NSW Education Standards Authority

2018 **HIGHER SCHOOL CERTIFICATE EXAMINATION**

Metal and Engineering

General Instructions

- Reading time – 5 minutes
- Working time – 2 hours
- Write using black pen
- Calculators approved by NESA may be used
- Write your Centre Number and Student Number at the top of pages 9, 13 and 15

Total marks: 80

Section I – 15 marks (pages 2–6)

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

Section II – 35 marks (pages 9–16)

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

Section III – 15 marks (page 17)

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

Section IV – 15 marks (page 18)

- 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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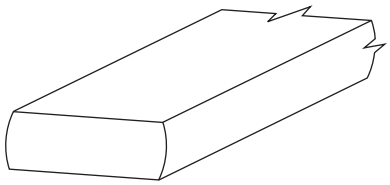
1 A piece of material stock is shown.



What is the name of the material?

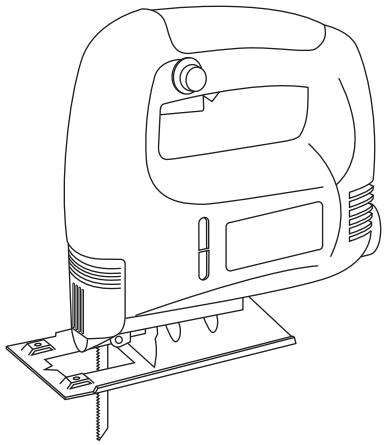
A. Flat bar

B. Angle bar

C. Square bar

D. Rectangle bar

2 A hand-held power tool is shown.



What is the name of the hand-held power tool?

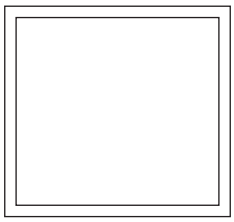
A. Shears

B. Jigsaw

C. Nibbler

D. Angle grinder

3 A section of mild steel tube with a wall thickness of 1.5 mm is shown.



What would be the most appropriate hacksaw blade to use to cut this steel?

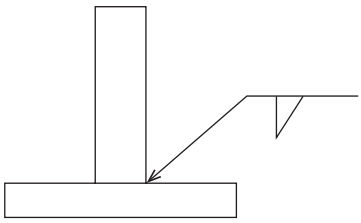
A. 14 TPI

B. 18 TPI

C. 24 TPI

D. 32 TPI

4 A drawing symbol is shown.



The symbol indicates a fillet weld

A. all around the joint.

B. on both sides of the joint.

C. on the arrow side of the joint.

D. on the opposite side of the joint.

5 A metal fabrication company has just received the following delivery of steel:

- 5 lengths of 12 mm diameter round bar each 6 metres long
- 6 lengths of 40 mm × 40 mm angle iron each 9 metres long.

How many linear metres of material have been delivered?

A. 26

B. 48

C. 84

D. 98

6 To what accuracy does an outside micrometer measure?

A. 0.001 mm

B. 0.01 mm

C. 0.1 mm

D. 1.0 mm

7 Holes are to be drilled in a large number of identical items.

What would be the most effective device for holding the items on the drilling table to ensure consistent accuracy while drilling?

A. G clamp

B. Template

C. Clamping jig

D. Engineer's vice

8 In quality management systems, at what point are quality control measures NOT carried out?

A. At the time of delivery

B. At the start of production

C. At the completion of production

D. At the midpoint of production time

9 Which of the following best expresses the hierarchy of risk control measures used to manage hazards?

A. Remove the hazard, change the process, adopt controls

B. Assess the hazard, isolate the hazard, substitute the equipment

C. Complete risk assessment, check the hazard, inform supervisor

D. Modify the equipment, document the hazard, evaluate the hazard

10 In an orthographic drawing, what is the angle between the line of sight and the plane of projection?

A. 30°

B. 45°

C. 60°

D. 90°

11 Which type of fire extinguisher should be used to extinguish an electrical fire in a workshop?

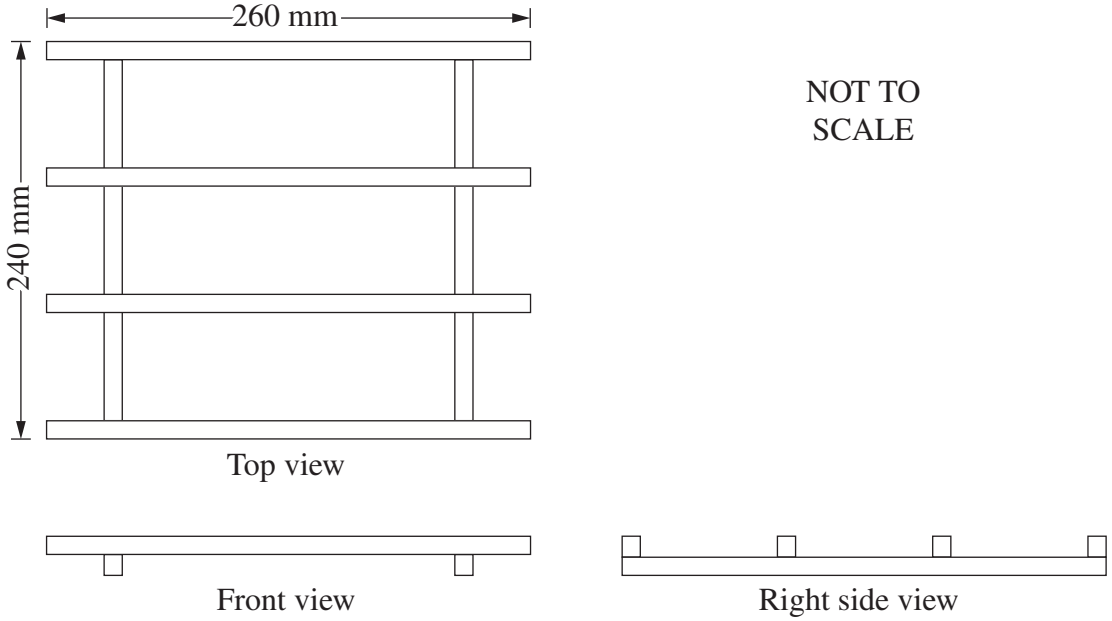
A. Foam

B. Water

C. Dry chemical

D. Wet chemical

12 The diagrams show a grate manufactured from 10 mm bar.



Calculate the linear amount of material required to make 6 grates.

A. 6240 mm

B. 8640 mm

C. 9120 mm

D. 9360 mm

13 A welder takes long service leave and goes on holidays. While on holidays he injures himself.

Under which benefit in the award is he entitled to claim this period of time off with the injury?

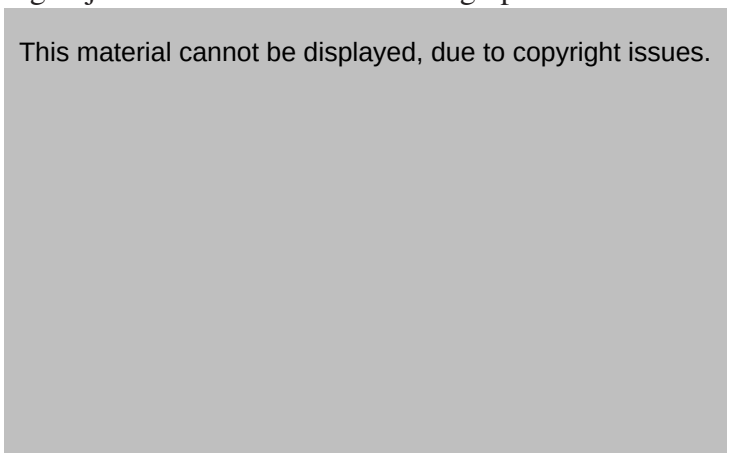
A. Sick leave

B. Holiday pay

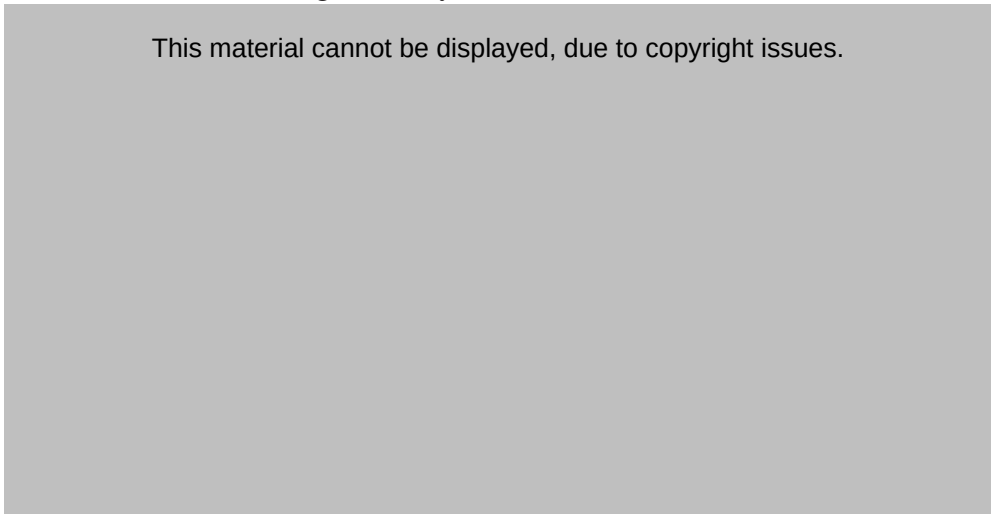
C. Long service leave

D. Workers compensation

14 The following object has been sectioned through plane A–A.



Which of the following correctly shows section A–A?



15 With the help of their union, the workers in a metal and engineering business have negotiated their terms and conditions of employment with their employer.

These employment terms and conditions will now be set out in

A. a union agreement.

B. an industrial award.

C. a flexible arrangement.

D. an enterprise agreement.

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Centre Number

Student Number

Metal and Engineering

Section II

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

Detach the page at the end of the paper and use Drawing 2018–1, MATERIAL GAUGE, to answer Question 19.

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

Show all relevant working in questions involving calculations.

Question 16 (6 marks)

Please turn over

Question 16 (6 marks)

A tool commonly used in the metal and engineering workplace is shown.

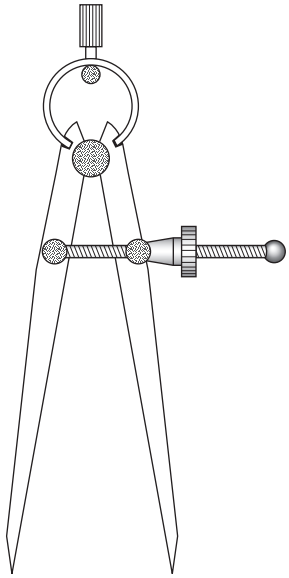

Image of a spring divider – taken from p56 of *Engineering, An Industry Study*, 4th ed, S D Baker, Peridis Publishing, Toowoomba, 2018, ISBN: 9780947225490

(a) Name the tool shown. **1**

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(b) List TWO uses of this tool. **2**

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(c) What is required to maintain the accuracy of the tool shown? **3**

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Question 17 (8 marks)

(a) What does the term *duty of care* mean in a workplace? **2**

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(b) Why are 'good housekeeping' practices important in the workplace? **3**

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(c) 'No matter how minor, all accidents should be reported.' **3**

Explain the importance of this statement for both the workplace and the employee.

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Centre Number

Metal and Engineering

Student Number

Section II (continued)

Question 18 (11 marks)

The drawing shows a pedestal drill.

(a) What pre-operational checks should be performed on this machine? **3**

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Question 18 continues on page 14

Question 18 (continued)

(b) A 22 mm hole needs to be drilled into a 12 mm mild steel plate. **4**

Explain why a pilot drill is used before drilling the 22 mm hole.

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(c) Machines have safe operating procedures (SOP) displayed at their locations. **4**

Compare the purpose and use of a safe operating procedure and a safe work method statement.

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End of Question 18

Centre Number

Metal and Engineering

Student Number

Section II (continued)

Question 19 (10 marks)

Use the drawing of the Material Gauge on page 20 to answer Question 19.

(a) At the location D4 on the drawing, the dimension R12.5 is shown. **1**

What does the R mean?

.....

(b) Complete the materials list by filling in the missing dimensions. **3**

Item	*Description*	*Length*	*Width*	*Thickness*	*Quantity*
1	External gauge				1

Question 19 continues on page 16

Please turn over

(c) ITEM 2 is to be manufactured using 25 × 8 mm mild steel bar. **6**

Complete the table by providing a sequence of steps and the tools required for BOTH marking out and manufacturing ITEM 2.

Sequence of steps – marking out	*Tools required*
Sequence of steps – manufacturing	*Tools required*

End of Question 19

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 available.

Your answer will be assessed on how well you:

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

Question 20 (15 marks)

Explain how both production and efficiency within the metal and engineering industry have been affected by new and emerging technologies.

Please turn over

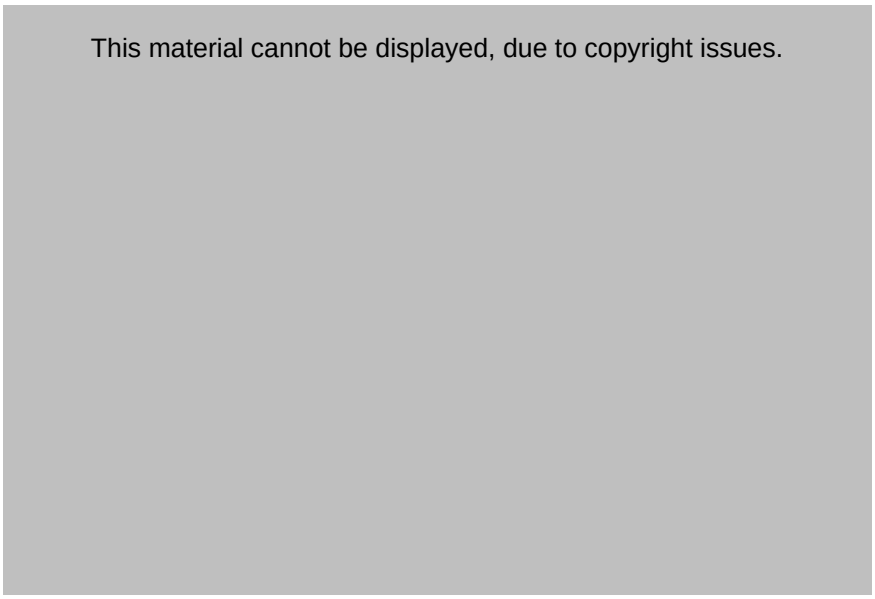
Section IV

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)

In the image, a metal fabricator is using an abrasive cut-off saw.



(a) Identify TWO safety breaches shown in the image. **2**

(b) A risk assessment is conducted for the operation of power tools such as the one shown in the image. **4**

What steps should the employer then take to help control the risk of injury?

(c) Explain the implications for the worker and the business when safety procedures have not been followed. **9**

End of paper

Metal and Engineering

Detach this sheet and use Drawing 2018–1 to answer Question 19

Please turn over

ITEM	DESCRIPTION	MATERIAL	QTY
1	EXTERNAL GAUGE	50 mm × 12 mm FLAT BAR	1
2	INTERNAL GAUGE	25 mm × 8 mm FLAT BAR	1
3			

ZONE	CHANGE	DATE

AMENDMENTS

ALL DIMENSIONS IN MILLIMETRES
TOLERANCES
LINEAR ±0.5 MM
ANGULAR

DRAWN LA
TRACED –
CHECKED CB
APPROVED
ISSUED 21-06-2018
RECORD OF ISSUE

NSW EDUCATION STANDARDS AUTHORITY

MATERIAL
NA

TITLE
MATERIAL GAUGE

DRAWING PRACTICE
AS 1100

FINISH
NA

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SCALE NTS | SIZE A4 | DRWG N 2018–1 | SHT 1 OF 1