BOARD OF STUDIES
NEW SOUTH WALES

STUDENT NUMBER

CENTRE NUMBER

HIGHER SCHOOL CERTIFICATE EXAMINATION

1998

INDUSTRIAL TECHNOLOGY

2 UNIT

SECTION III—METAL

Total time allowed for Sections I, II and III—One hour and a half
(Plus 5 minutes reading time)

DIRECTIONS TO CANDIDATES

- Write your Student Number and Centre Number at the top right-hand corner of this page.
- Where appropriate, show working for solutions neatly and clearly.
- You may use Board-approved drawing instruments and calculators.

Section III—Metal (15 marks)

- Attempt ALL questions.
- Answer the questions in the spaces provided in this paper.

MARKER'S USE ONLY

Question		
13		
14		
15		

QUESTION 13. (5 marks)

MARKER'S USE ONLY

Shown below is an exploded pictorial drawing of a tow ball assembly.

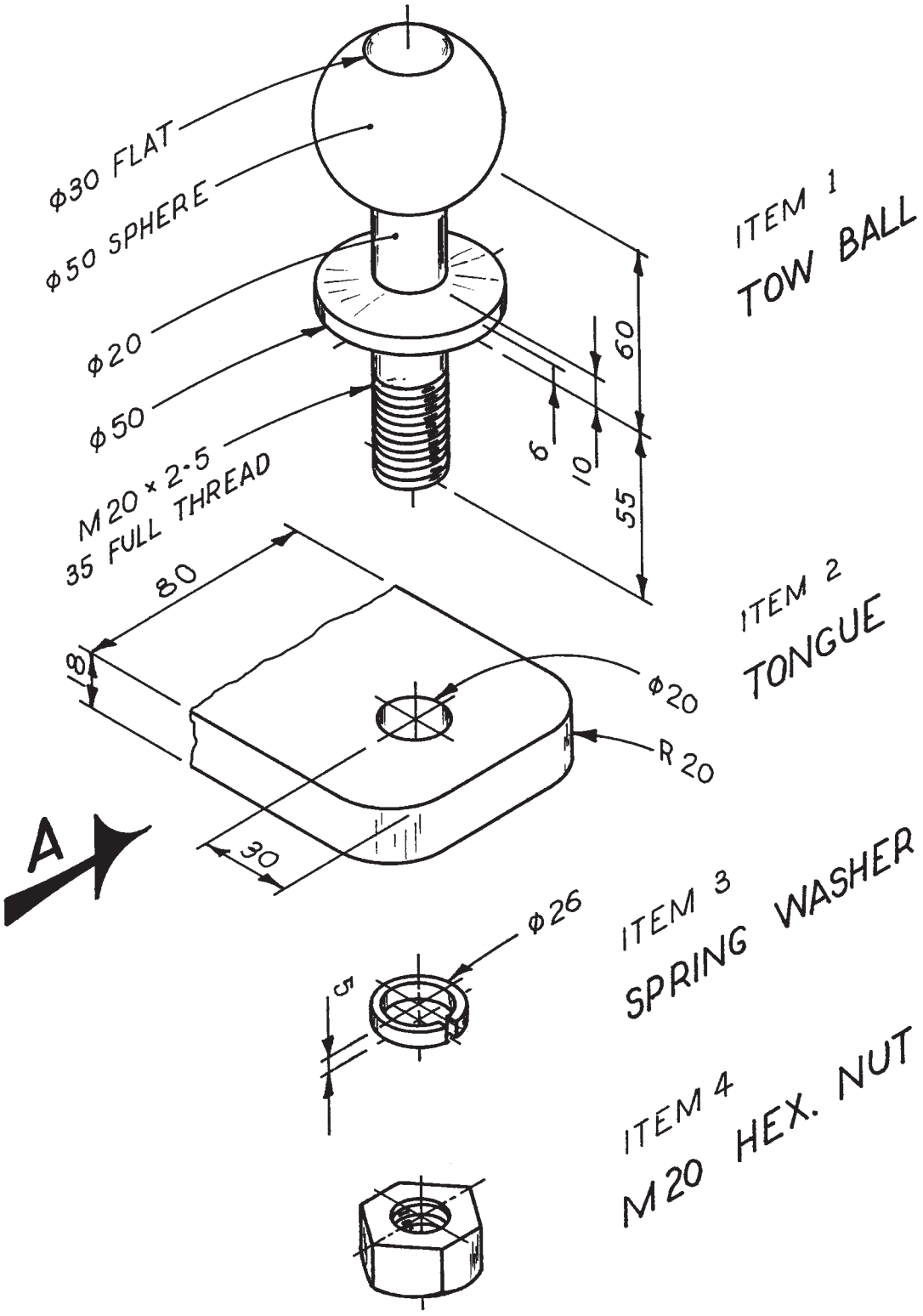


FIG. 1. TOW BALL ASSEMBLY

QUESTION 13. (Continued)

MARKER'S USE ONLY

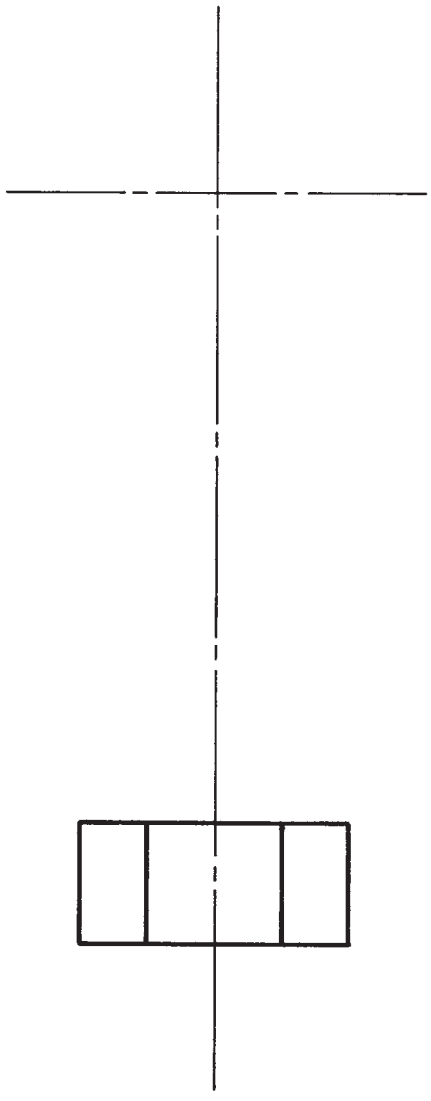
(a) Using the details given on page 2, draw a front view from direction *A* of Figure 1—tow ball assembly, to a scale of 1 : 1.

(b) Show the following dimensions on the drawing. Use correct dimensioning standards.

(i) The diameter of the spherical end of the tow ball

(ii) The taper on the collar of the tow ball

(iii) The surface finish symbol for a value of 1·6 all over



FRONT VIEW

Question 13 continues on page 4

QUESTION 13. (Continued)

MARKER'S USE ONLY

(c) Complete the materials list below by describing each item and indicating a suitable material.

Item	*Description*	*Material*
1		
2		
3		
4		

(d) For Item 1, list FOUR reasons for the choice of this material.

(i) .....

(ii) .....

(iii) .....

(iv) .....

(e) (i) Name TWO important properties that would be required of the material for Item 3.

1. .....

2. .....

(ii) Describe a heat treatment process used to achieve the properties in part (e) (i).

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QUESTION 13. (Continued)

MARKER'S USE ONLY

(f) Calculate the cost of producing 50 tow ball assemblies using the data below.

∅50 solid bar (140 mm cut length)	$96 per 3 m length
Spring washer	12 cents each
M20 hex nut	20 cents each
Cost of machining	$3 each

Cost = $ .....

(g) The thread on Item 1 is not machined the full length of the spigot. Give TWO reasons for this.

(i) .....

.....

(ii) .....

.....

(h) At what angle would the lathe compound slide be set to machine the taper on the collar of Item 1?

Angle = ...°

Question 13 continues on page 6

QUESTION 13. (Continued)

MARKER'S USE ONLY

(i) What tool would be used to accurately measure the diameter of the spigot on Item 1 before the thread is machined?

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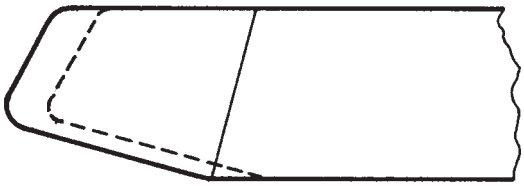
(j) On the drawings below, clearly label the following cutting-tool angles.

(i) Front clearance angle

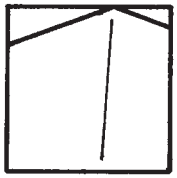
(ii) Side cutting angle

(iii) Back rake angle

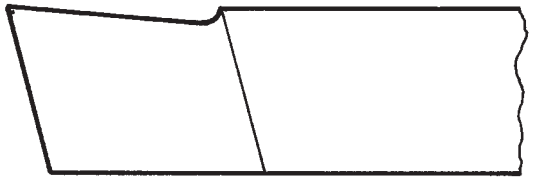
(iv) Side rake angle



TOP VIEW



LEFT SIDE VIEW



FRONT VIEW

QUESTION 14. (5 marks)

MARKER'S USE ONLY

Details of a barbeque (BBQ) stand are given below.

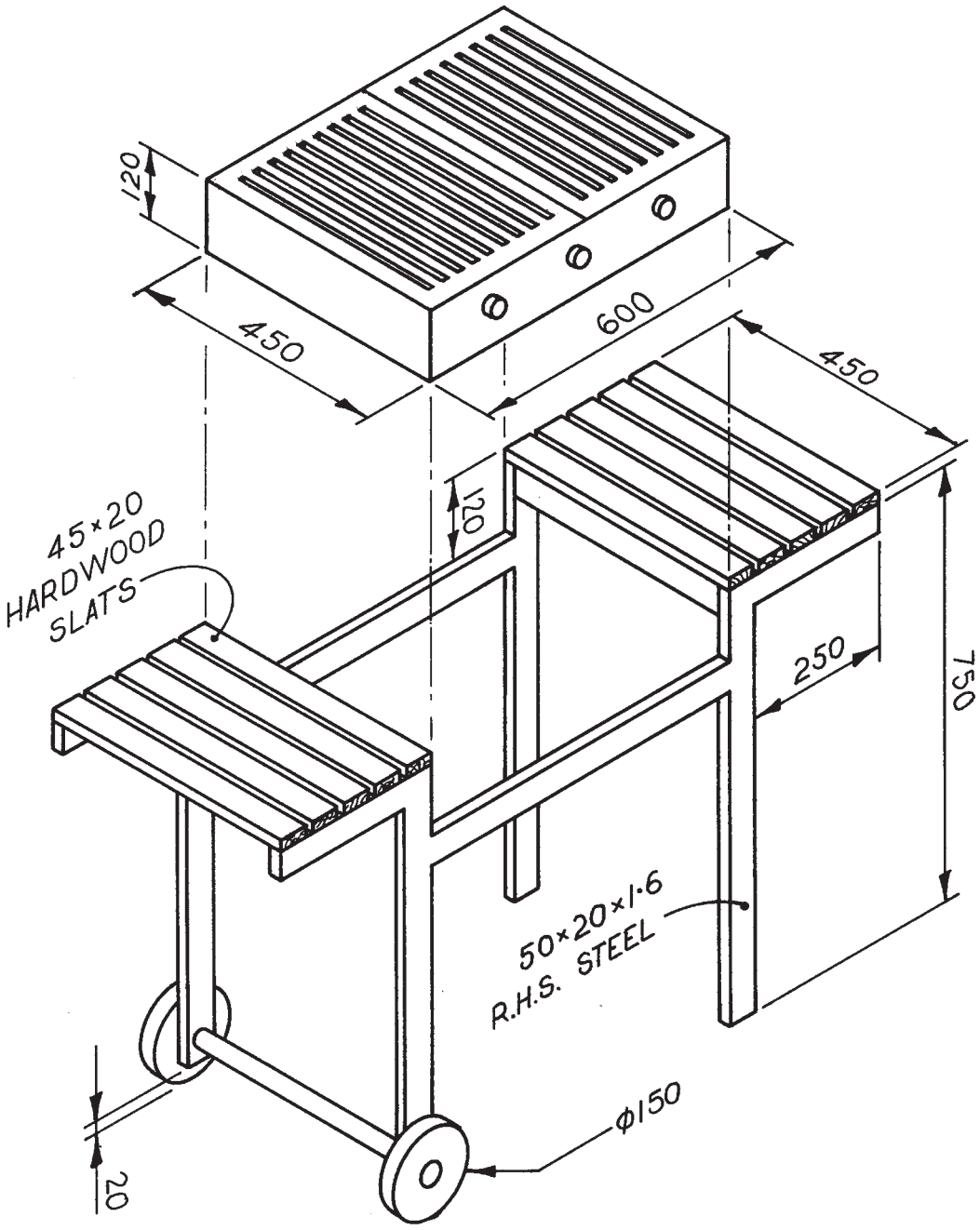


FIG. 2. BBQ STAND

Question 14 continues on page 8

QUESTION 14. (Continued)

MARKER'S USE ONLY

(a) The BBQ stand is to be fabricated from $50 \times 20 \times 1{\cdot}6$ RHS steel.

(i) Explain the description: $50 \times 20 \times 1{\cdot}6$ RHS.

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.....

(ii) Name one hand tool and one machine tool that could be used to cut the frame joints.

Hand tool .....

Machine tool .....

(iii) State TWO processes that could be used for permanent joining of the frame members.

1. .....

2. .....

QUESTION 14. (Continued)

MARKER'S USE ONLY

(iv) Select a process that you would use to permanently join the frame members from part (iii).

Process used .....

1. Describe the preparation of the joints that is necessary prior to using this joining process.

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2. Sketch and describe this joining process.

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3. List THREE safety precautions you would need to take when using your selected joining process.

Precaution 1 .....

Precaution 2 .....

Precaution 3 .....

4. Describe the preparation required prior to applying a protective coating to the steel.

.....

.....

.....

5. Name an appropriate surface finishing process for the steel frame.

.....

Question 14 continues on page 10

QUESTION 14. (Continued)

MARKER'S USE ONLY

(v) Sketch a suitable method of attaching the hardwood slats to the steel frame.

(vi) List FOUR safety precautions that should be observed when using a portable 100 mm angle grinder.

1. .....

2. .....

3. .....

4. .....

(b) A manufacturer wishes to mass produce the BBQ stand. To assist in production, a number of jigs would be used. Sketch ONE suitable jig, briefly explaining its purpose.

Purpose

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SKETCH OF JIG .....

QUESTION 14. (Continued)

MARKER'S USE ONLY

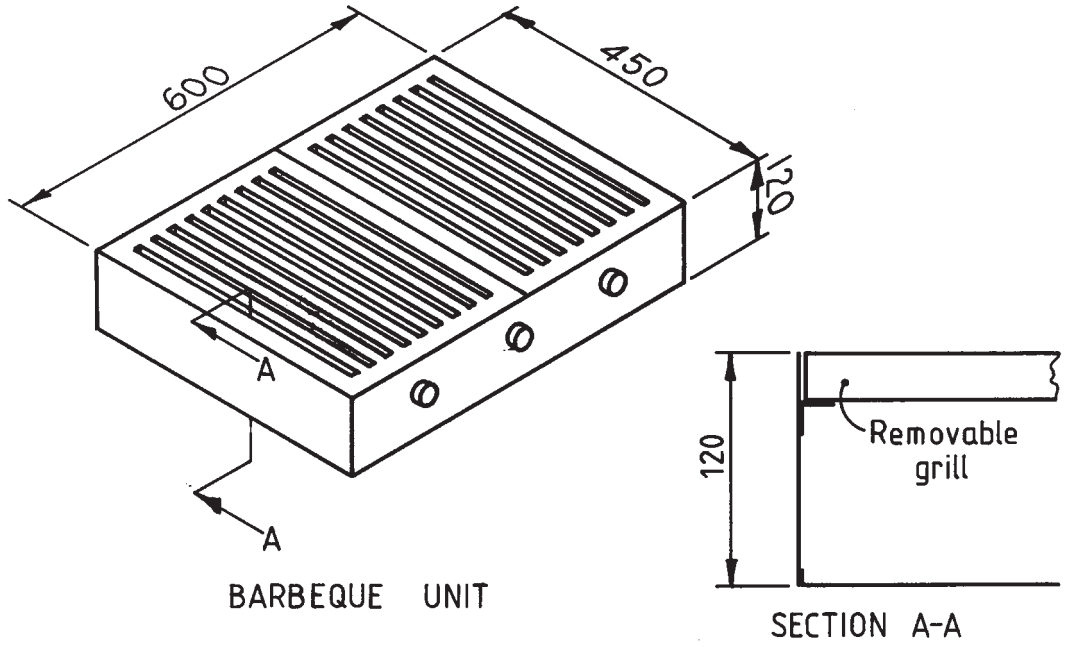
(c) Complete the following table. Make a labelled sketch of the fault and suggest two ways of overcoming the problem for each welding fault.

Welding fault	*Labelled sketch of fault*	*Two ways of overcoming the problem*
Flattened bead Excessive spatter		1. .... 2. ....
Distortion		1. .... 2. ....

QUESTION 15. (5 marks)

MARKER'S USE ONLY

A manufacturer wishes to design an opening hood for the BBQ unit below to enable food to be roasted.



(NOTE. All sheet steel 0·6 mm.)

The design specifications include:

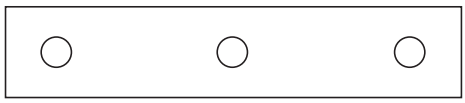
- The hood is to be hinged, and allow a roast of approximately 200 mm height maximum to be cooked on top of the removable grill.
- The hood is to be made from 0·6 mm thick sheet metal.

QUESTION 15. (Continued)

MARKER'S USE ONLY

(a) Using the design specifications and the sizes given, draw a suitable hood for the BBQ unit to a scale of 1 : 10.

TOP VIEW



FRONT VIEW

SIDE VIEW

Scale 1 : 10

(b) Make a neat freehand sketch showing a possible hinge solution for the hood. Indicate the method of attaching the hinge to the BBQ unit and the hood.

Question 15 continues on page 14

QUESTION 15. (Continued)

MARKER'S USE ONLY

(c) Make a neat freehand sketch of a possible development shape suitable for the hood. Include allowances for safe edges and seams. Try to minimise the number of seams.

QUESTION 15. (Continued)

MARKER'S USE ONLY

(d) Refer to your answer in part (c). List and describe the first four steps in making the hood from a piece of flat sheet metal. List the tools/equipment required for each step.

Step 1 .....

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Tools/equipment required .....

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Step 2 .....

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Tools/equipment required .....

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Step 3 .....

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Tools/equipment required .....

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Step 4 .....

.....

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Tools/equipment required .....

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