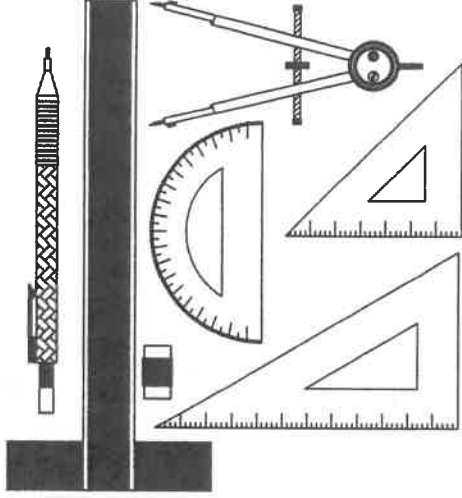


NATIONAL SENIOR CERTIFICATE EXAMINATION  
2021

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	

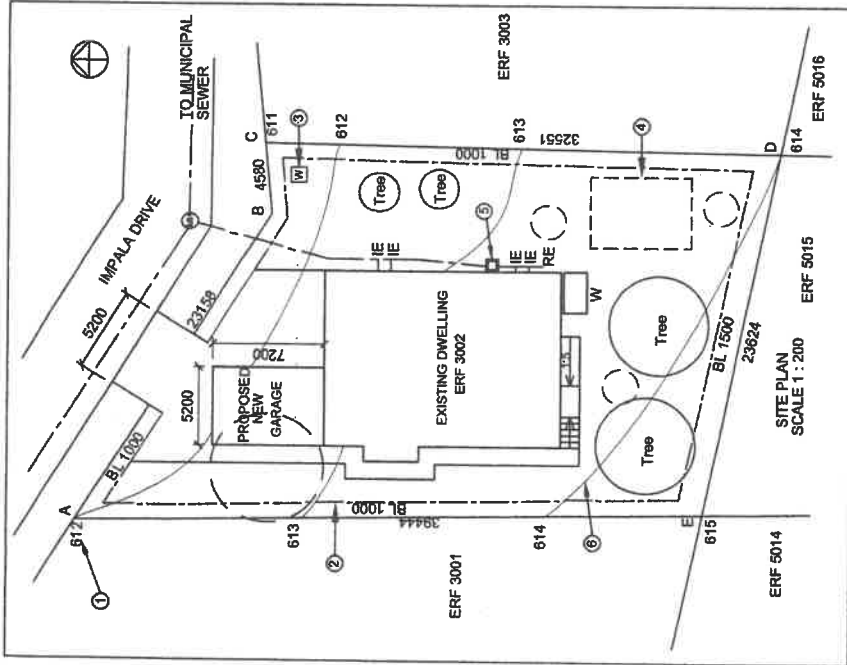
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PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

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, including 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.

EXAMINATION NUMBER

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STUDY THE DRAWING ABOVE AND ANSWER THE QUESTIONS THAT FOLLOW.

CIRCLE THE LETTER CORRESPONDING TO YOUR ANSWER

1	A	ERF 5016	B	ERF 5015	C	ERF 5014	D	ERF 3001
1	A	INDUCTION EYE	B	INSPECTION EYE	C	INDUCTION EVE	D	INSPECTION EVE
1	A	4	B	6	C	2	D	1
1	A	NORTH	B	SOUTH	C	EAST	D	WEST
1	A	A	B	C	C	D	D	E
1	A	BEACON HEIGHT	B	ERF NUMBER	C	DIMENSION	D	CORNER NUMBER
1	A	BOUNDARY LABEL	B	BOUNDARY LINE	C	BUILDING LINE	D	BUILDING LABEL

**QUESTION 1**  
CIVIL ANALYTICAL

1	A	WASTE TANK	B	WATER TANK	C	WATER METER	D	ELECTRICITY METER
1	A	SEPTIC TANK	B	HIDDEN DETAIL	C	WORK TO BE REMOVED	D	WATER TANK
1	A	DOG KENNEL	B	GULLY	C	SEPTIC TANK	D	STEP
1	A	DRAIN LINE	B	SEWER LINE	C	WATER PIPE	D	CONTOUR
1	A	1500 mm	B	1000 mm	C	1500 m	D	1000 m
1	A	1	B	2	C	4	D	6
1	A	5000	B	5200	C	1000	D	23158

Answer:

1	A		B		C	
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1.17 Which of the following options indicate the largest slope of ERF 3002?

1	A	NORTH TO SOUTH	B	SOUTHWEST TO NORTHEAST	C	EAST TO WEST	D	NORTHWEST TO SOUTHEAST
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1.18 In the space below, draw, in NEAT freehand, the PLAN VIEW and ELEVATION VIEW of the SANS 10143 graphical symbol for a wash basin.

2	PLAN VIEW	ELEVATION VIEW
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ANSWER SHEET 1

EXAMINATION NUMBER									
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20 MARKS

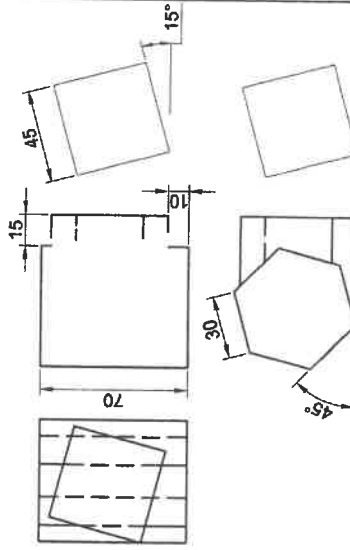
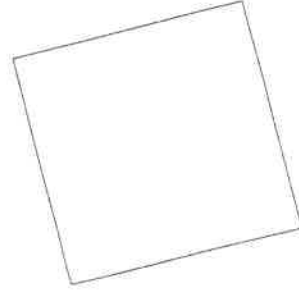
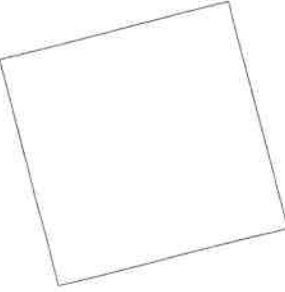
**QUESTION 2**  
**INTERPENETRATION & DEVELOPMENT**

The drawings below show the **INCOMPLETE Front View, COMPLETE Top View and Right View of a right SQUARE PRISM** made to fit around a right regular **HEXAGONAL PRISM**.

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 square branch piece.

Show all hidden detail.  
Show all construction.



**ASSESSMENT CRITERIA**

- You will be assessed on your ability to do the following:
- draw the given incomplete Front View 4
  - complete the Front View 23
  - show necessary construction 2
  - draw the development of the square branch piece 11

FV	27	CON	2	DEV	11
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40 MARKS

EXAMINATION NUMBER

ANSWER SHEET 2

**QUESTION 3**  
**TWO-POINT**  
**PERSPECTIVE**

The figures show the three views of a house with an open garage and verandah.  
Draw a neat two-point perspective view of the house and garage showing the inside of the garage.

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

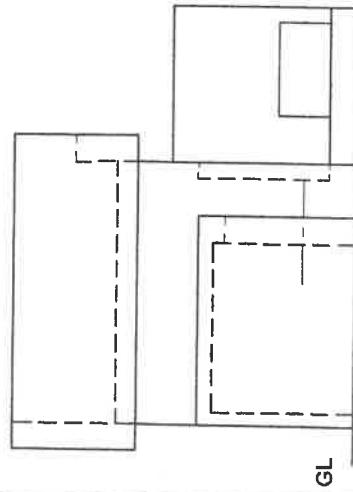
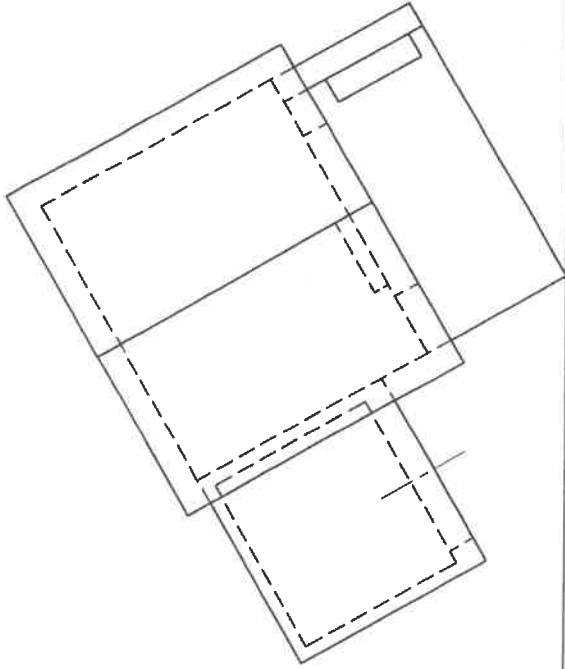
Neatly label the vanishing points RVP and LVP.  
NO HIDDEN DETAIL IS REQUIRED.

**ASSESSMENT CRITERIA**

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

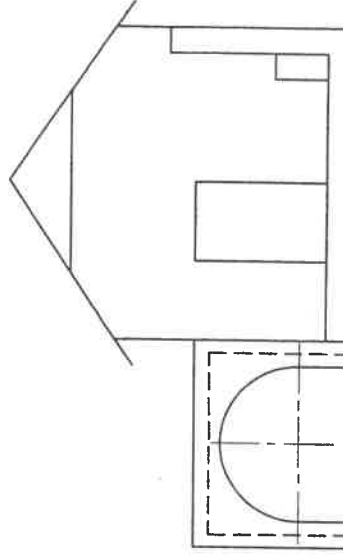
- determine and label the vanishing points 2
- draw the two-point perspective view 38

PP  
HL



GL

SP+



GL

PTS	22
PTS	7
Con	3
Att	8
VPS	2

40 MARKS

EXAMINATION NUMBER

ANSWER SHEET 3

**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 south elevation with
  - ▶ window positions, ground and floor levels
  - ▶ An incomplete schematic floor plan of a tiled **STOREEROOM** 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
- 3) The **OUTSIDE WEST ELEVATION**

**FLOOR PLAN INSTRUCTIONS**

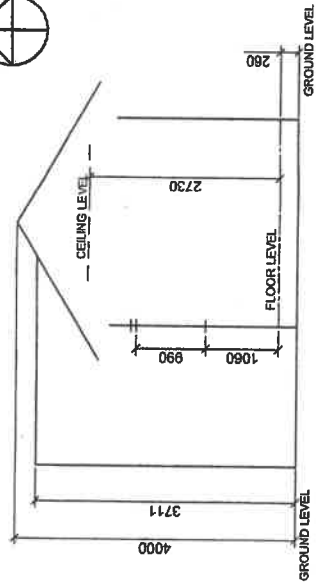
- Draw the complete floor plan of the storeroom.
- It is **NOT** necessary to draw the roof line.
- The following alterations must be made to the storeroom:
  - ▶ Remove and brick up **DOOR 2**.
  - ▶ Remove the internal wall as indicated.
- Draw and hatch all walls
- Insert all window details
- Insert the door detail of the external door (**DOOR 1**)
- Draw the ramp and landing. Indicate the inclination of the ramp.
- Label the floor plan and indicate the scale
- Draw and label the cutting plane A-A

**SECTIONAL SOUTH ELEVATION INSTRUCTIONS**

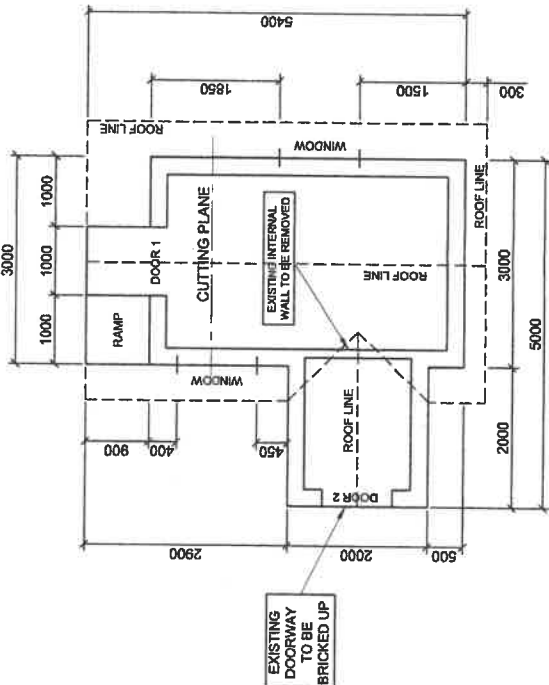
- Draw the complete **SOUTH ELEVATION** showing the section as per the indicated cutting plane
- Complete the foundation details
  - ▶ insert all floor slab details
  - ▶ use 150 mm compacted hardcore filling and 10 mm screed
- Label the ground level and damp-proof course
- Draw in the sectional window using the C22 frame detail
  - ▶ use **ONE** 242 x 75 mm concrete lintel above the window
  - ▶ use a 222 x 110 mm quarry tile 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 and a 30° pitch
  - ▶ use 228 x 38 mm fascia boards
  - ▶ use 9 mm gypsum ceiling boards
- Draw the doorway only. (Do not draw the door frame)
- Show all hatching detail
- Label the sectional **SOUTH ELEVATION**

**WEST ELEVATION INSTRUCTIONS**

- Draw the complete outside **WEST ELEVATION**
- Show the window details. Do not draw the windowsills.
- Show some detail for the metal roof sheeting
- Label the **WEST ELEVATION**

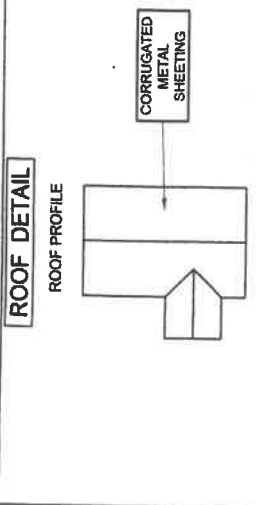


**SCHEMATIC SOUTH ELEVATION**

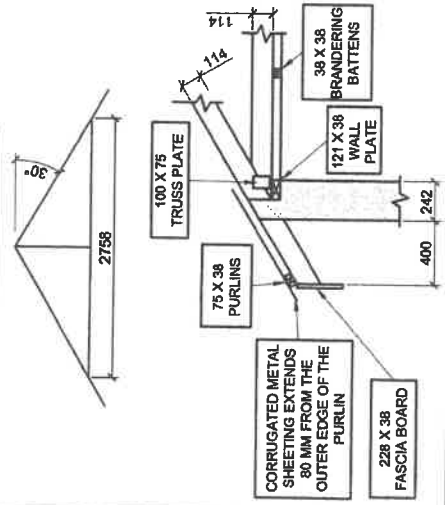


**SCHEMATIC FLOOR PLAN**

- NOTES:**
- Floor tiles should be used for the entire floor area.
  - Brickwork must be carried out as indicated on the schematic drawing:
    - ▶ **DOOR 2** must be bricked up.
    - ▶ The internal wall must be removed.
  - The ramp leads onto a landing which is the same height as the finished floor level. The ramp has a gradient of 1:4.
  - The finished floor level is in line with the top of the screed.



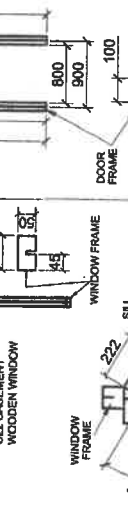
**ROOF TRUSS DETAIL**



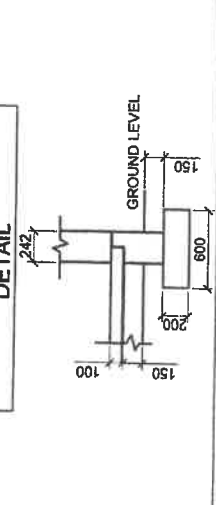
**WINDOW DETAIL**



**DOOR DETAIL**



**INCOMPLETE FOUNDATION DETAIL**



**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	Fascia Boards	2
9	Sectioned Walls	4
10	Sectioned Window	5
11	Floor & Foundation	6
12	DPC	2
13	Hatching	9
14	Doorway	3
15	Labels	2
<b>Subtotal</b>		<b>52</b>

**Subtotal** 52

**Floor Plan**

16	Walls	7
17	Hatching	4
18	Windows	4
19	Door	3
20	Ramp	5
21	Cutting Plane	2
22	Labels	2
<b>Subtotal</b>		<b>27</b>

**Subtotal** 27

**West Elevation**

23	Ramp	2
24	Walls	5
25	Window	4
26	Fascia Board	2
27	Roof	7
28	Label	1
<b>Subtotal</b>		<b>21</b>

**Subtotal** 21

**TOTAL** 100

EXAMINATION NUMBER

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ANSWER SHEET 4