauge is shown.
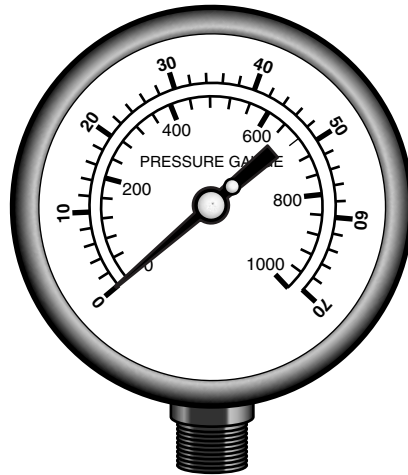
If the gauge needle reads 40 on the outside scale, what is the reading on the inside scale?

(A)   480

(B)   560

(C)   580

(D)   590

Please turn over

10   The figures below represent four possible lifting postures.
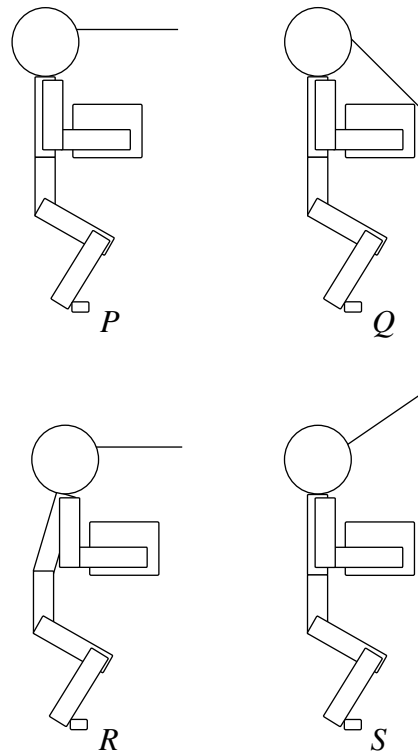
Which diagram best illustrates the correct posture when lifting a heavy object?

(A)   *P*

(B)   *Q*

(C)   *R*

(D)   *S*

11   What is the meaning of the quality concept *Get it Right, First Time*?

(A)   A worker performs some tasks to the customer's specifications.

(B)   A worker performs tasks and the quality depends on other workers.

(C)   A worker performs tasks until the quality is close to the customer's specifications.

(D)   A worker performs tasks and takes responsibility for the quality of their own work.

12   Which of the following is a physical hazard?

(A)   Fumes

(B)   Ultraviolet rays

(C)   Unguarded machines

(D)   Manual handling techniques

13 A fire hazard warning sign is shown.

What is the colour design of a fire hazard warning sign?

(A) A blue symbol on a red background

(B) A black symbol on a red background

(C) A red symbol on a yellow background

(D) A black symbol on a yellow background

14 Which of the following portable power tools is the most suitable for the rapid removal of imperfections, such as roughness or beading, on flat and external surfaces?

(A) Angle grinder

(B) Bench grinder

(C) Cut-off grinder

(D) Straight grinder

15 In relation to manufacturing and quality, which of the following best describes the external customer?

(A) The product distributor

(B) The end user of the product

(C) The external product inspector

(D) The purchasing officer who buys the product

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Metal and Engineering

Centre Number

Student Number

Section II

35 marks
Attempt Questions 16–20
Allow about 45 minutes for this section

Answer the questions in the spaces provided.

Marks

Question 16 (13 marks)

Detach page 20, and use Drawing 2005–1 to answer this question.

(a)   What material is used to manufacture the Base RH (Item 1)?   **1**

        ....

(b)   What is the clearance between the Bar (Item 3) and the hole in the   **1**
        Screw (Item 2)?

        ....

(c)   Calculate the length of the internal thread in the Base RH (Item 1).   **2**

        ....

(d)   What is the minimum gap the Jack Screw will fit between when being used?   **2**

        ....

        ....

(e)   Calculate the tapping drill size for the internal thread in the Base RH (Item 1).   **2**
        (Show all working.)

        ....

        ....

        ....

        ....

Question 16 continues on page 10

Question 16 (continued)

(f) Explain why the Jack Screw has both right-hand and left-hand threads.   **2**

....

....

....

....

....
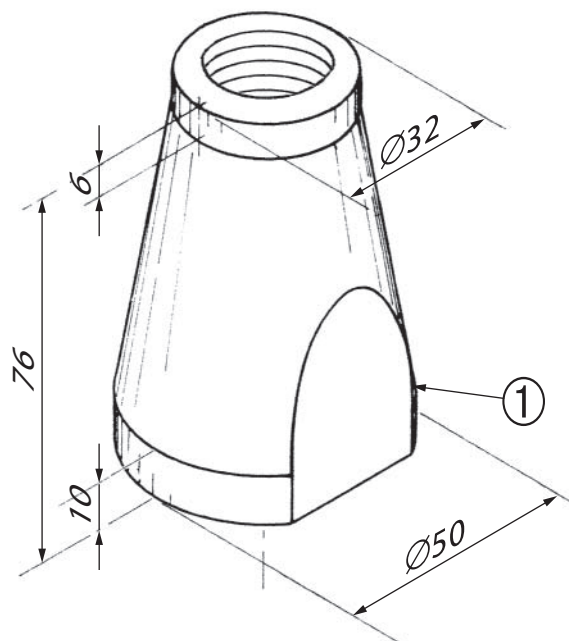
(g) The title block indicates the drawing standard as AS1100.   **3**

State THREE reasons why it is necessary to have a drawing standard.

....

....

....

....

....

....

End of Question 16

Refer to the diagram of Base RH (Item 1) to answer Questions 17 and 18.

Question 17 (3 marks)

Using the following formula, calculate the included angle of the taper on the Base RH (Item 1). **3**

$$\text{Included angle} = \frac{(\text{Difference in diameters}) \times 57.3}{\text{Length of taper}}$$

(Show all working.)

....

....

....

....

....

Question 18 (4 marks)

The $\varnothing32$ dimension on the Base RH (Item 1) is to be amended to read $\varnothing32.00_{-0.05}^{+0.05}$.

(a)   What name is given to the tolerance distribution for the amended dimension?   **1**

    ....

(b)   Complete the table using the amended dimension.   **3**

Nominal size		$\varnothing32$
Basic size		$\varnothing32.00$
Diameter	Upper limit	
	Lower limit	
	Tolerance	

Metal and Engineering

Section II (continued)

Centre Number

Student Number

Question 19 (6 marks)

Please turn over

Question 19 (6 marks)

The diagram shows one type of vernier calipers.

Awaiting Copyright Clearance

(a) What is the maximum accuracy of the vernier scale shown?   **1**

    ....

(b) What is the reading shown on the vernier calipers?   **2**

    ....

(c) Describe the procedure to set the vernier calipers shown to a reading of   **3**
     61.56 mm.

    ....

    ....

    ....

    ....

    ....

    ....

Question 20 (9 marks)

(a) When filing a flat surface, the file teeth may become clogged with shavings.   **2**

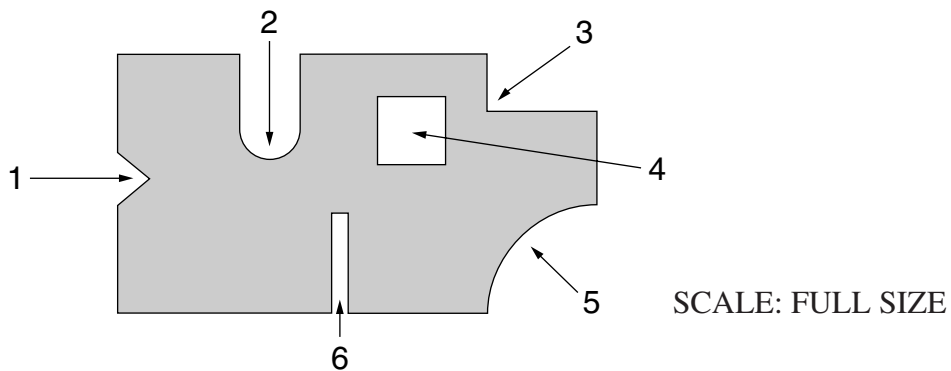What is this called, and how can it be minimised?

....

....

....

....

....

(b) The item shown is to be manufactured using 3 mm mild steel plate.   **3**

SCALE: FULL SIZE

Complete the table, naming the most appropriate file to produce the shapes indicated.

Shape	File type
1	
2	
3	
4	
5	
6	

Question 20 continues on page 16

Question 20 (continued)

(c)   The label from the end of a new box of files is shown.   **4**
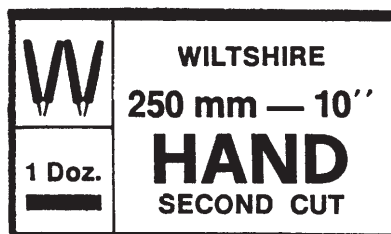
Fully explain the remaining terms in the table, referring to the shape and special features of these files.

WILTSHIRE	Name of company that manufactured the files
W	Four files arranged in the shape of a 'W' company trademark/logo
250 mm — 10′′	
HAND	
SECOND CUT	
1 Doz.	Number of files in box (12 only)

End of Question 20

Metal and Engineering

Section III

30 marks
Attempt TWO questions from Questions 21–23
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 21 (15 marks)

An engineering firm is required to manufacture ONE plate as shown.

Awaiting Copyright Clearance

Prepare a job plan to manufacture the plate, setting out a safe and efficient sequence of steps, together with the related tools.

NOTE. Only marking-out tools, hand tools and a bench drill are available to manufacture the plate.

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 22 (15 marks)

Engineering workplaces have been changed by the introduction of technologies.

Discuss this statement in relation to workplace practices, the production of quality products and the reduction of costs. Use appropriate workplace examples.

Question 23 (15 marks)

A new sign is to be displayed in an engineering workshop.

```
A PLACE FOR EVERYTHING
AND
EVERYTHING IN ITS PLACE
```

Explain the intended effect of this sign on the employer, employees, and the organisation of tools, equipment and material in the workshop.
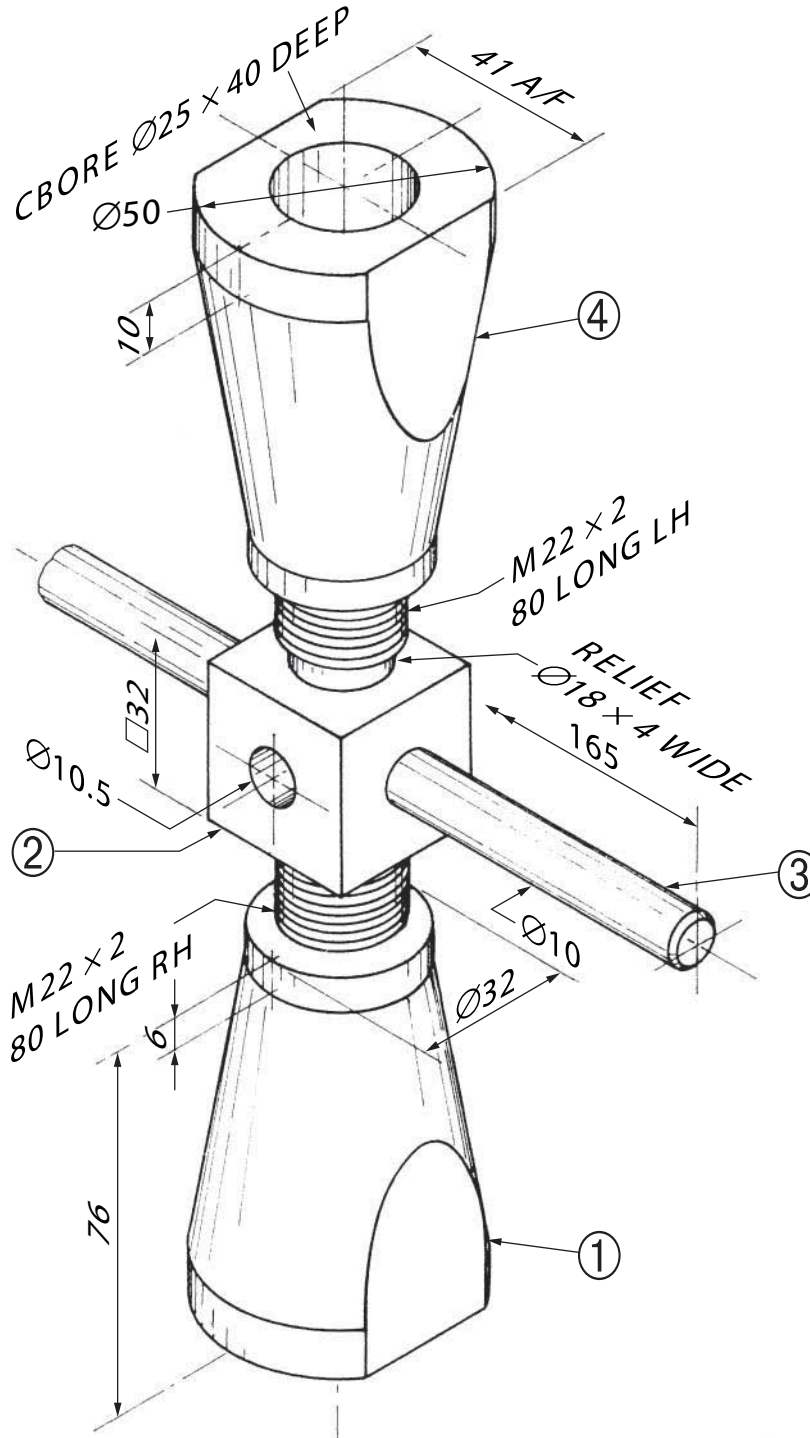
End of paper

Metal and Engineering

Detach this sheet and use Drawing 2005–1 to answer Question 16.

Please turn over

DO NOT SCALE

CBORE ∅25 × 40 DEEP

∅50

41 A/F

10

④

M22 × 2
80 LONG LH

RELIEF
∅18 × 4 WIDE

165

□32

∅10.5

②

M22 × 2
80 LONG RH

6

∅10

∅32

③

76

①

A	26/10/05		ORIGINAL ISSUE				JR	WC
	DATE	ZONE	CHANGE			ECN	BY	CKD
			AMENDMENTS					

4	BASE LH	1	CI
3	BAR	1	BMS
2	DOUBLE SCREW	1	MS
1	BASE RH	1	CI
ITEM	DESCRIPTION	No OFF	MATL

ALL DIMENSIONS IN MILLIMETRES TOLERANCES		DRAWN	JR	BOARD OF STUDIES	
		TRACED	–		
LINEAR	MATERIAL	CHECKED	WC	TITLE	
		APPROVED	TC	JACK SCREW	
ANGULAR		ISSUED	26-10-05		
		RECORD OF ISSUE			
DRAWING STANDARD AS 1100	FINISH	A		SCALE NTS	SIZE A4	DRWG N° 2005–1	SHT