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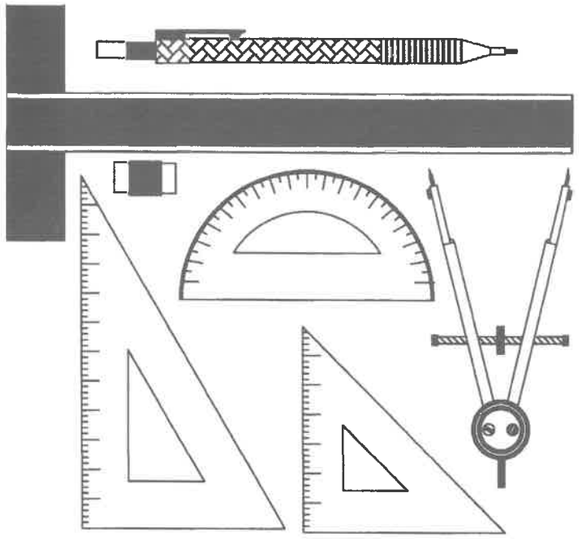

NATIONAL SENIOR CERTIFICATE EXAMINATION

2022

ENGINEERING GRAPHICS AND DESIGN

PAPER 1

MARKS: 200
TIME: 3 HOURS

FOR OFFICIAL USE ONLY					
QUESTION	SECTION	MARK	MODERATED	MAXIMUM	CODE
1	CIVIL ANALYTICAL			20	
2	INTERPENETRATION & DEVELOPMENT			40	
3	TWO-POINT PERSPECTIVE			40	
4	CIVIL DRAWING			100	
	TOTAL			200	

CHECKED BY

Please paste the barcode label here.

EXAMINATION NUMBER

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of **6 pages** including the cover page and **4 questions.**
2. **All** questions must be answered.
3. Unless specified otherwise, all questions are in **First-angle Orthographic Projection.**
4. Unless specified otherwise, all questions are to be completed to a **scale of 1:1.**
5. **All** answer sheets must be re-stapled in numerical order, even questions that have not been answered.
6. All **construction work** must be shown.
7. Print your **examination number** neatly on each page.
8. Use only the **answer sheets** provided.
9. Your drawings should reflect **neatness** and **accuracy.**
10. All dimensions or detail not given must be **assumed** in **good proportion.**
11. Your drawings should comply with SANS 10143.

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FIGURE A

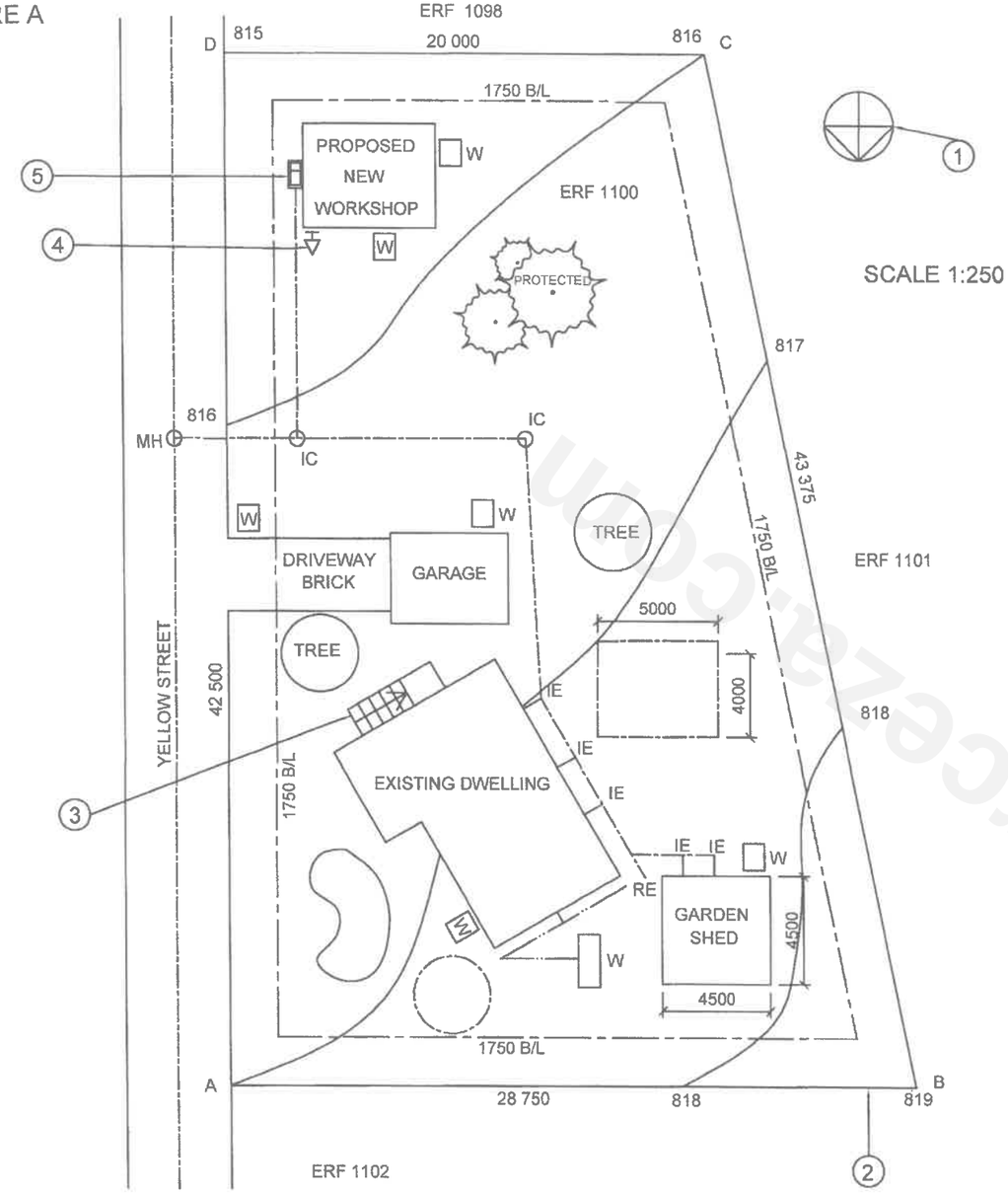


FIGURE B

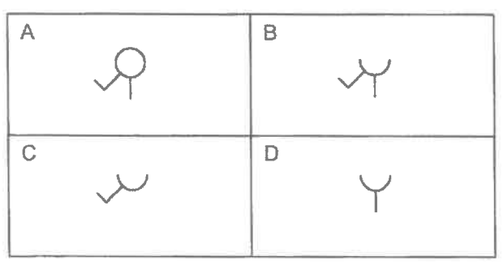
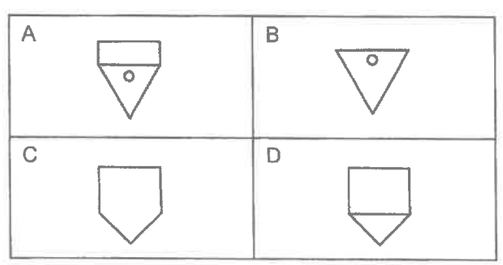


FIGURE C



QUESTION 1

CIVIL ANALYTICAL

STUDY THE ADJACENT DRAWINGS AND ANSWER THE QUESTIONS THAT FOLLOW.
INDICATE THE LETTER CORRESPONDING TO YOUR ANSWER IN THE BLOCK PROVIDED

1.1 What type of drawing is Figure A? A Map B Elevation C Site Plan D Schematic		1
1.2 What are the dimensions of the building that needs to be removed? A 4500 x 4500 B 4000 x 5000 C 400 x 500 D Unknown		1
1.3 In which corner of ERF 1100 is the proposed new workshop? A Southeast B Northeast C Southwest D Northwest		1
1.4 How close can the proposed new workshop be built to Yellow Street? A 20 000 B 42 500 C 1750 D 2000		1
1.5 How many water tanks are there on ERF 1100? A 2 B 3 C 4 D 5		1
1.6 Using the given scale, what is the width of the driveway? A 300 B 3500 C 2500 D 3000		1
1.7 What material is the driveway made out of? A Asphalt B Tar C Stone D Brick		1
1.8 If the ENTIRE property were fenced, how many metres of fencing would be used (nearest metre)? A 135 000 B 135 C 13.5 D 1350		1
1.9 Which ERF borders to the SOUTH of ERF 1102? A ERF 1101 B ERF 1098 C ERF 1100 D Unknown		1
1.10 Identify the beacon heights. Which of the following indicates the greatest downward slope? A A to C B C to A C D to B D B to D		1
1.11 What is the feature at 1 called? A North Arrow B South Point C North Point D South Arrow		1
1.12 What is the feature at 2 called? A Boundary Line B Building Line C Boundary Label D Fence		1
1.13 What does the feature at 3 represent? A Ramp B Steps C Septic Tank D Water Meter		1
1.14 What is the feature at 4 called? A Water Valve B Fire Hydrant C Spade D Fire Extinguisher		1
1.15 What is the feature at 5 called? A Bath B Gully C Grease Trap D Kennel		1
1.16 What is the beacon height of corner A? A 816 B 817 C 818 D 819		1
1.17 Refer to Figure B. Which image is the SANS 10143 symbol for a switched socket outlet? A A B B C C D D		1
1.18 Refer to Figure C. Which image is the SANS 10143 symbol for the elevation view of a wall-mounted urinal? A A B B C C D D		1
1.19 In the space below, determine the area of the GARDEN SHED in metres squared. Round off the answer to TWO decimal places. Answer:		2

20 MARKS

ANSWER SHEET 1

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QUESTION 2

INTERPENETRATION & DEVELOPMENT

The drawings below show the INCOMPLETE Front View, COMPLETE Top View and Left View of a horizontal right equilateral **TRIANGULAR pipe** joined together with a vertical right regular **PENTAGONAL duct.**

Draw the following:

2.1 the complete Front View clearly showing the line of interpenetration formed between the two solids.

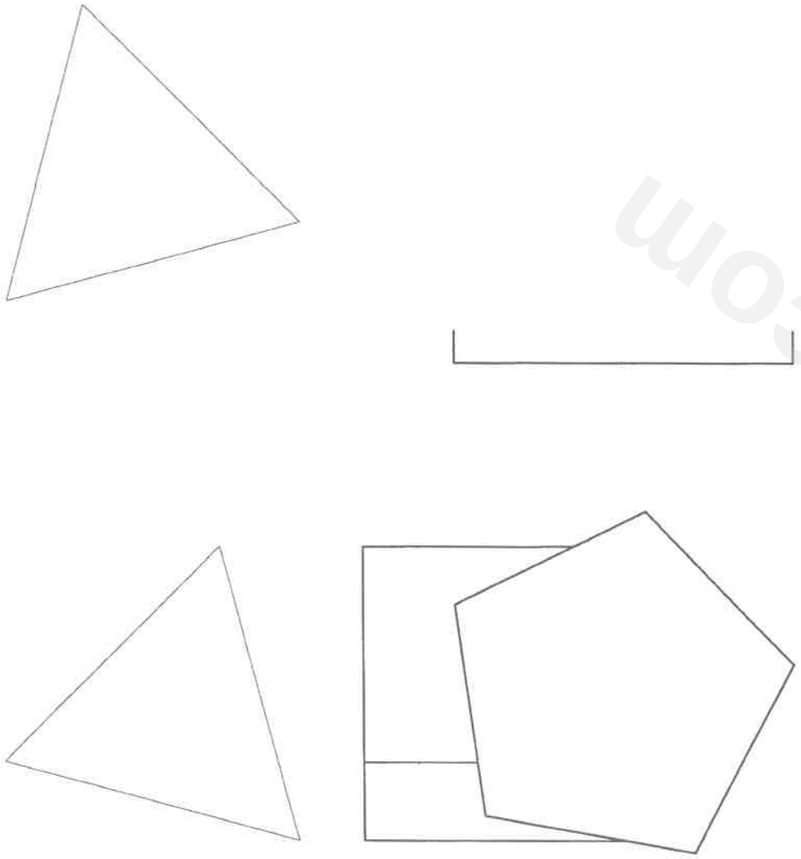
2.2 the surface development of the 3 rectangular panels of the pentagonal duct which shows the lines of interpenetration. These rectangular panels have been indicated by A, B & C below.

Show all hidden detail.
Show all construction.
Do not draw the left view.

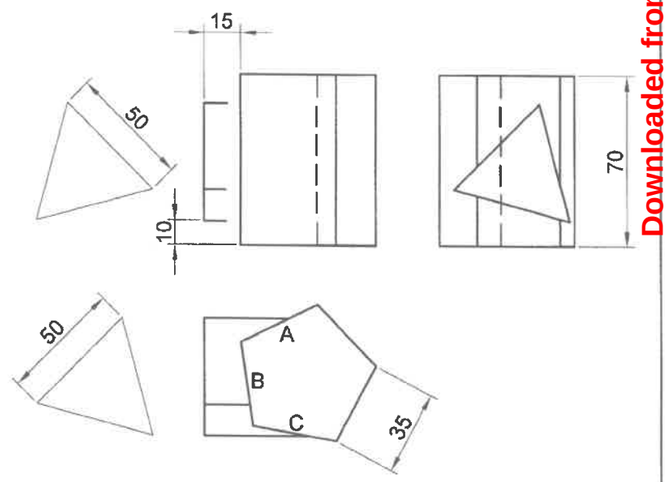
ASSESSMENT CRITERIA

You will be assessed on your ability to do the following:

• draw the given incomplete Front View	6
• complete the Front View	21
• show necessary construction	2
• draw the development	11



DEVELOPMENT of A, B & C



FV 27

CON 2

DEV 11

40 MARKS

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ANSWER SHEET 2

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QUESTION 3

TWO-POINT PERSPECTIVE

The figures show the three views of a partly covered verandah, a pool surface at ground level, a fire pit, a braai and a doorway into an existing dwelling.
Draw a neat two-point perspective view of the verandah, pool surface, fire pit, braai and doorway.

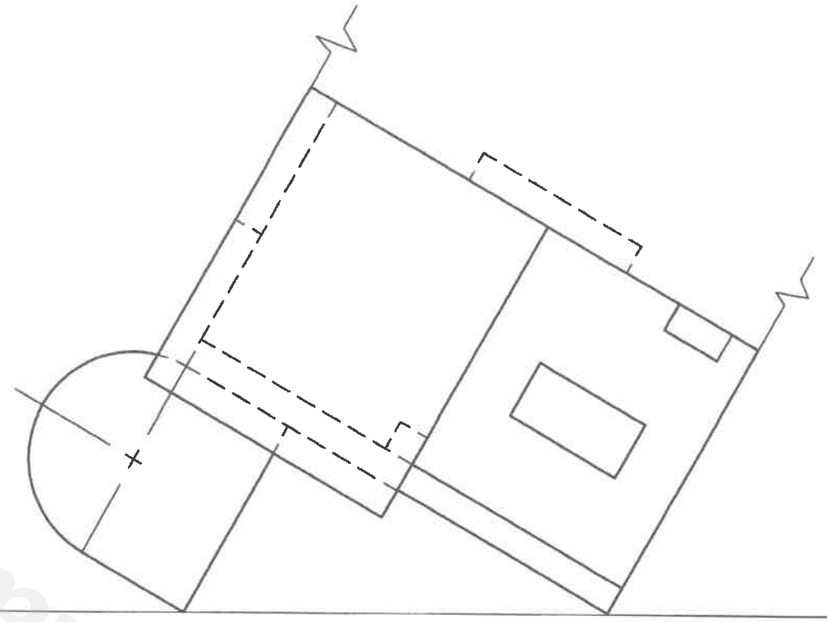
PP - Picture Plane
HL - Horizon Line
GL - Ground Line
SP - Station Point

Neatly label the vanishing points RVP and LVP.
Do not show any depth in the pool.
NO HIDDEN DETAIL IS REQUIRED.

ASSESSMENT CRITERIA

You will be assessed on your ability to do the following:

- determine and label the vanishing points 2
- draw the two-point perspective view 38



40 MARKS

EXAMINATION NUMBER

ANSWER SHEET 3

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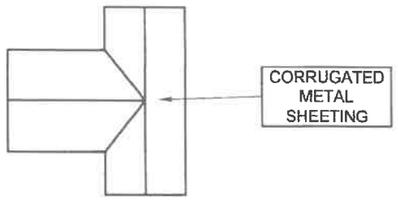
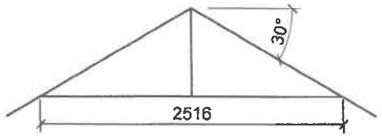
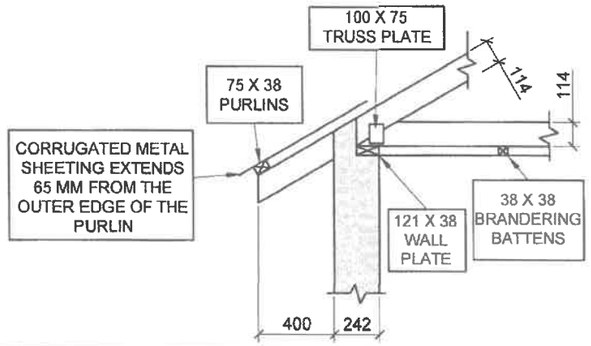
ROOF DETAIL

ROOF PROFILE

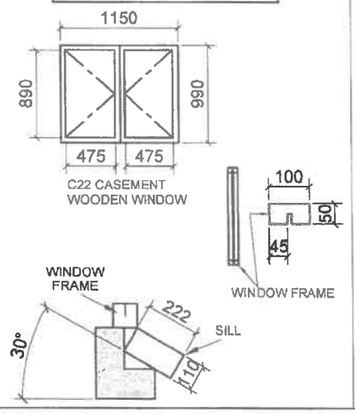


ROOF TRUSS DETAIL

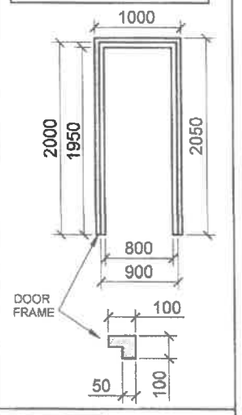




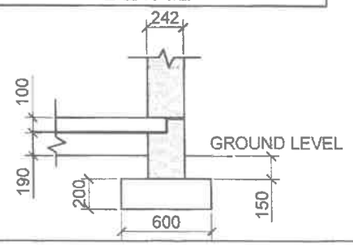
WINDOW DETAIL

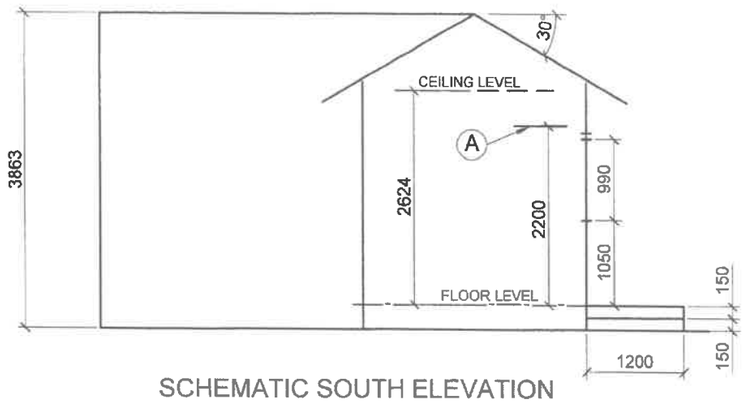


DOOR DETAIL

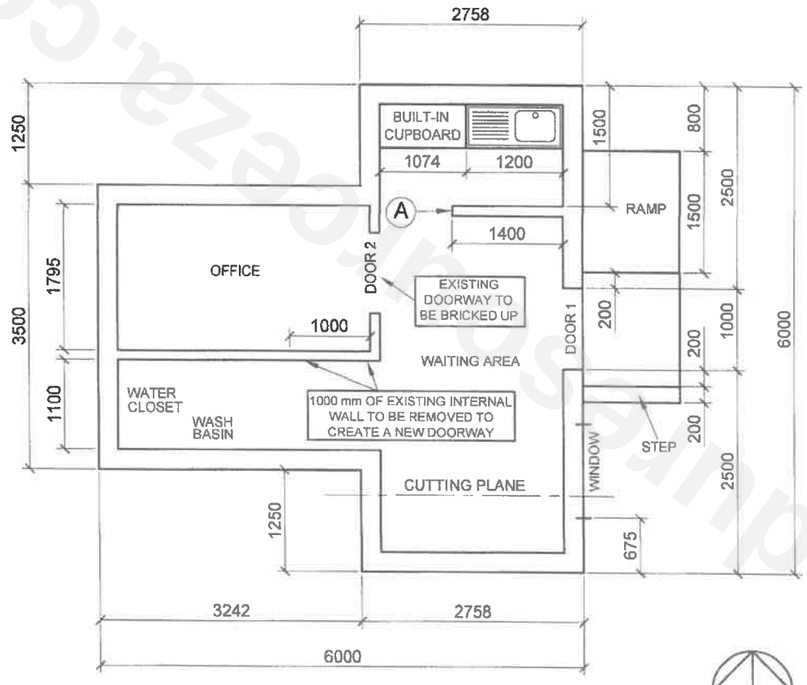


INCOMPLETE FOUNDATION DETAIL





SCHEMATIC SOUTH ELEVATION



SCHEMATIC FLOOR PLAN

NOTES:

- Floor tiles should be used for the entire floor area.
- Brickwork must be carried out as indicated on the schematic floor plan:
  DOOR 2 must be bricked up.
  Part of the internal wall must be removed as indicated to make a new doorway.
- The built-in cupboard and the sink both have a depth of 550 mm.
- The built-in cupboard has a height from finished floor level of 1800 mm.
- The ramp and step lead onto a landing which is the same height as the finished floor level. The ramp has a gradient of 1:5.
- The internal wall marked "A" has a height from the finished floor level of 2200 mm.
- The finished floor level is in line with the top of the screed.

QUESTION 4

CIVIL DRAWING

Answer this question on ANSWER SHEET 4 (page 6).
All drawings must comply with SANS 10143.

The following are given:

- Roof detail
- Window detail
- Door frame detail
- Incomplete foundation detail
- An incomplete schematic elevation with
  - ▶ window positions, ground and floor levels
- An incomplete schematic floor plan of a tiled ***CLINIC*** with
  - ▶ window and door positions
  - ▶ perimeter dimensions

Draw the following on Answer Sheet 4 using a scale of 1:50:

1) The **complete FLOOR PLAN**
2) The **SECTIONAL SOUTH ELEVATION** on the indicated cutting plane

FLOOR PLAN INSTRUCTIONS

- Draw the complete floor plan of the clinic
- The following alterations must be made to the clinic:
  - ▶ Remove and brick up DOOR 2
  - ▶ Remove part of the internal wall as indicated for a new doorway
- Draw and hatch all walls
- Insert the window details
- Insert the door detail of the external door (DOOR 1) only
- Draw the ramp and landing. Indicate the inclination of the ramp
- Draw the step and indicate the direction
- Indicate a smoke detector in the centre of the office
- Insert the following electrical detail:
  - ▶ A two-tube, 40 watt fluorescent light in the waiting area
  - ▶ a single-pole, wall-mounted light switch for the fluorescent light, next to the **external door**
- Insert all the plumbing fixtures according to the correct SANS 10143 conventions, using appropriate measurements
- Draw the built-in cupboard
- Label the floor plan and indicate the scale
- Draw and label the cutting plane A-A

SECTIONAL SOUTH ELEVATION INSTRUCTIONS

- Draw the complete SOUTH ELEVATION showing the section as per the indicated cutting plane and the remaining outside elevation
- Complete the foundation details
  - ▶ insert all floor slab and substructure details
  - ▶ use 190 mm compacted hardcore filling and 10 mm screed
- Label the ground level and damp-proof course
- Draw in the sectional window using the C22 frame detail
  - ▶ use ONE 242 x 75 mm concrete lintel above the window
  - ▶ use a 222 x 110 mm quarry tile for the windowsill
  - ▶ show the window frame detail
- Roof details
  - ▶ draw the roof truss using 114 x 38 mm rafters and 100 x 75 mm truss plates
  - ▶ use FOUR 75 x 38 mm purlins spaced appropriately
  - ▶ use TWO 121 x 38 mm wall plates
  - ▶ use TWO 38 x 38 mm ceiling battens spaced appropriately
  - ▶ use corrugated metal sheeting for the roof with a 30° pitch
  - ▶ use 9 mm gypsum ceiling boards
- Draw the internal wall marked "A" and the built-in cupboard
- Draw the step
- Show all hatching detail
- Label the SECTIONAL SOUTH ELEVATION

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QUESTION 4

CIVIL DRAWING

Assessment Criteria

Sectional Elevation

1	Ceiling Battens	2	
2	Wall Plates	2	
3	Ceiling Board	1	
4	Truss Plates	4	
5	Roof Truss	5	
6	Purlins	4	
7	Roof	1	
8	Sectioned Walls	4	
9	Sectioned Window	5	
10	Floor & Foundation	6	
11	DPC & NGL	2	
12	Hatching	9	
13	External Walls	2	
14	Roof & Roof Detail	3	
15	Internal Detail	3	
16	Step	3	
17	Labels	2	
Subtotal		58	

Floor Plan

18	Walls	11	
19	Hatching	5	
20	Window	2	
21	Door	3	
22	Step	3	
23	Ramp	5	
24	Built-in-Cupboard	2	
25	Plumbing Fixtures	3	
26	Smoke Detector	1	
27	Electrical	3	
28	Labels	2	
29	Cutting Plane	2	
Subtotal		42	
TOTAL		100	

EXAMINATION NUMBER

ANSWER SHEET 4

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