basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

CIVIL TECHNOLOGY

FEBRUARY/MARCH 2011

MEMORANDUM

MARKS: 200

This memorandum consists of 16 pages.

QUESTION 1   LO 3 AS 1,2,4,5,7,10

1.1   Wear protective clothing. ✓
Wear gloves when mixing cement ✓
Wear gum boots
Wear overall
Wear dust mask
ANY TWO OF THE ABOVE
Explanation – inhalation of cement dust can cause lung diseases ✓
                    Contact with wet cement can cause chemical burns ✓   (4)

1.2   Keep the electric cable away from rotating parts of the machine. ✓
Avoid contact with any moving parts of the machine. ✓
Adopt a steady stance whilst using the machine.
Do not allow yourself to be distracted whilst using the machine.
Ensure that the machine is connected to an earth leakage system

ANY TWO OF THE ABOVE OR OTHER ACCEPTABLE EXPLANATION   (2)

1.3   To protect the reinforcement from harsh weather conditions ✓
To protect the reinforcement from intense heat in case of fire ✓
To protect the reinforcement from chemicals when used in rivers and the ocean

ANY TWO OF THE ABOVE   (2)

1.4   1.4.1   Pitch or bolt pitch ✓
1.4.2   Seam lap or border seam ✓
1.4.3   Backmark ✓   (3)

1.5   One mark for choice and one mark for motivation (open – ended question)   (1)

Bolts and nuts ✓
Holes must be drilled precisely. Easy to be erected and dismantled ✓

Welding
Skilled welder to do the job.
Permanent.

ANY ONE OF THE ABOVE OR OTHER ACCEPTABLE EXPLANATION   (1)

1.6   The pressure exerted by the wet concrete at the bottom of the formwork is the greatest and gradually decreases as the level rises to the top.   ✓ ✓   (2)

1.7   1.7.1   D   ✓   (1)

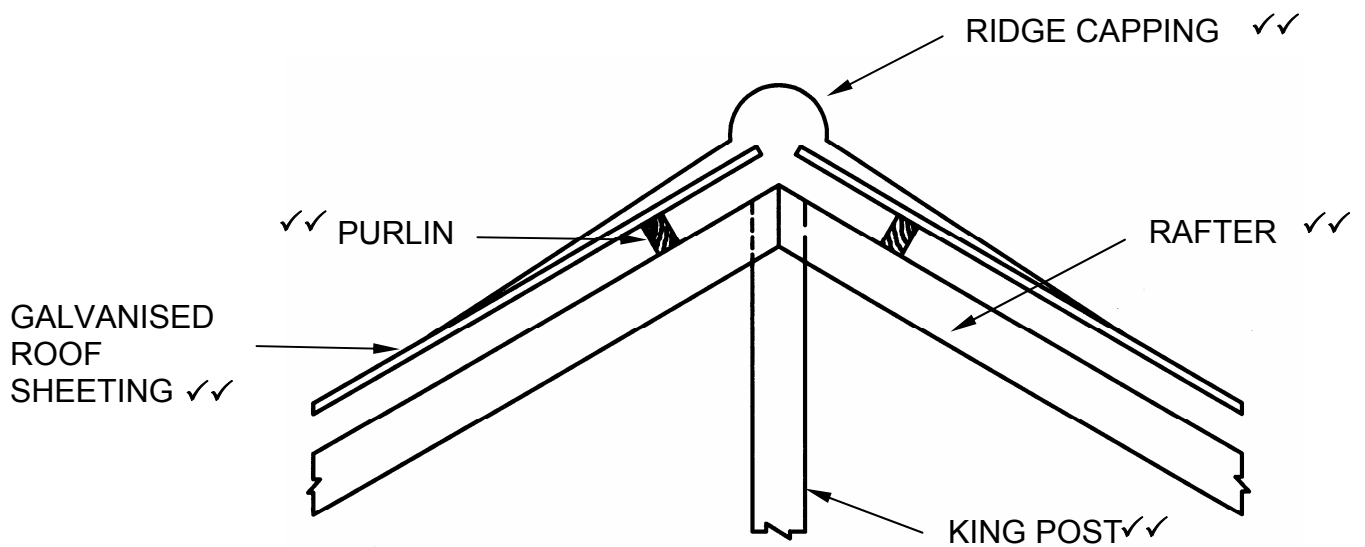   1.7.2   A   ✓   (1)

           1.7.3   D   ✓   (1)

           1.7.4   A   ✓   (1)

           1.7.5   D   ✓   (1)

1.8

FIGURE 1.8

DESCRIPTION	MARK ALLOCATION
Correct placement of kingpost and label	2
Correct indication of rafters and label	2
Correct placement of purlin and label	2
Correct indication of galvanised roof sheeting and label	2
Correct placement of ridge capping and label	2
TOTAL	10

                                                              (10)

                                                             [30]

QUESTION 2   LO 3   AS 3,4,5,7

2.1   A rough arch is built with uncut bricks and then plastered✓ whilst a gauge arch is built with specially cut bricks and not plastered✓   (2)

2.2
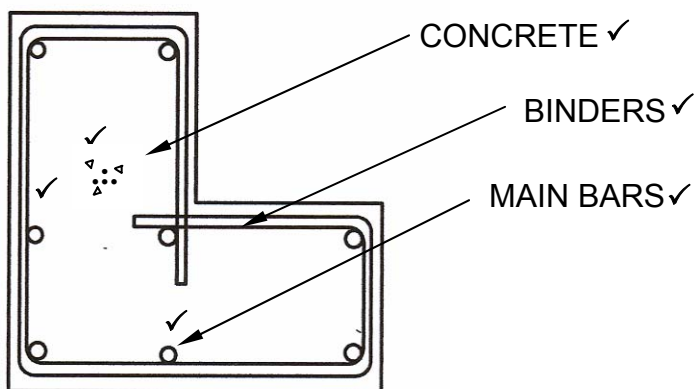
FIGURE 2.2

Stirrups / binders – 1 mark
Concrete – 1 mark
Main bars – 1 marks
Labels – 1 mark for each of the above   (6)

2.3   A   Wedge ✓
        B   Concrete ✓
        C   Formwork boards ✓
        D   Yoke ✓
        E   Clamp ✓
        F   Bolt & nut or nut ✓   (6)

2.4   Horizontal distances ✓
       Vertical distances ✓
       Horizontal angles
       Vertical angles

       ANY TWO OF THE ABOVE   (2)

2.5   A – B = 1,69 – 1,59
           = 0,10 ✓
           ✓
      C = 1,59 – 0,10
        = 1,49 ✓   (3)

2.6   D ✓
         E ✓
         A ✓
         C ✓
         B ✓   (5)

2.7   REFER TO ANSWER SHEET 2.7   (10)

2.8   Maximum span ✓
         Unit weight ✓
         Nature of struts ✓
         Sound insulation ✓
         Insulation characteristics
         Thickness of the units
         Pre-stressed units
         Fire resistance
         Construction speed
         Reinforcement requirements
         Support and boxing required
         Safety characteristics
         Weight reductions
         Volume reductions
         Pre-cast layer

         ANY FOUR OF THE ABOVE   (4)

2.9   Natural low bearing capacity of soil. ✓
         High water table. ✓
         Subsoil – subjected to movement e.g. expansion and contraction of
         shrinkable clay soil.
         Subsoil – subjected to high moisture content.
         Recently placed filling materials which are not sufficiently compacted.

         ANY TWO OF THE ABOVE   (2)
                                                          [40]

QUESTION 3   LO 3 AS 5,8

3.1   3.1.1   REFER TO ANSWER SHEET 3.1   (10)

        3.1.2   REFER TO ANSWER SHEET 3.1   (5)

3.2   3.2.1   It provides a reliable source of water. ✓
                  The water is often suitable for household use. ✓
                  It is independent of the municipal supply

                  **ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE
                  ANSWERS**   (2)

        3.2.2   During power outage an electric pump wont work ✓
                  The water may be polluted or dirty ✓
                  The water may be too acid or alkaline
                  Pumps can break or need expensive repair

                  **ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE
                  ANSWERS**   (2)

3.3   Wind power is free energy ✓
        Wind power is a clean source of energy   ✓
        Very little maintenance is required

        ANY TWO OF THE ABOVE   (2)

                          ✓   ✓
3.4   It is power generated by flowing or falling water   (2)

3.5   A reservoir ✓
        Turbines ✓
        Generator ✓
        Power lines ✓   (4)

3.6   In a position facing the equator or facing north. ✓
         ± 35° up to 40° to the horizontal

        ANY ONE OF THE ABOVE   (1)

3.7   Use solar-powered appliances
        Use energy-saving appliances
        Switch off unnecessary electrical appliances

        ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER   (2)
                                                                            [30]

QUESTION 4   LO 3   AS 2,3,7,8

4.1   4.1.1   REFER TO ANSWER SHEET 4.1   (12)

         4.1.2   REFER TO ANSWER SHEET 4.1   (3)

4.2   To protect it against water and rot ✓
          To protect it against attack from fungi ✓
          To protect it against attack from insects such as beetles
          To protect it against attack from wood borers

          ANY TWO OF THE ABOVE   (2)

4.3.1   A slump test is done to check the consistency and workability of ✓
different batches of concrete mixes.

          ONE MARK FOR EITHER CONSISTENCY OR WORKABILITY   (1)

4.3.2   A – true slump ✓
              B – shear slump ✓
              C – collapsed slump ✓   (3)

4.3.3   Form (conical mould) ✓
              Spirit level ✓
              Ruler
              Base plate
              Tamping rod/Bullet-point rod

          ANY TWO OF THE ABOVE   (2)

4.4   It weakens the metal ✓   (1)

4.5   Painted ✓
         Galvanised ✓
         Powder coated
         Electroplating

         (2)

         ANY TWO OF THE ABOVE

4.6   Volume = l x b x d
                ✓   ✓   ✓
            = 3 x 0,6 x 0,2
             = 0,36 m^3 ✓   (4)

                                                      [30]

QUESTION 5   LO 3 AS 5,6

5.1   REFER TO ANSWER SHEET 5.1 (13)

5.2   5.2.1   Area 1 = l x b
                    = 70 x 50 ✓
                    = 3 500 mm² ✓

    Area 2 = ½ b x h
                = ½ x 21 x 30 ✓
                = 315 mm² ✓

    Total area   =   3 500 – 315 ✓
                = 3 185 mm² ✓

OR

           ✓✓   ✓✓
Total area   =   3 500 – 315
            =   3 185 mm² ✓✓

Two marks if the correct areas are given without any calculations.

(6)

5.2.2   Take moments about A left side
           ✓   ✓   ✓   ✓   ✓
3 185 mm² x X   = (3 500 x 35) – (315 x 17)
                = 122 500 – 5 355
                = $\frac{117\ 145}{3\ 185}$ ✓

                = 36,78 mm ✓✓

OR

	AREA (A)	X	AREA OF X (Ax)
Rectangle	3 500 ✓	$\frac{L}{2} = \frac{70}{2} = 35$ ✓	122 500
Triangle	- 315 ✓	$\frac{b}{3} = \frac{21}{3} = 7 + 10 = 17$✓	- 5 355
Σ	3 185 ✓		117 145

$\frac{\Sigma\ Ax}{\Sigma\ A}$

= $\frac{117\ 145}{3\ 185}$ ✓

=   36,78 mm ✓✓

OR

Position of centroid $= \dfrac{(A1 \times d) - (A2 \times d)}{\text{Total Area}}$

✓ ✓ ✓ ✓

$= \dfrac{(3\ 500 \times 35) - (315 \times 17)}{3\ 185}$ ✓

$= \dfrac{122\ 500 - 5\ 355}{3\ 185}$

$= \dfrac{117\ 145}{3\ 185}$ ✓

= 36,78 mm ✓✓ (8)

5.3 Strain $= \dfrac{\text{change in length}}{\text{Original length}}$

$= \dfrac{0,4 \text{ mm}}{800 \text{ mm}}$ ✓ ✓

= 0, 0005 ✓ **OR** $0,5 \times 10^{-3}$ **OR** 5×10^{-4} (3)
[30]

QUESTION 6 LO 6 AS 4,5,7,8

6.1 REFER TO ANSWER SHEET 6.1 (15)

6.2 REFER TO ANSWER SHEET 6.2 (25)
[40]

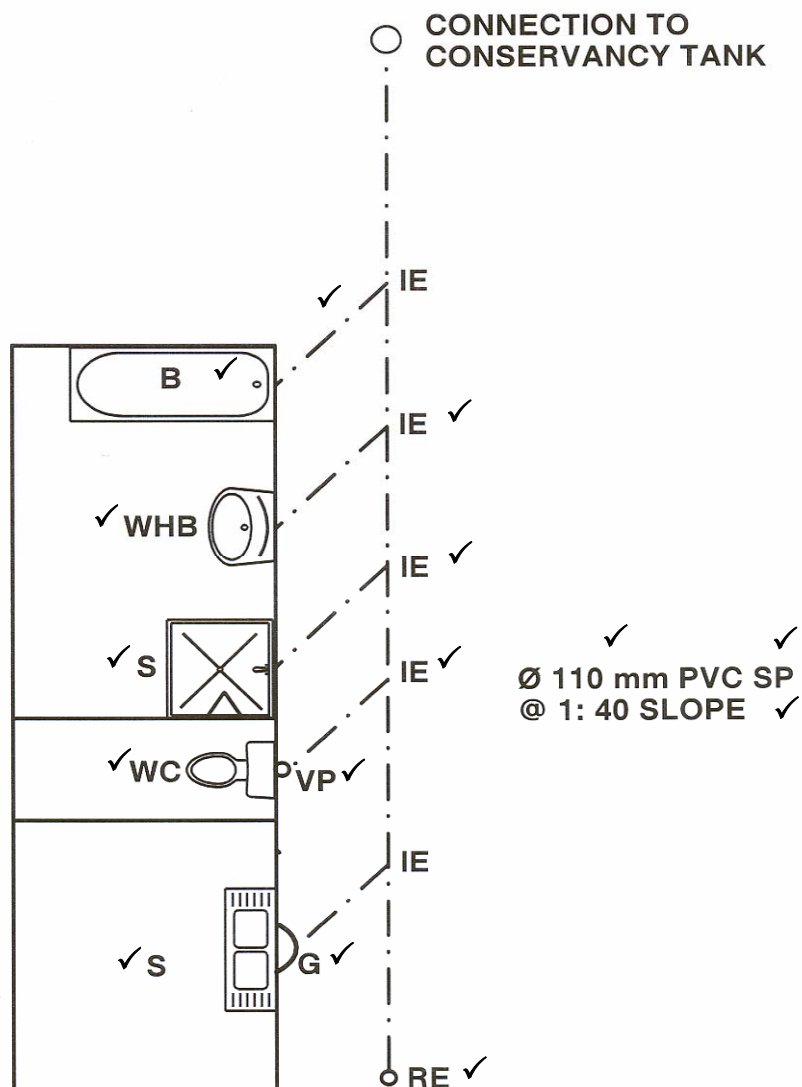**TOTAL: 200**

QUESTION 2.7

ANSWER SHEET 2.7
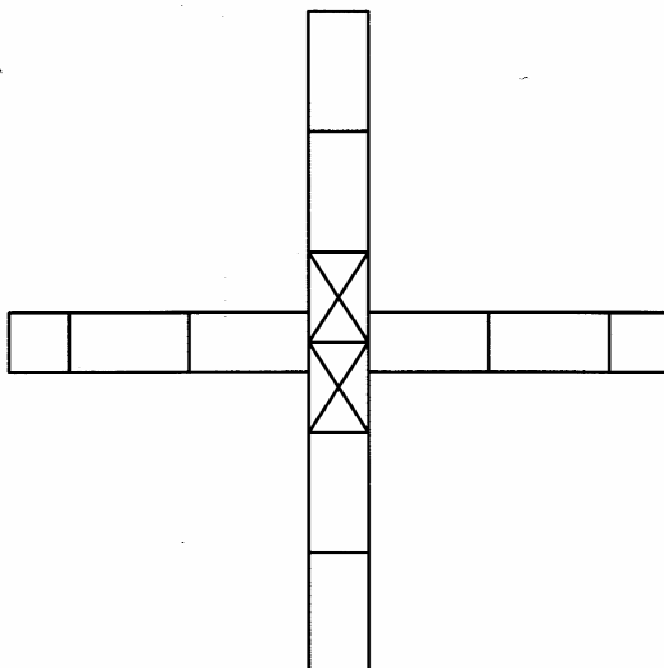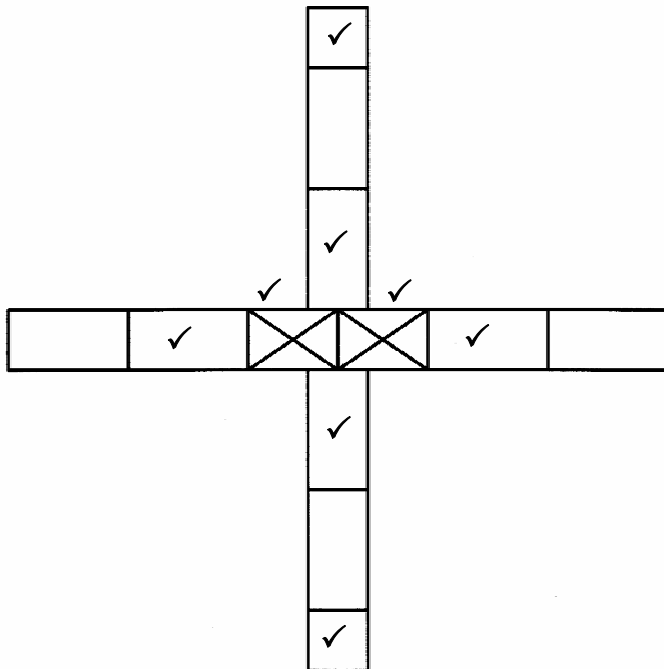
| Neatness | 1 mark |

CROSS JUNCTION ✓
(OR ANY OTHER SUITABLE TITLE)

(10)

QUESTION 3.1

ANSWER SHEET 3.1

MARK ALLOCATION		
RE	1	
IE	3	
VP	1	
G	1	
Correct line type	1	
Description of pipe	3	
Sanitary fixtures	5	
TOTAL	15	

(15)

QUESTION 4.1

ANSWER SHEET 4.1

4.1.1

DESCRIPTION	NO. REQUIRED	LENGTH	WIDTH	THICKNESS	SUBTOTAL LENGTH REQUIRED
A – RAFTER	20 ✓	6 420 mm	114 mm	38 mm	128 400 mm **OR** 128,4 m ✓
B – TIE BEAM	10 ✓	4 400 mm	114 mm	38 mm	44 000 mm **OR** 44 m ✓
C – KING POST	10✓	2 100 mm	114 mm	38 mm	21 000 mm **OR** 21 m ✓
D – STRUT	20 ✓	1 850 mm	114 mm	38 mm	37 000 mm **OR** 37 m ✓
E – QUEEN POST	20 ✓	1 550 mm	114 mm	38 mm	31 000 mm **OR** 31 m ✓
TOTAL LENGTH REQUIRED FOR TEN TRUSSES					261 400 mm **OR** 261,4 m ✓✓

(12)

4.1.2   Number of lengths required
         = 261,4 m ÷ 6 m ✓
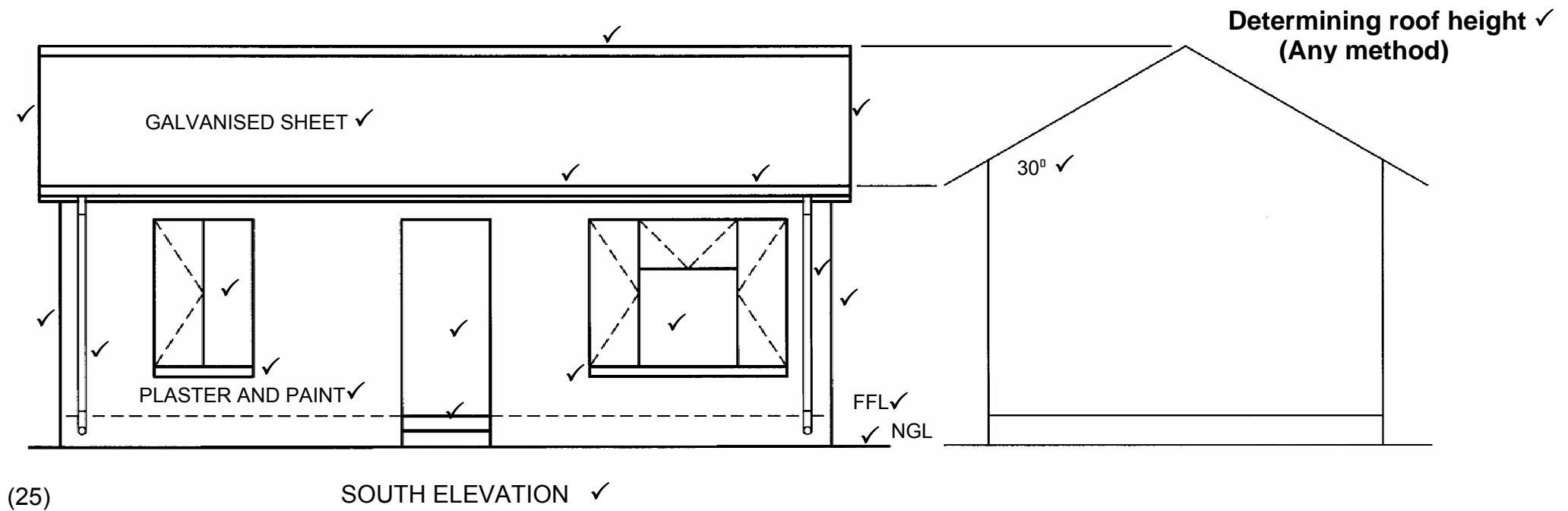   = 43,56 lengths ✓
         = 44 lengths ✓   (3)

QUESTION 5.1

ANSWER SHEET 5.1

5.1.2 Space diagram

5.1.1 Vector diagram

Scale: 1 mm = 1 N
NB: Vector diagram not to scale

(1)

(4)

5.1.3

MEMBER	MAGNITUDE	NATURE
AD	29 N ✓	STRUT ✓
BD	58 N ✓	TIE ✓
CE	69 N ✓	TIE ✓
DE	81 N ✓	STRUT ✓

Allow a tolerance of 1 Newton on either side.   (8)

QUESTION 6.1

ANSWER SHEET 6.1

No.	QUESTIONS	ANSWERS	MARKS
1	What is the scale of the drawing?	1 : 500	1
2	What is the site number on the western side of the proposed building?	122	1
3	Identify number 1.	Building line	1
4	Identify number 2.	North point	1
5	What is the street name on the south side of the site?	PARK STREET	1
6	What is the number of the site on which the proposed building is to be erected?	123	1
7	What colour is used to indicate new buildings on a site plan?	RED	1
8	What is the length of the boundary line on the eastern side of the site?	42 000 mm **OR** 42 m	1
9	Calculate the total perimeter of the house.	44 m	2
10	Calculate the total area of the site.	1 134 m² [27 m x 42 m = 1 134 m²]	2
11	Calculate the total area of the proposed house.	96 m² [(10 m x 8 m) + (4 m x 4 m) = 96 m²]	2
12	Calculate the percentage area that the proposed house will occupy on the site.	8,47% [$\frac{96}{1\,134}$ x $\frac{100}{1}$]	1

(15)

QUESTION 6.2

ANSWER SHEET 6.2

Determining roof height ✓
(Any method)

GALVANISED SHEET ✓

30⁰ ✓

PLASTER AND PAINT ✓

FFL ✓

NGL

(25)

SOUTH ELEVATION ✓

SCALE 1 : 50 ✓

Neatness ✓✓

Roof construction	3
Fascia boards	1
Gutters	1
Down pipe	2
Windows	2
Door	1
Step	1
Wall	2
Window sills	2
Floor level	1
Natural ground level	1
Wall finishing	1
Roof pitch	1
Roof covering	1
Scale (print)	1
South elevation (print)	1
Accuracy/Neatness	2
Determining roof height	1
TOTAL	25