BOARD OF STUDIES
NEW SOUTH WALES

2010

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 20 minutes for this section

Section II Pages 9–15

35 marks

- Attempt Questions 16–19
- Allow about 50 minutes for this section

Section III Page 17

15 marks

- Attempt Question 20
- Allow about 25 minutes for this section

Section IV Page 18

15 marks

- Attempt Question 21
- Allow about 25 minutes for this section

Section I

15 marks
Attempt Questions 1–15
Allow about 20 minutes for this section

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

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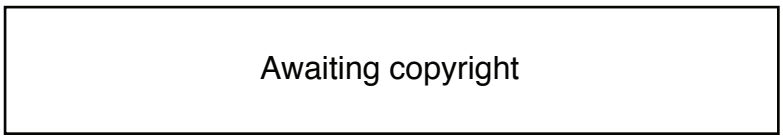
1 What type of metalworking punch is shown?



(A) Centre

(B) Hole

(C) Nail

(D) Pin

2 Which is the best tool to test a metal component for flatness?

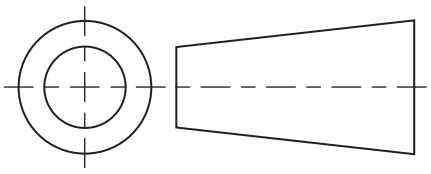
(A) Steel rule

(B) Trammels

(C) Spring dividers

(D) Vernier calipers

3 What angle of orthographic projection is represented by the following symbol?



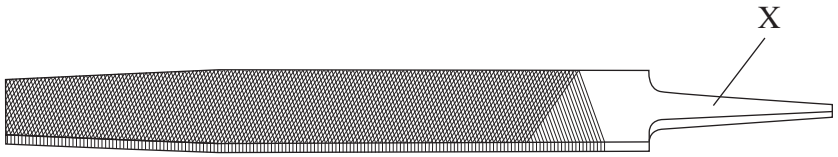
(A) First

(B) Second

(C) Third

(D) Fourth

4 What is the part labelled X on the file shown?



File, D Schlyder, Engineering: An industry study for secondary schools, P.C.S Publications, 2001, reproduced with permission.

(A) Ferrule

(B) Handle

(C) Shoulder

(D) Tang

5 What action should be taken if a portable electric power drill starts making a strange noise?

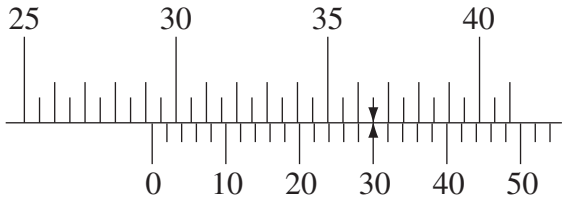
(A) Check that the job is securely clamped.

(B) Report the fault to a supervisor or manager.

(C) Keep using the drill to see if the noise goes away.

(D) Return the drill to its storage area and obtain another drill.

6 What is the reading on the vernier scale as indicated by the arrows?



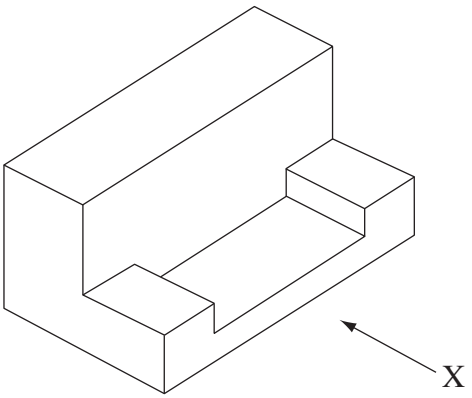
(A) 25.30

(B) 29.30

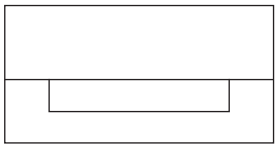
(C) 35.30

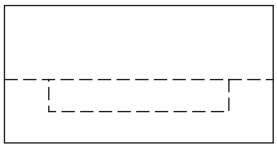
(D) 36.30

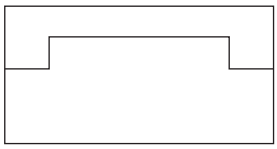
7 A recessed step block is shown.

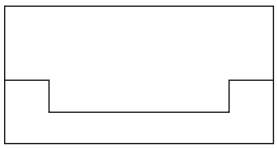


Which of the following drawings is the view from direction X?

(A) 

(B) 

(C) 

(D) 

8 A shaft is to be machined to $\varnothing 60.56\ ^{+0.02}_{-0.00}$ mm.

What is the maximum allowable diameter of the machined shaft?

(A) 60.56 mm

(B) 60.58 mm

(C) 60.76 mm

(D) 62.56 mm

9 Which of the following is incorporated into an industrial award?

(A) Rates of pay

(B) Union membership

(C) Reporting procedures

(D) Standards of workmanship

10 A component is drawn using a scale of 1:20.

If its actual length is 120 mm, what would its length be when drawn?

(A) 0.16 mm

(B) 6.00 mm

(C) 140 mm

(D) 2400 mm

11 When should a micrometer be calibrated?

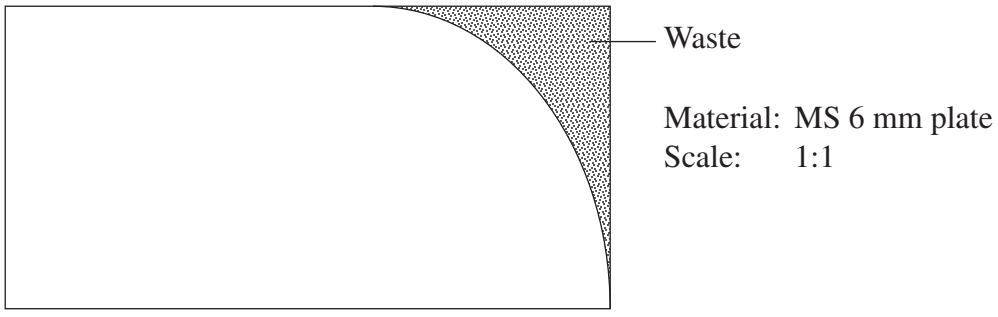
(A) Every ten minutes

(B) At the end of a job

(C) At the beginning of a job

(D) At both the beginning and the end of a job

12 A rectangular piece of material is shown.



What would be the most appropriate tool to efficiently remove the majority of the waste shown in the shaded area?

(A) File

(B) Tinsnips

(C) Hacksaw

(D) Bench shears

13 What class of safety sign is used when specifc personal protective equipment (PPE) must be worn?

(A) Danger

(B) Mandatory

(C) Hazard warning

(D) Emergency information

14 Lifting heavy loads from below knee level is a common cause of back injuries in the workplace.

What is the most effective method of control for reducing these injuries?

(A) Make heavy loads more compact.

(B) Slightly bend knees and use leg muscles.

(C) Avoid putting the heavy loads on the floor.

(D) Put handles on the heavy loads for a better grip.

15 What is the primary purpose of a standard operating procedure (SOP) in controlling the quality of a manufactured product?

(A) The reduction and control of hazards

(B) The reduction in variation of the products

(C) The improvement of client communication

(D) The detection and reporting of product defects

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2010 HIGHER SCHOOL CERTIFICATE EXAMINATION

Metal and Engineering

Centre Number

Student Number

Section II

35 marks
Attempt Questions 16–19
Allow about 50 minutes for this section

Detach pages 19–20, and use Drawing 2010–1, TANK SUPPORT FRAME, to answer Questions 16–17.

Answer the questions in the spaces provided. These spaces provide guidance for the expected length of response.

Question 16 (10 marks)

Refer to Drawing 2010–1 to answer parts (a) to (e).

(a) What is the purpose of the pictorial drawing shown at B5? **1**

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(b) What item was changed for issue B? **1**

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(c) Section A–A is known as a section plane. **2**

Provide reasons for the use of a section plane.

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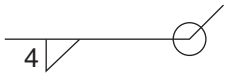
(d) Refer to the welding symbol found at C2. Describe the features of the welding symbol shown. **2**



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Question 16 continues on page 10

Question 16 (continued)

(e) Calculate the total cost of materials to produce three (3) tank support frames. Show all working. **4**

Price list:

- $38 \times 38 \times 6$ angle — \$2.00 per linear metre
- 50×6 flat bar — \$1.20 per linear metre

NOTE: Do not allow for waste.

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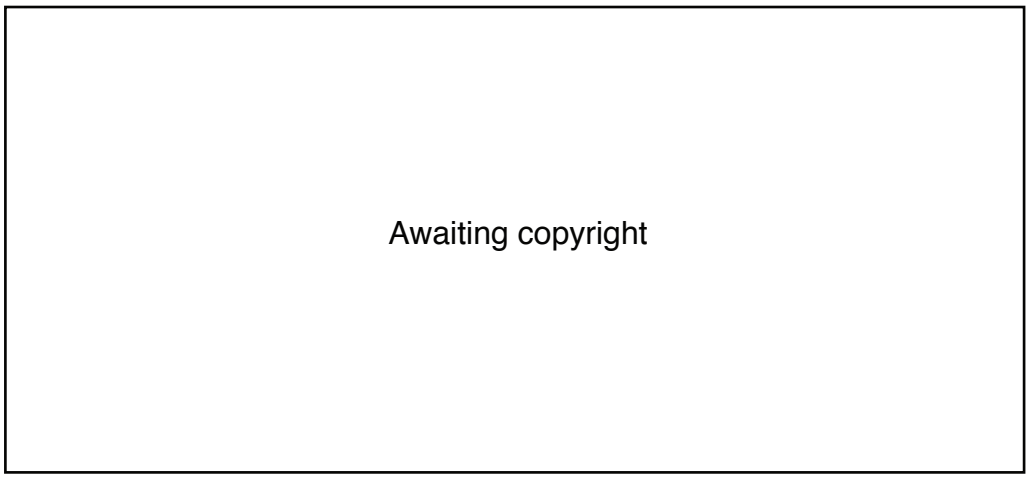
End of Question 16

Question 17 (9 marks)

(a) Using information from Drawing 2010–1, TANK SUPPORT FRAME, insert the correct dimensions in the table. **3**



Question 17 continues on page 12

Question 17 (continued)

(b) In the table pro vided, propose a sequence of steps that could be follo wed to mark out and manuf acture Item 4 – FOO T PAD. F or each step list the tools required. **6**

Sequence of steps – marking out	*Tools*
Sequence of steps – manufacture	*Tools*

End of Question 17

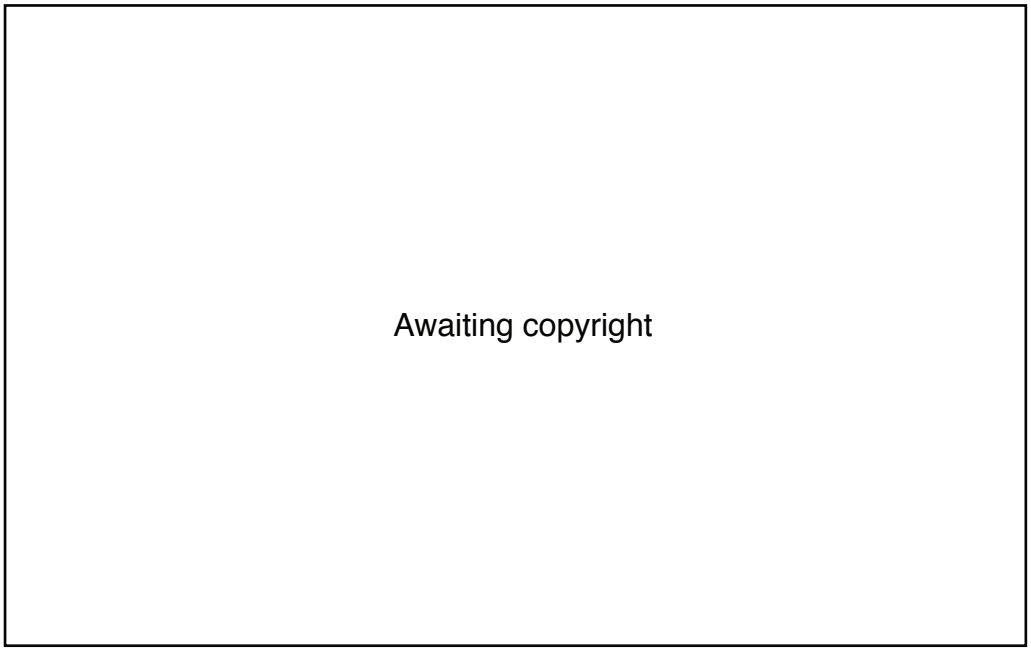
Metal and Engineering

Centre Number

Section II (continued)

Student Number

Question 18 (8 marks)



(a) What type of drilling machine is shown? **1**

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(b) Propose a pre-operational safety checklist for the drilling machine. **3**

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Question 18 continues on page 14

Question 18 (continued)

(c) Alex is using the drilling machine to drill a ∅20 mm hole in 6 mm thick mild steel and notices that the drill bit o verheats and does not cut properly. **4**

Explain how Alex could prevent these problems from occurring.

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End of Question 18

Question 19 (8 marks)

(a) Identify a type of error that can occur when using a steel rule. **1**

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(b) Provide a use for the measuring and testing de vices listed in the table. **3**

Name of tool	*Use*
Engineers square	
Feeler gauge	
Outside micrometer	

(c) Explain how the industry practice *measure twice, cut once* influences production quality. **4**

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Metal and Engineering

Section III

15 marks
Attempt Question 20
Allow about 25 minutes for this section

Answer the question in a writing booklet. Extra writing booklets are a vailable.

In your answer you will be assessed on ho w well you:

- demonstrate knowledge and understanding relevant to the question
- communicate ideas and information using rele vant workplace examples and industry terminology
- present a logical and cohesi ve response

Question 20 (15 marks)

Explain ho w indi vidual emplo yees can contrib ute to the health and safety of others in the workplace by fulfilling their responsibilities and duties.

Please turn over

Section IV

15 marks
Attempt Question 21
Allow about 25 minutes for this section

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

Question 21 (15 marks)

Vocational training is seen by the manufacturing, engineering and related industries as critical to skilling the workforce to meet changing needs. Opportunities to develop skills to meet these changing needs may be provided through a combination of both on-the-job and off-the-job training.

(a) Name an emerging technology and state how it has changed the skills required of manufacturing workers. **2**

(b) Outline the strategies an employer can use for on-the-job training of new skills. **4**

(c) Describe the training requirements and employment conditions for both apprenticeships and traineeships in NSW. **9**

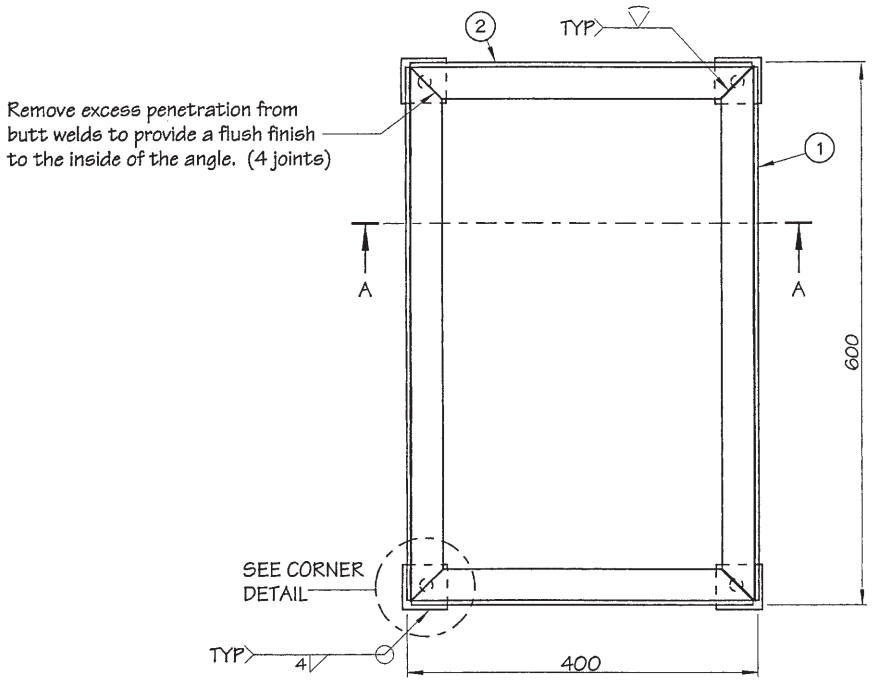
End of paper

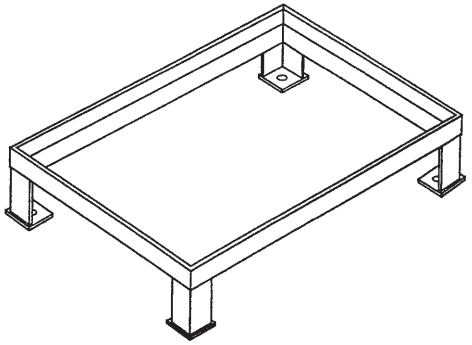
Detach this sheet and use Drawing 2010–1 to answer Questions 16–17.

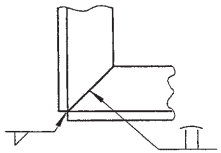
Please turn over

DO NOT SCALE

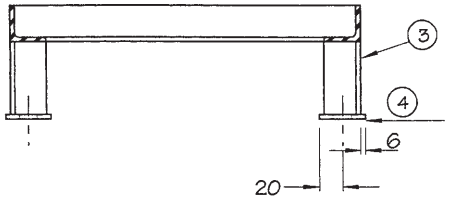
ITEM	DESCRIPTION	No OFF	DRG No
4	FOOT PAD	4	
3	LEG 84 long	4	
2	END 388 long	2	
1	SIDE 588 long	2	



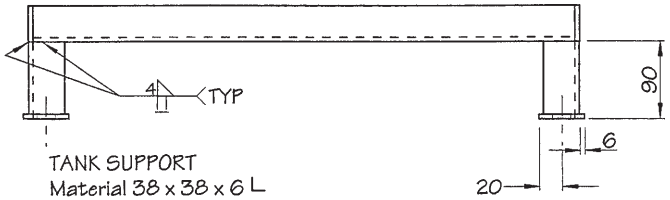




CORNER DETAIL
N.T.S.



SECTION 'A A'



TANK SUPPORT
Material 38 x 38 x 6 L

ISSUE	DATE	ZONE	CHANGE	ECN	BY	CKD
B	20/12/09	D6	90 was 80		LA	JD
A	09/11/09		ISSUED FOR PRODUCTION			

AMENDMENTS

ALL DIMENSIONS IN MILLIMETRES
TOLERANCES
LINEAR ± 0.5
ANGULAR ± 0°–30

DRAWING PRACTICE
AS 1100

MATERIAL
NA

FINISH
UNO
12.5

DRAWN	LA
TRACED	BM
CHECKED	GH
APPROVED	JD
ISSUED	09/11/09
RECORD OF ISSUE	

A	B			

BOARD OF STUDIES

TITLE
TANK SUPPORT FRAME

SCALE	SIZE	DRWG N	SHT
NTS	A4	2010–1	1