



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

CIVIL TECHNOLOGY

NOVEMBER 2011

MEMORANDUM

MARKS: 200

This memorandum consists of 18 pages.

Chief Examiners (Internal Moderators have to be able to verify answers that are accepted as correct and taken from reliable sources.

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

- 1.1 1.1.1 A – Ear muffs/ Ear protection/ Ear plugs ✓
B – Safety goggles/ Safety glasses/Eye protection/Safety goggles ✓ (3)
C – Gloves ✓
- 1.1.2 A – When using equipment like a angle grinder that makes a lot of noise. ✓
B – When grinding or cutting material. ✓
Chasing walls.
C – When working with material with sharp or rough edges/ when chipping slag after welding C- when working with: concrete/ hot material/ welding ✓ (3)

OR ANY OTHER ACCEPTABLE ANSWERS

- 1.2
- Apply continuous pressure to the wound with a handkerchief or cloth. ✓
 - For a wound on a limb, lift one or both limbs higher than the body/ heart. ✓
 - Apply a pressure bandage or use pressure point if bleeding continues.
 - Keep body warm and treat for shock until help arrive. (2)

ANY TWO OR ANY OTHER ACCEPTABLE ANSWERS

COLUMN A		COLUMN B	
1.3.1	Sustainability	K✓	Preserving material in its original state
1.3.2	Pre-cast concrete	I✓	Concrete cast elsewhere and placed in position.
1.3.3	Slump test	G✓	Used to determine the workability of fresh concrete.
1.3.4	PVC	F✓	Conduit pipes is an example of this material
1.3.5	Cube test	B✓	Used to determine the compressive (crushing) strength of concrete
1.3.6	In-situ concrete	L✓	Fresh concrete cast in place
1.3.7	Dumpy level	C✓	A precision measuring instrument used to measure height and distance
1.3.8	Telescopic staff	E✓	An accessory used with a dumpy level
1.3.9	Hydration	J✓	A chemical reaction between water and cement
1.3.10	Compaction	H✓	Removal of air bubbles from concrete

(10)

1.4

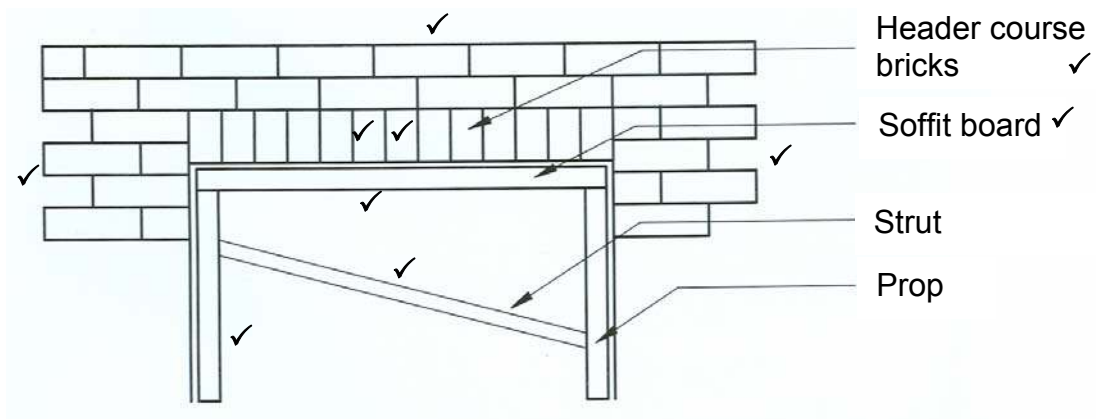


FIGURE 1.4

ASSESSMENT CRITERIA	MARK
Flat gauged arch brick header course	2
Two courses of brickwork above arch	1
Surrounding brickwork in stretcher bond	2
Soffit board	1
Props	1
Strut	1
Any two labels	2
TOTAL	10

(10)

1.5

- Bricks are pressed and formed to the required shape (is done by the brick manufacturer) ✓
- Bricks are sanded against a rough or fine toothed surface
- Bricks are cut into desired shape by means of a special saw
- Buy the brick

(1)

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

1.6

- Longitudinal half lap/ longitudinal halving joint ✓

(1)

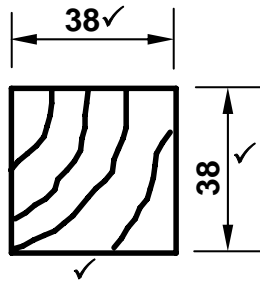
ANY OTHER ACCEPTABLE ANSWER

[30]

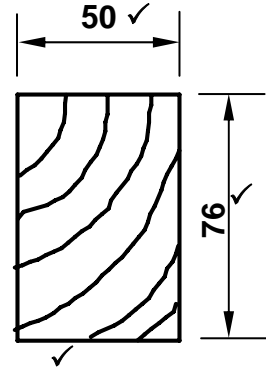
QUESTION 2 LO 3 AS 3, 4, 5, 7

2.1 REFER TO ANSWER SHEET 2.1.

2.2



Batten 38 mm x 38 mm/
50 mm x 38 mm tilting batten
For concrete roof tiles



Purlin 76 mm x 50 mm/
76 mm x 76 mm tilting purlin
for galvanised roof sheeting

(6)

If the candidate has drawn 2 sections through the roof showing a batten on one and a purlin on another. 1 mark for each sketch must be given. If he labels the drawing correctly with the size he gets 3 marks for each sketch.

2.3

DRYWALL CONSTRUCTION	BRICK WALL CONSTRUCTION
The erection of dry walls is a dry process ✓	Wet material such as mortar is to be used to join bricks ✓
The partitions are adaptable and can be fitted in awkward places ✓	It is time consuming to cut bricks to accommodate awkward angles in a wall ✓
Materials are portable/need less storage space than brickwork. ✓	Materials require a lot of storage space ✓
Partition stud/steel rail/standard partitions weigh less.	Material is heavy

ANY SIX OF THE ABOVE (THREE IN EACH COLUMN) OR ANY OTHER ACCEPTABLE ANSWER IF THE COMPARISON CORRELATES

(6)

2.4

2.4.1

- Precast concrete piling ✓
- Continuous auger piling ✓
- Driven in steel piling
- Auger drill piling
- Displacement piling
- Sleeved piling
- Percussion piling

ANY TWO OF THE ABOVE

(2)

- 2.4.2
- On unstable soil or ground ✓
 - Where the soil is loose ✓
 - Non-cohesive soil
 - Where there is soil movement
 - Constantly wet areas

ANY TWO OR ANY OTHER ACCEPTABLE ANSWERS (2)

2.5

✓ ✓

1,941 – 1,782 = 0,159 m ✓ OR 159 mm

OR

1,782 – 1,941 = -0,159 mm

(3)

2.6 2.6.1 Back sight ✓

(1)

2.6.2 Intermediate sight ✓

(1)

2.6.3 Fore sight ✓

(1)

- 2.7
- The workmen to place the concrete must be ready ✓
 - Ramps to take concrete to another level if necessary must be erected before the concrete arrives ✓
 - The formwork to cast the concrete must be ready ✓
 - All tools and equipment to place the concrete must be clean and ready
 - The rate of placing and compacting the concrete must be done in such a way so as not to waste time

(3)

ANY THREE OR ANY OTHER ACCEPTABLE ANSWERS

- 2.8
- Pipe scaffolds ✓ – builder/carpenter/glazier ✓
 - Putlog scaffolds ✓ – high-rise buildings ✓
 - Movable/mobile platforms – electrician/painter/repairing of ceiling boards
 - Independent scaffolds – bricklaying/building gable ends
 - Trestles – building walls of low height/installing gutters/painting
 - Dependent scaffold – depends on building for support/allow for more working space on scaffold
 - Truss-out scaffold – depends on building for support/allow for more working space on scaffold

ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

(4)
[40]

QUESTION 3 LO 3 AS 5, 8

- 3.1 3.1.1 A – Sink ✓
B – Gully ✓
C – P-trap ✓ or Gully trap
D – Inspection eye (IE) ✓ (4)
- 3.1.2 110 mm ✓ (1)
- 3.1.3 40 mm/50 mm ✓ (1)
- 3.1.4 To prevent foul gasses and smells from entering a building ✓
Forms a water seal (1)
ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER
- 3.1.5 Waste-water pipe ✓ (1)
- 3.1.6 Main sewer pipe ✓ (1)
- 3.1.7 Between 1 : 40 to 1 : 60 ✓ (1)

- 3.2
- Sewage from the house flows into the first chamber ✓
 - Heavier sewage sinks to the bottom ✓
 - Bacteria decompose the solid sewage into a liquid ✓
 - The sludge remains at the bottom of the tank ✓
 - The soluble sludge eventually flows into the second chamber ✓
 - Only liquid flows from the outlet pipe of chamber two ✓
 - This liquid flows into a French drain where it soaks into the ground ✓

LEARNERS SHOULD NOT BE PENALISED IF THEY PRESENT THE ANSWER IN ANY ORDER (7)

- 3.3
- No pollution or noise ✓
 - Electricity supply is continuous ✓
 - The system is easy to regulate
 - Water is not used up (renewable energy)
 - Water still flows downstream as before
 - Hydro-electric power stations have very low operating cost
 - The lifespan of a hydro-electric power station is much longer than nuclear and coal plants
 - Hydro-electric power is the most energy efficient way of generating electricity. It can convert 90% of the available energy into electricity
- ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER** (2)

- 3.4
- To water gardens and plants ✓
 - Water can be provided in coastal areas with scarce water resources
 - Salt water can be desalinated to be purer than normal fresh water
 - Salt can be obtained in the process
 - Unusable brackish water can also be desalinated (1)
 - Water becomes potable (drinkable)
- ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER**

- 3.5
- Saves electricity. It can be up to 30 percent cheaper than electrical alternatives ✓
 - Gas gives instant heat ✓
 - Gas geysers provide constant hot water supply ✓
 - Not affected by power failures
 - Always a supply of hot water on hand
 - The fumes of burned out gas of the geyser such as the water vapour and carbon dioxide are the same elements that humans exhale, which makes gas healthier than electrical heaters that dry out the air

ANY THREE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWERS. (3)

- 3.6
- 3.6.1 Inspection eye ✓ (1)
- 3.6.2 Rodding eye ✓ (1)
- 3.7
- 3.7.1 WC✓ (1)
- 3.7.2 B ✓ (1)
- 3.7.3 S✓ (1)
- 3.8
- 3.8.1 S-trap✓ (1)
- 3.8.2 P-trap✓ (1)
- [30]**

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

4.1 Refer to ANSWER SHEET 4.1 as the preferred method or alternatively use the method below.

4.1.1 Inside measurement of garage Length = 9 440 mm – 440 mm
= 9 000 mm ✓
Width = 6 440 mm – 440 mm
= 6 000 mm ✓ (2)

4.1.2 Total inside area of garage = length x breadth
= 9 000 mm x 6 000 mm
= 54 m² ✓ (3)

4.1.3 Area of one ceiling board = 3 000 mm x 1 200 mm ✓
= 3,6 m² ✓ (2)

4.1.4 Number of ceiling boards = 54 m² ÷ 3,6 m² ✓
= 15 ceiling boards ✓ (2)

4.1.5 Total length of cornice = 2 (9 000 mm) ✓ + 2 (6 000 mm) ✓
= 18 000 mm + 12 000 mm
= 30 000 mm OR 30 m ✓ (3)

4.2

LEAD	MILD STEEL
Highly toxic ✓	Not toxic ✓
Blue grey metal ✓	Grey ✓
Heavy	Lighter
Rust free	Corrodes easily
Non-ferrous	ferrous
Conductor of electricity	Conductor of electricity

ANY FOUR OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER (4)

4.3 4.3.1 1 200 mm ✓ (1)

4.3.2 1 800 – (2 x 16 mm) = 1 768 mm ✓ (1)

4.3.3 1 800 – (2 x 16 mm) = 1 768 mm ✓ (1)

4.3.4 1 768 mm ✓ (1)

4.3.5 1 200 mm ✓ (1)

4.3.6 900 mm ✓ (1)

- 4.4
- Painting ✓
 - Galvanising ✓
 - Apply oil
 - Powder coating
- (2)

OR ANY OTHER ACCEPTABLE ANSWERS.

- 4.5 4.5.1
- Gypsum plaster ✓
 - Clout nail/nail
 - Silicone

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

- 4.5.2
- Steel nails ✓
 - Silicone

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

- 4.5.3
- Panel pin ✓
 - Silicone

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

- 4.5.4
- Clout nails ✓
 - Dry-wall screws

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

- 4.6
- Prevents timber from deterioration ✓
 - Enhances its appearance ✓
 - Prevents attacks from insects
 - Protects timber from the elements (weather)

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

QUESTION 5 LO 3 AS 5, 6

5.1 5.1.1 Area of rectangle = 3 200 mm² ✓ (1)

5.1.2 Area of triangle = 1 350 mm² ✓ (1)

5.1.3 Position of centroid = $\frac{(A_1 \times d) + (A_2 \times d)}{\text{Total Area}}$

$$= \frac{(3\,200 \times 40) + (1\,350 \times 20)}{4\,550}$$

$$= \frac{128\,000 + 27\,000}{4\,550}$$

$$= \frac{155\,000 \text{ mm}^3}{4\,550 \text{ mm}^2}$$

$$= 34,07 \text{ mm} \checkmark\checkmark$$

OR

Take moments about B

$$4\,550 \text{ mm}^2 \times X = (3\,200 \times 40) + (1\,350 \times 20)$$

$$= 128\,000 + 27\,000$$

$$= \frac{155\,000 \text{ mm}^3}{4\,550 \text{ mm}^2}$$

$$= 34,07 \text{ mm} \checkmark\checkmark$$

OR

	AREA (A)	X	Area of X (Ax)
Rectangle	3 200 ✓	$\frac{L}{2} = \frac{80}{2} = 40$ ✓	128 000 mm ³
Triangle	+ 1 350 ✓	$\frac{b}{3} = \frac{30}{3} = 10 + 10 = 20$ ✓	+ 27 000 mm ³
Σ	4 550 mm ² ✓		155 000 mm ³

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

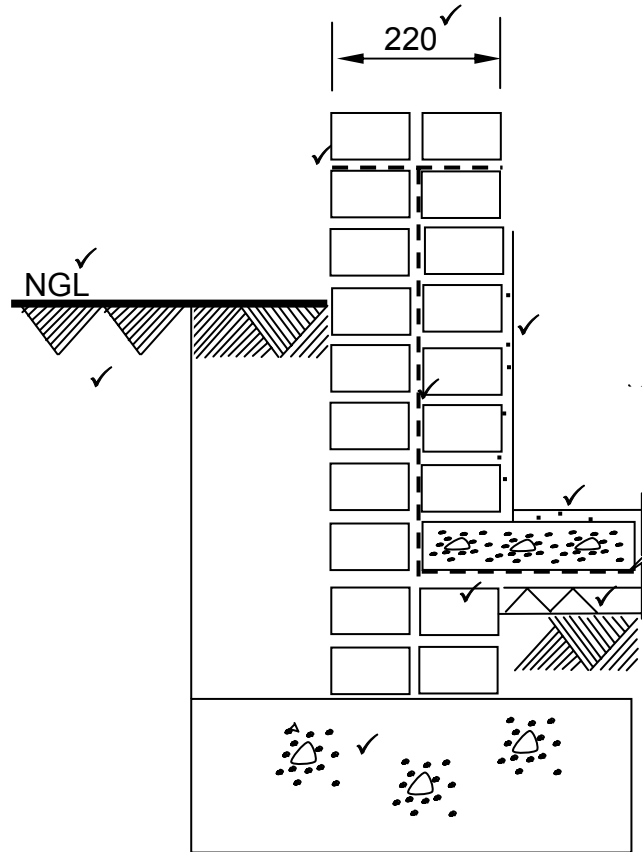
$$= \frac{155\,000 \text{ mm}^3}{4\,550 \text{ mm}^2}$$

$$= 34,07 \text{ mm} \checkmark\checkmark$$

(8)

ANSWER SHEET 2.1

QUESTION 2.1



ASSESSMENT CRITERIA	MARK
Position of DPC	3
Drawing symbol for screed	1
Plaster	1
Drawing symbol for undisturbed earth under natural ground level	1
Abbreviation for natural ground level	1
Drawing symbol for concrete	2
Drawing symbol for hardcore filling	1
Wall thickness	1
TOTAL	11

(11)

ANSWER SHEET 4.1**QUESTION 4.1**

A	B	C	D
			Inside length of garage
			= 9 440 – 2/220
			= 9 440 – 440
			= 9 000 mm ✓
			Inside width of garage
			= 6 440 – 2/220
			= 6 440 – 440
			= 6 000 mm ✓
			Inside area of garage
1/	9 ✓		
	6 ✓	54 m ² ✓	
1/	3,0 ✓		Area of one ceiling board
	1,2	3,6 m ² ✓	
			Total number of ceiling boards required
1/3,6	54	15	= $\frac{54}{3,6}$ ✓
			= 15 ceiling boards ✓
			Length of cornice required for the garage
2/	9	18 m ✓	Long sides
2/	6	12 m ✓	Short sides
		18 m	Total length required
		<u>12 m</u>	= 18 m + 12 m
		30 m	= 30 m ✓

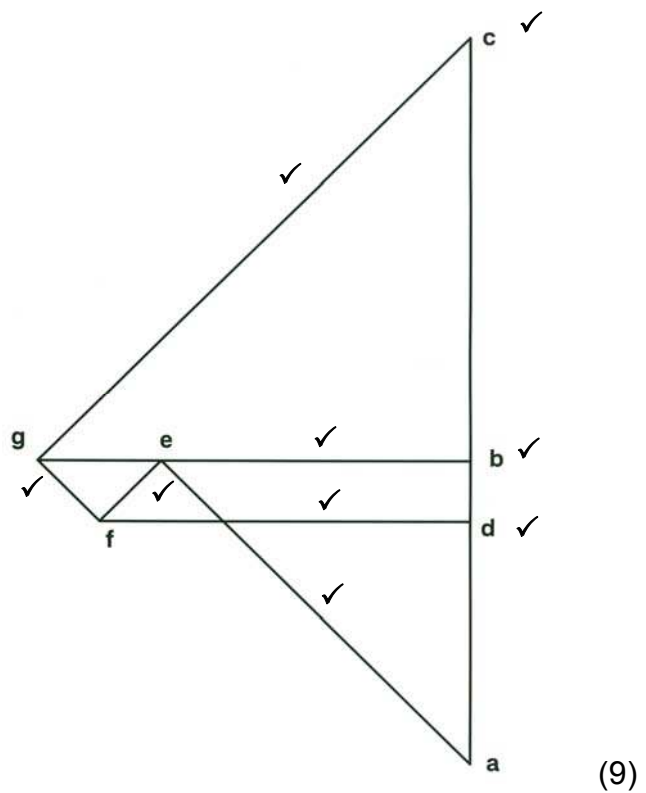
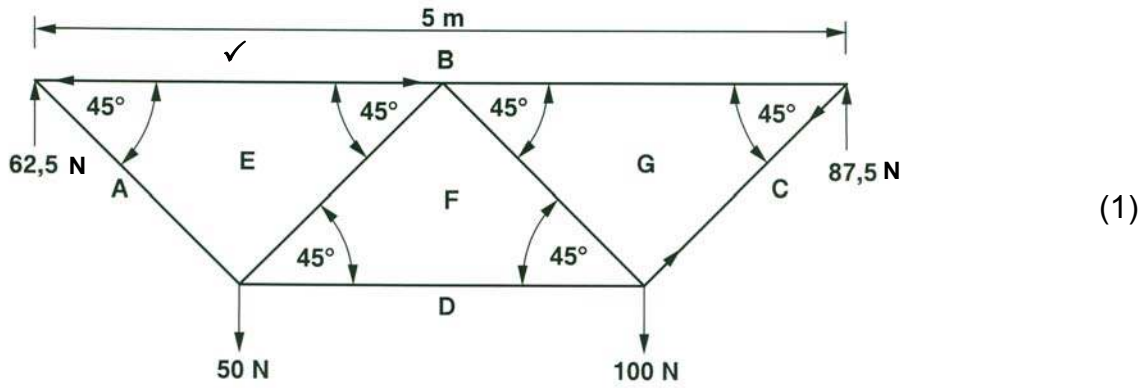
(12)

ANSWER SHEET 5.2

QUESTION 5.2.1

Space Diagram

5.2.1




QUESTION 5.2.2 AND QUESTION 5.2.3

MEMBER	NATURE	MAGNITUDE
AE	Tie	88 N ✓
BE	Strut ✓	62 N
BG	Strut	88 N ✓
CG	Tie ✓	124 N

Allow a tolerance of 2 Newton on either side

(4)

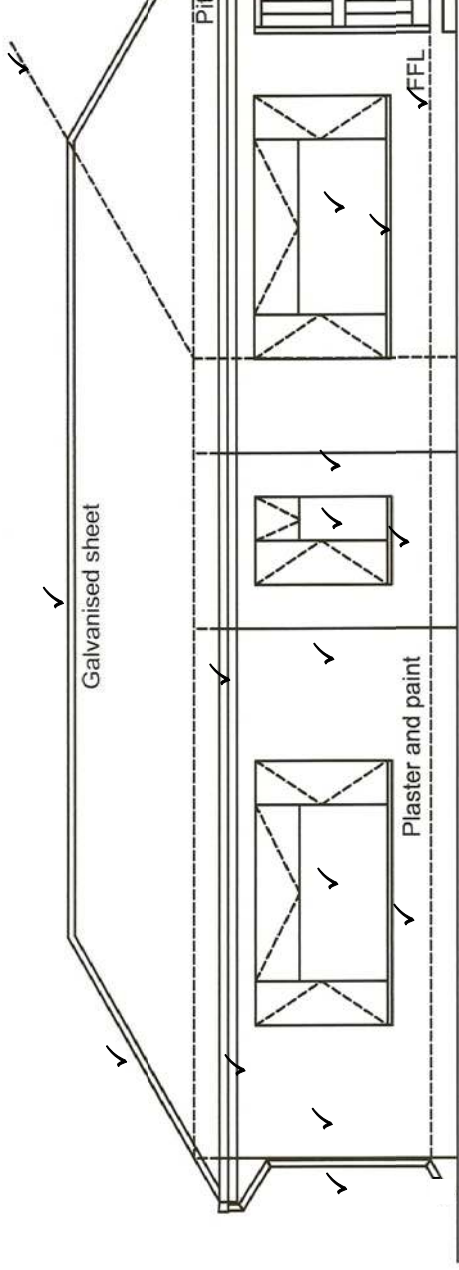
QUESTION 6.1**ANSWER SHEET 6.1**

No.	QUESTIONS	ANSWERS	MARKS
1	Identify the type of roof covering (labelled 1)	Roof tile, e.g. clay tile	1
2	What type of material is the roof covering made of?	Clay/concrete/slate/cement fibre	1
3	Identify number 2.	Rafter	1
4	Identify number 3.	Strut	1
5	Identify number 4.	Tie-beam	1
6	Identify number 5.	Beam filling	1
7	What is wrong with the heights of the window and door?	It is not level/not at the same height.	1
8	Identify number 6.	Ceiling board	1
9	Study the internal wall on the concrete slab and identify ONE error.	There is no foundation for this wall.	1
10	What is the width of the internal wall if it is a half brick wall?	110 mm	1
11	Name ONE material that can be used to make this component indicated by number 7.	PVC/aluminium/cement fibre/galvanised	1
12	Identify number 8.	Window sill (External)	1
13	Identify number 9.	Wash hand basin	1
14	Draw a freehand symbol for a bath.		2

(15)

ANSWER SHEET 6.2

QUESTION 6.2



WEST ELEVATION ✓

SCALE 1 : 100 ✓

Accuracy / Neatness ✓✓

Roof construction	3
Fascia boards	1
Gutters	1
Down pipe	2
Windows	3
Door	1
Step	1
Walls – height and lengths	4
Window sills	3
Determining roof height	1
TOTAL	20
FFL (Finished floor level)	1
Scale (print)	1
West elevation (print)	1
TOTAL	3
Accuracy/neatness	2
TOTAL	2
GRAND TOTAL	25

-1 mark for wrong elevation

[40]



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GRADE 12

CIVIL TECHNOLOGY

NOVEMBER 2011

MARKS: 200

TIME: 3 hours

This question paper consists of 16 pages, 5 answer sheets and a formula sheet.

REQUIREMENTS:

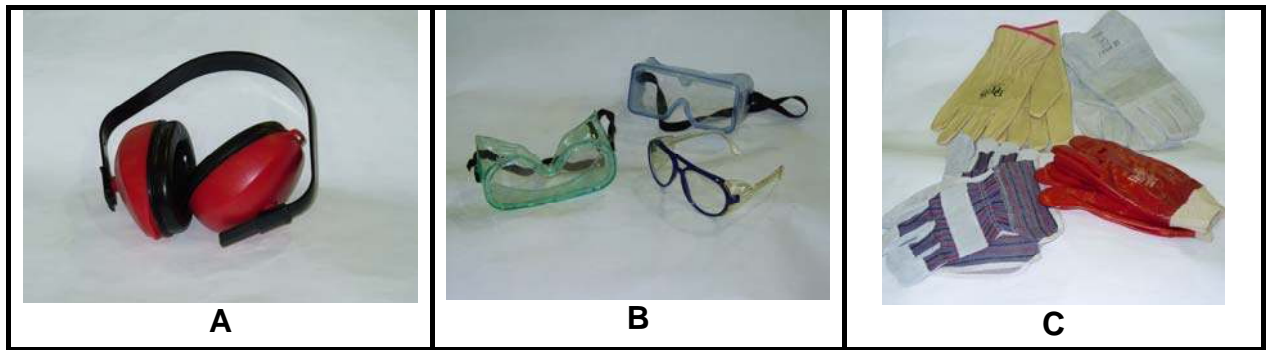
1. Drawing instruments
2. A non-programmable pocket calculator
3. ANSWER BOOK

INSTRUCTIONS AND INFORMATION

1. This question paper consists of SIX questions.
2. Answer ALL the questions.
3. Answer each question as a whole, do NOT separate subquestions.
4. Start EACH question on a NEW page.
5. Sketches may be used to illustrate your answers.
6. ALL calculations and written answers must be done in the ANSWER BOOK or on the attached ANSWER SHEETS.
7. Use the mark allocation as a guide to the length of your answers.
8. Drawings and sketches must be done in pencil, fully dimensioned and neatly finished off with descriptive titles and notes to conform to the SANS/SABS Code of practice for building drawing practice.
9. For the purpose of this question paper, the size of a brick should be taken as 220 mm x 110 mm x 75 mm.
10. Use your discretion where dimensions and/or details have been omitted.
11. Non-programmable pocket calculators may be used.
12. Answer QUESTIONS 2.1, 4.1, 5.2, 6.1 and 6.2 on the attached ANSWER SHEETS using drawing instruments where necessary.
13. Write your centre number and examination number on every ANSWER SHEET and hand them in with your ANSWER BOOK, whether you have used them or not.
14. Drawings in the question paper are not to scale due to electronic transfer.

QUESTION 1: CONSTRUCTION PROCESSES

1.1 The pictures below are those of safety equipment worn on a building site.



1.1.1 Identify the items of equipment illustrated in **A**, **B** and **C**. (3)

1.1.2 Name ONE specific instance where you will use the equipment in **A**, **B** and **C** respectively. (3)

1.2 Explain how you will stop severe external bleeding from a limb. (2)

1.3 Choose a description from COLUMN B that matches a term in COLUMN A. Write only the letter (A–L) next to the question number (1.3.1–1.3.10) in your ANSWER BOOK, for example 1.3.11 M.

COLUMN A		COLUMN B	
3.1	Sustainability	A	keeps concrete moist after casting
3.2	Pre-cast concrete	B	used to determine the compressive (crushing) strength of concrete
3.3	Slump test	C	a precision measuring instrument used to measure height and distance
3.4	PVC	D	mixture of iron, chrome, nickel and manganese
3.5	Cube test	E	an aid used with a dumpy level
3.6	In situ concrete	F	conduit pipes is an example of this material
3.7	Dumpy level	G	used to determine the workability of fresh concrete
3.8	Telescopic staff	H	removal of air bubbles from concrete
3.9	Hydration	I	concrete cast elsewhere and placed in position
3.10	Compaction	J	a chemical reaction between water and cement
		K	preserving material in its original state
		L	fresh concrete cast in place

(10 x 1) (10)

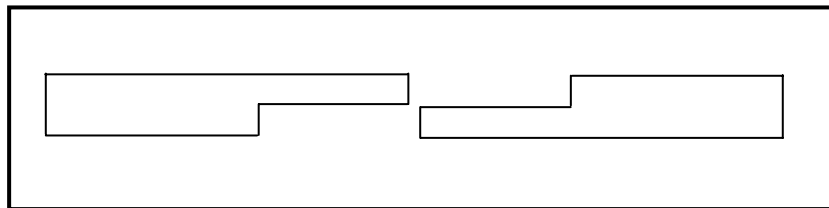
1.4 With the aid of drawing instruments, make a neat sketch of a flat gauged arch in a face-brick wall showing the following details:

- Bricks for flat gauged arch in header course
- Two courses in stretcher bond above the header course
- All surrounding brickwork in stretcher bond. Show only two courses of brickwork below the header course.
- Soffit board to support the header course
- Props to hold the soffit board in position
- A strut between the props to prevent the props from collapsing

Show ANY TWO labels on your drawing. (10)

1.5 You are required to build a gauged arch. Explain ONE method that is used to obtain the shaped bricks (voussoirs) for the arch. (1)

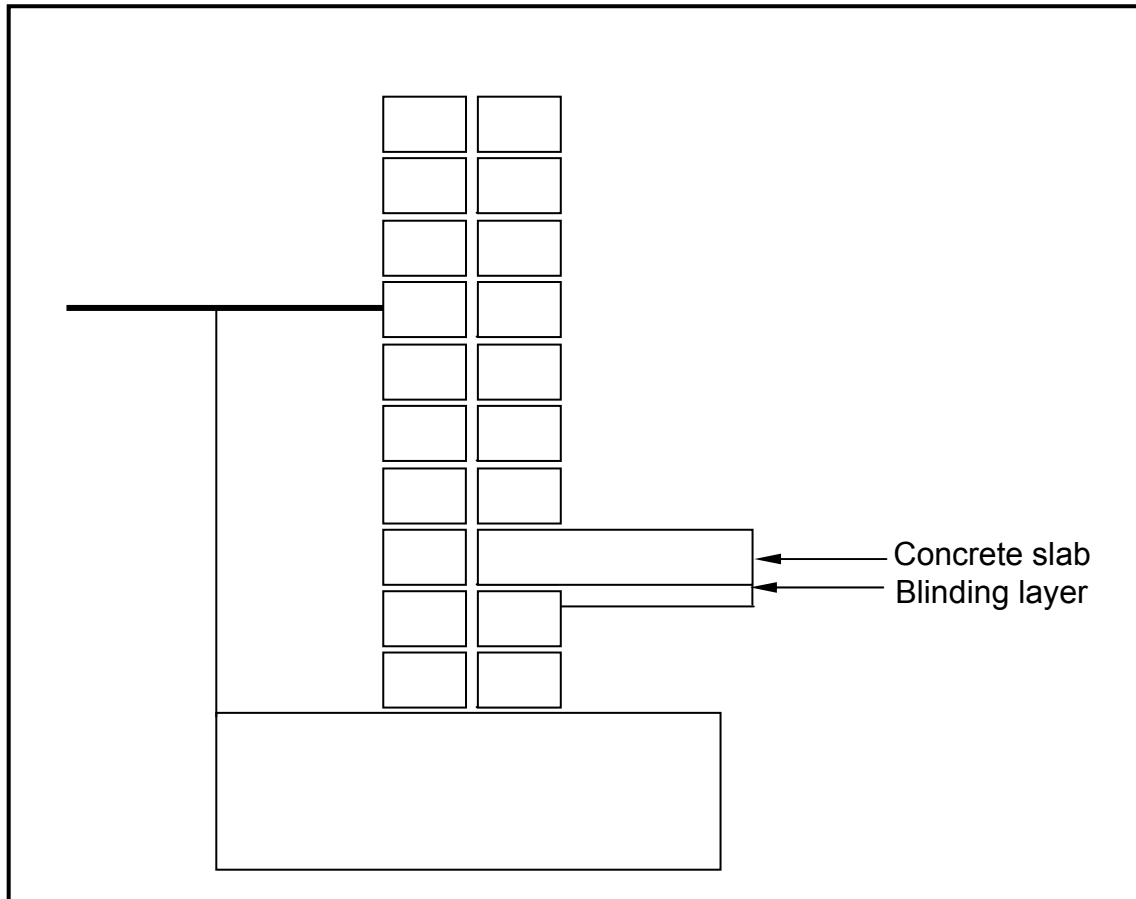
1.6 A wall plate needs to be extended along its length. The joint below is used for this purpose. Identify the joint.



(1)
[30]

QUESTION 2: ADVANCED CONSTRUCTION PROCESSES

- 2.1 FIGURE 2.1 illustrates an incomplete sketch of a basement wall. Answer the questions that follow on the drawing on ANSWER SHEET 2.1.

**FIGURE 2.1**

- 2.1.1 Draw and indicate the correct position of the damp-proof membrane sheet. (3)
- 2.1.2 Draw the screed coat (screed) and indicate the correct drawing symbol. (1)
- 2.1.3 Draw the plaster to the internal part of the wall of the building. (1)
- 2.1.4 Draw in the symbol for earth filling below ground level in the correct place. (1)
- 2.1.5 Indicate the abbreviation for the natural ground level in the correct place. (1)
- 2.1.6 Draw in the symbol for concrete in the foundation and concrete slab. (2)
- 2.1.7 Draw in the symbol for hardcore filling under the blinding layer. (1)
- 2.1.8 Indicate the wall thickness on the drawing. (1)

2.2 Illustrate, with freehand sketches, the difference between a batten, as used for concrete roof tiles, and a purlin, as used for corrugated iron sheet roof cover. Show the measurements on your drawings. (6)

2.3 Compare dry wall construction with brick wall construction. Redraw the table below in your ANSWER BOOK and tabulate your answers. (6)

	DRY WALL CONSTRUCTION	BRICK WALL CONSTRUCTION
1		
2		
3		

2.4 Piling is used for foundations under special circumstances.

2.4.1 Name TWO types of piling. (2)

2.4.2 Explain TWO circumstances that will require the use of piles. (2)

2.5 FIGURE 2.5 shows TWO readings as seen through the eye piece of a dumpy level. Use these readings and calculate the difference in height between point A and point B.

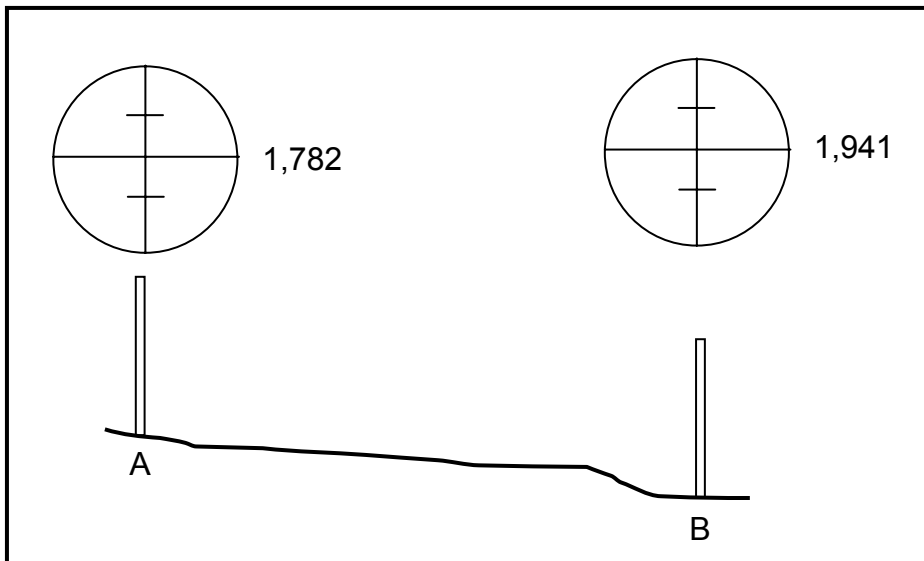


FIGURE 2.5

(3)

2.6 Explain what the following refer to with regard to the dumpy level, when reading in a collimation table:

2.6.1 BS (1)

2.6.2 IS (1)

2.6.3 FS (1)

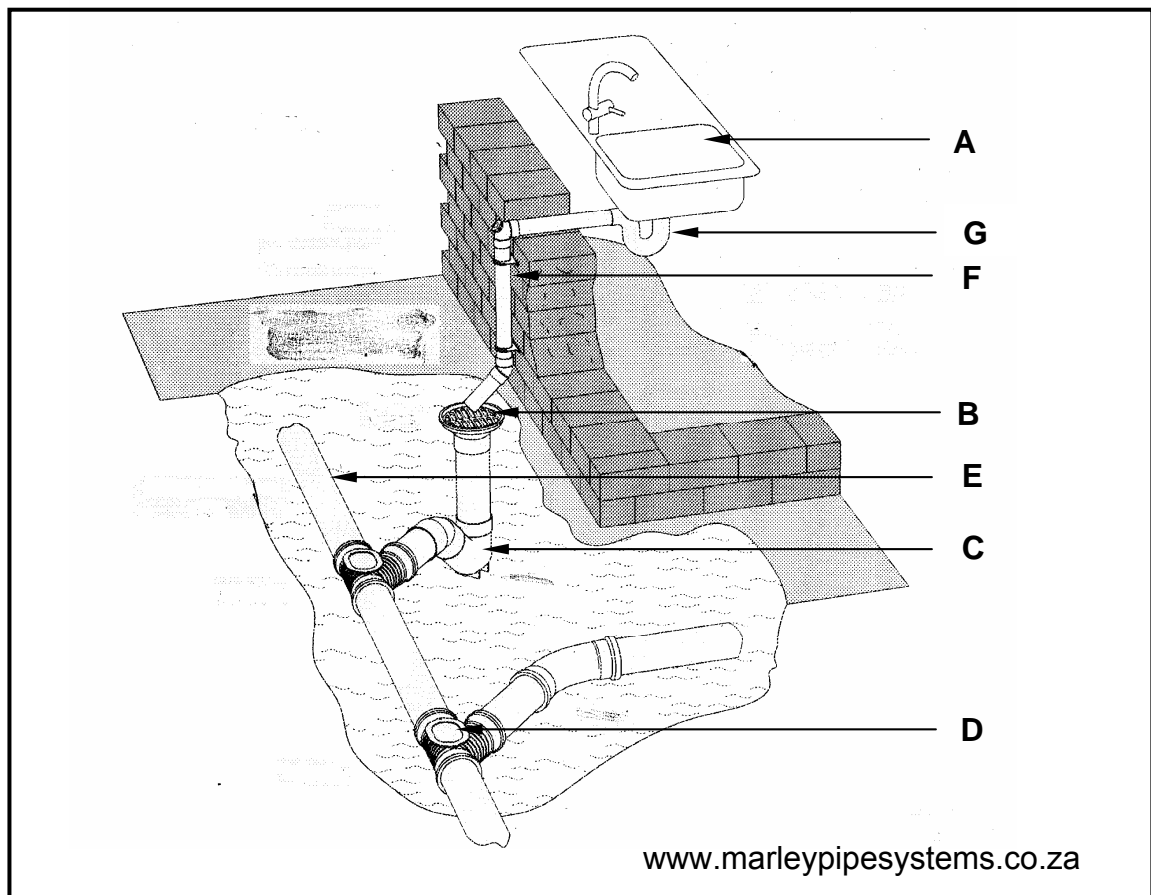
2.7 Discuss the factors that must be considered after ready-mixed concrete has been ordered to ensure that the placing of the concrete is carried out efficiently and timeously. (3)

2.8 Name TWO types of scaffolds that can be used on building sites and describe ONE place where you will use each of these types of scaffolds respectively. (4)

[40]

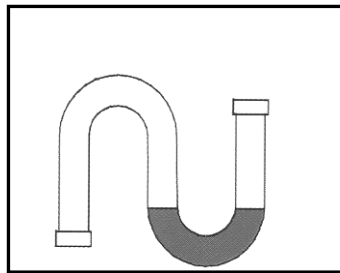
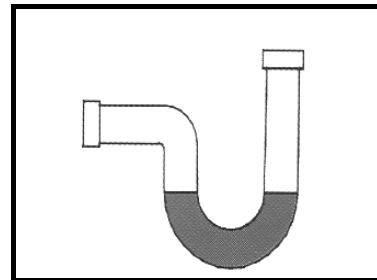
QUESTION 3: CIVIL SERVICES

- 3.1 FIGURE 3.1 below shows the sewerage system of a part of a house. Analyse FIGURE 3.1 and answer the questions that follow.

**FIGURE 3.1**

- 3.1.1 Write down **A–D** in your ANSWER BOOK and give the correct name of the part next to the corresponding letter. (4)
- 3.1.2 What is the diameter of pipe **E** if it is an unplasticised polyvinyl chloride (uPVC) pipe? (1)
- 3.1.3 What is the diameter of pipe **F** if it is an unplasticised polyvinyl chloride (uPVC) pipe? (1)
- 3.1.4 Explain the purpose of **G**. (1)
- 3.1.5 What is the pipe labelled **F** called? (1)
- 3.1.6 What is pipe **E** called in the sewerage system? (1)
- 3.1.7 What should the gradient of pipe **E** be for a residential dwelling? (1)
- 3.2 Explain, in your own words, the working of a septic tank. (7)

- 3.3 Describe TWO advantages of hydro-electricity. (2)
- 3.4 Describe ONE advantage of desalinating sea water. (1)
- 3.5 Describe THREE advantages of using gas water heaters. (3)
- 3.6 Explain the following abbreviations that are used on building drawing plans:
- 3.6.1 IE (1)
- 3.6.2 RE (1)
- 3.7 Give the abbreviations for the following fitments used in a building:
- 3.7.3 Water closet (1)
- 3.7.4 Bath (1)
- 3.7.5 Shower (1)
- 3.8 Identify the water traps illustrated in FIGURE 3.8.1 and FIGURE 3.8.2 below.

**FIGURE 3.8.1****FIGURE 3.8.2**

(2)
[30]

QUESTION 4: MATERIALS AND QUANTITIES

4.1 FIGURE 4.1 below shows the floor plan of a double garage. The walls are 220 mm thick. Use ANSWER SHEET 4.1 to answer the questions that follow.

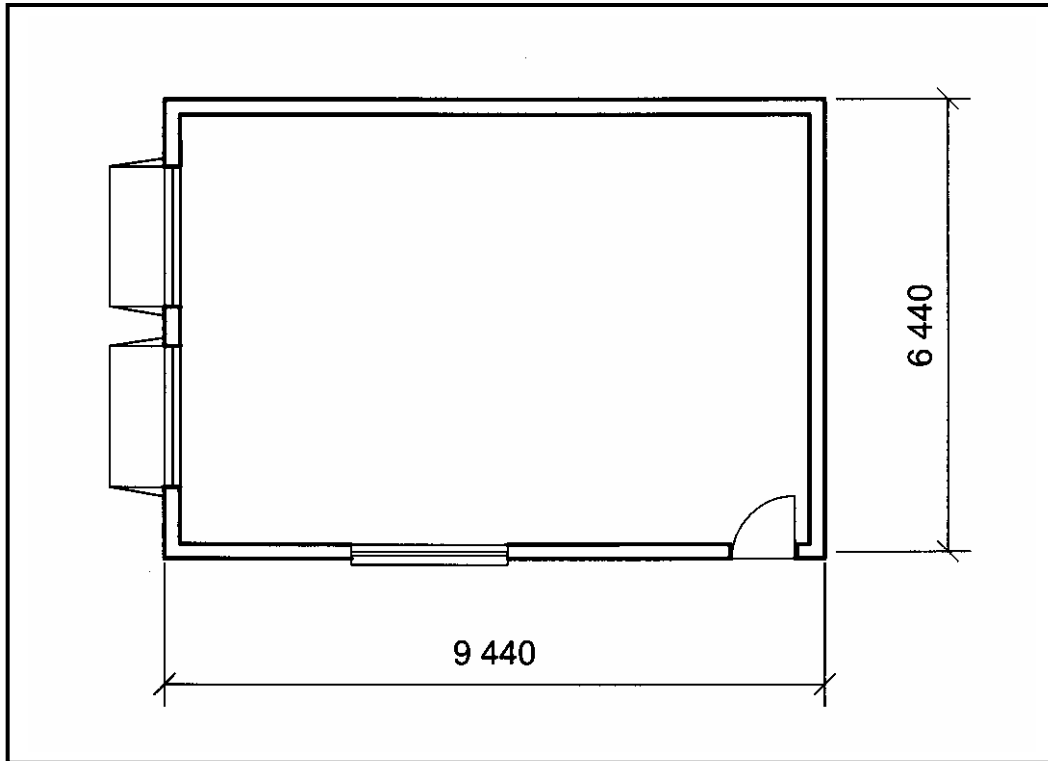


FIGURE 4.1

- 4.1.1 Calculate the inside length and width of the garage. (2)
- 4.1.2 Calculate the total area of the inside of the garage (excluding the walls). Round off your answer to TWO decimal places. (3)
- 4.1.3 Calculate the area of ONE ceiling board if the ceiling board measures 3 000 mm x 1 200 mm. Round off your answer to TWO decimal places. (2)
- 4.1.4 Calculate the number of ceiling boards needed for the garage. (2)
- 4.1.5 Calculate the total length of cornice required for the garage. Round off your answer to TWO decimal places. (3)

4.2 Compare TWO properties of lead with TWO properties of mild steel. Redraw the table below in your ANSWER BOOK and tabulate your answers.

	LEAD	MILD STEEL
1		
2		

(4)

4.3 FIGURE 4.3 shows a drawing of a wall-mounted cabinet made out of 16 mm thick melamine chipboard, with a 3 mm thick masonite (hardboard) back. Butt joints are used in the construction of the cabinet.

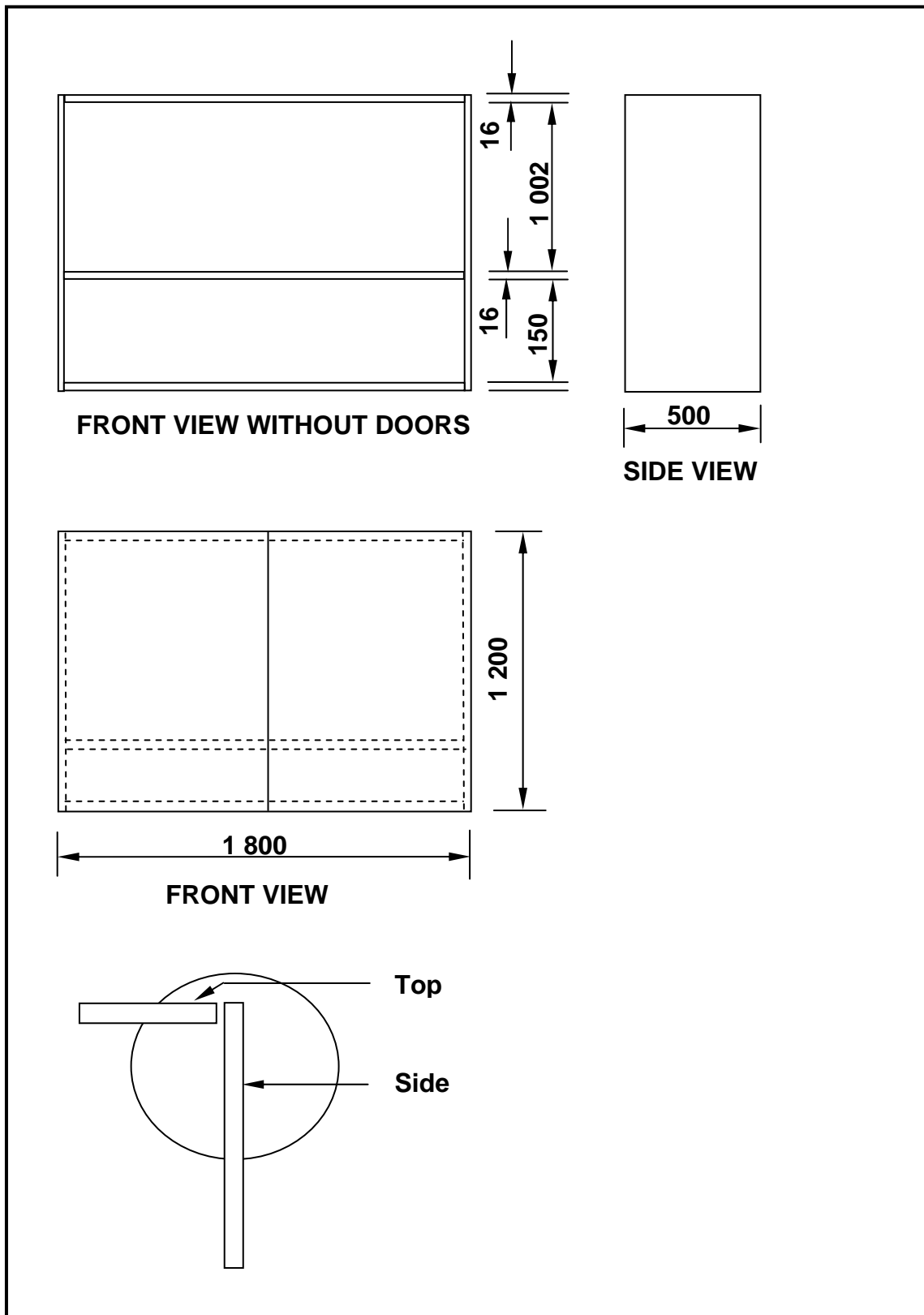


FIGURE 4.3

Use the following specifications:

- One shelf
- Two doors
- The external measurements of the cabinet are:
 - Height: 1 200 mm
 - Width: 1 800 mm
 - Depth: 500 mm
 - Thickness of melamine chipboard: 16 mm

Analyse the drawing and calculate the required information to complete the cutting list shown below. Do NOT redraw the table but write down 4.3.1–4.3.6 in your ANSWER BOOK and next to it the correct size of each part as indicated in the table.

DESCRIPTION	NUMBER REQUIRED	LENGTH	WIDTH	THICKNESS
Sides	2	4.3.1	500 mm	16 mm
Top	1	4.3.2	500 mm	16 mm
Bottom	1	4.3.3	500 mm	16 mm
Shelf	1	4.3.4	500 mm	16 mm
Doors	2	4.3.5	4.3.6	16 mm

(6)

4.4 Name TWO ways or methods that can be used to prevent mild steel sections from deteriorating. (2)

4.5 Name ONE joining agent that can be used to fix the following materials in place when finishing off a room:

4.5.1 Cornice (1)

4.5.2 Skirting (1)

4.5.3 Quadrant onto a skirting (quarter round mould) (1)

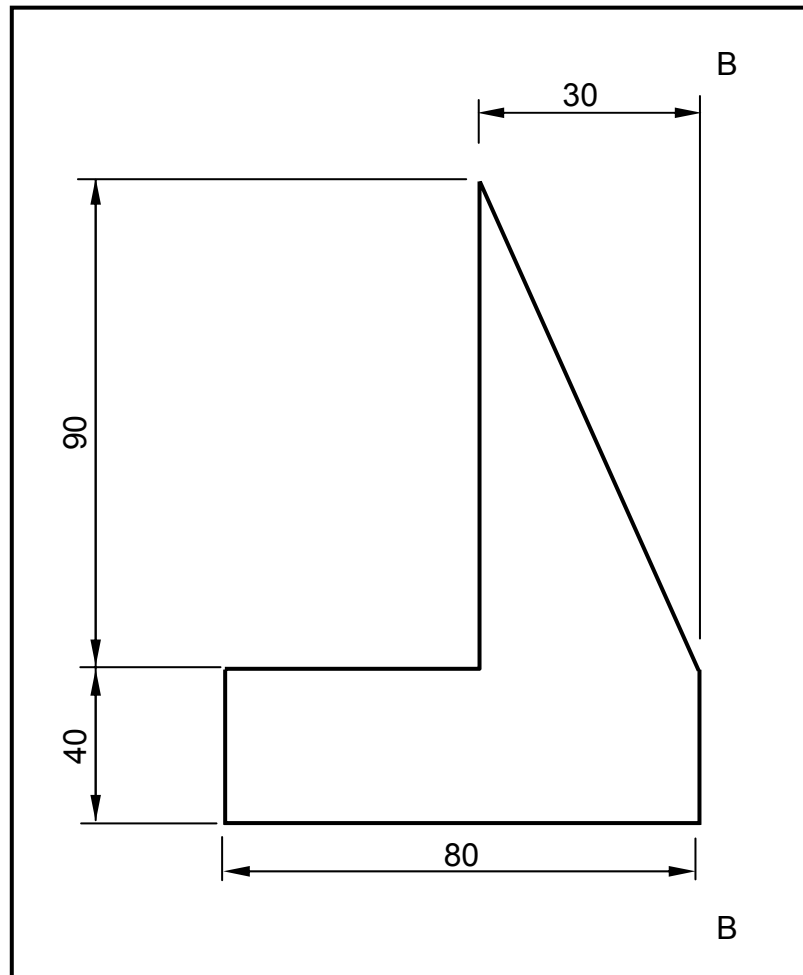
4.5.4 Ceiling board to branderings (ceiling batten) (1)

4.6 Give TWO reasons why it is necessary to treat timber with preservatives. (2)

[30]

QUESTION 5: APPLIED MECHANICS

- 5.1 FIGURE 5.1 shows a figure of a lamina. All measurements are in millimetres. Refer to the FORMULA SHEET when answering this question.

**FIGURE 5.1**

- 5.1.1 Write down the area of the rectangle. (1)
- 5.1.2 Write down the area of the triangle. (1)
- 5.1.3 Calculate the position of the centroid from B-B. Round off your answer to TWO decimal places. (8)

5.2 FIGURE 5.2 below shows the space diagram of a framed roof truss.

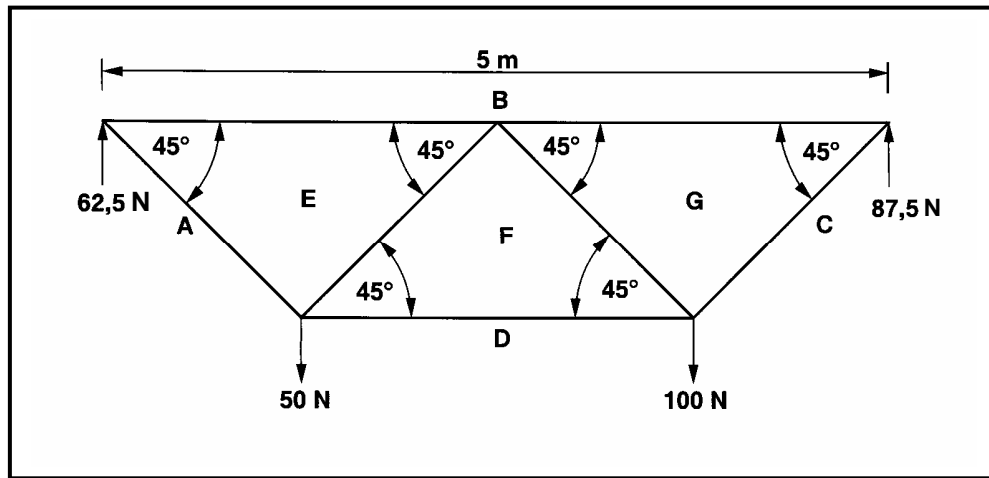


FIGURE 5.2

- 5.2.1 Analyse FIGURE 5.2 and develop and draw the vector (force) diagram of this frame on ANSWER SHEET 5.2. Use scale 1 mm = 1 N. (9)
- 5.2.2 Show the nature of forces BE and CG on the space diagram on ANSWER SHEET 5.2. (1)
- 5.2.3 Use the information from the space and vector diagrams and complete the table on ANSWER SHEET 5.2. (4)

5.3 FIGURE 5.3 shows a beam with THREE point loads and ONE uniformly distributed load. Calculate the magnitude of the reaction force at RL by taking moments about RR.

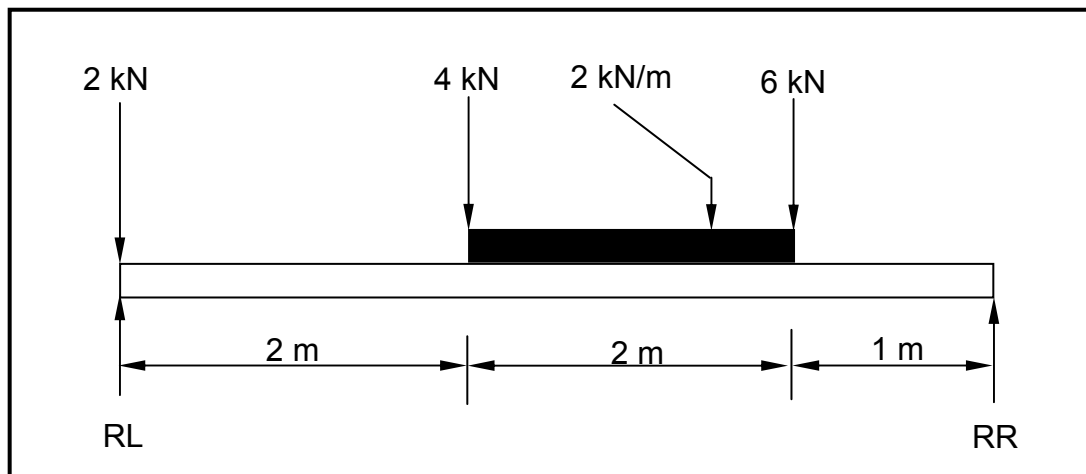


FIGURE 5.3

(6)
[30]

QUESTION 6: GRAPHIC COMMUNICATION

6.1 FIGURE 6.1 illustrates an incomplete sectional view of a part of a building. Analyse the drawing and complete the table on ANSWER SHEET 6.1.

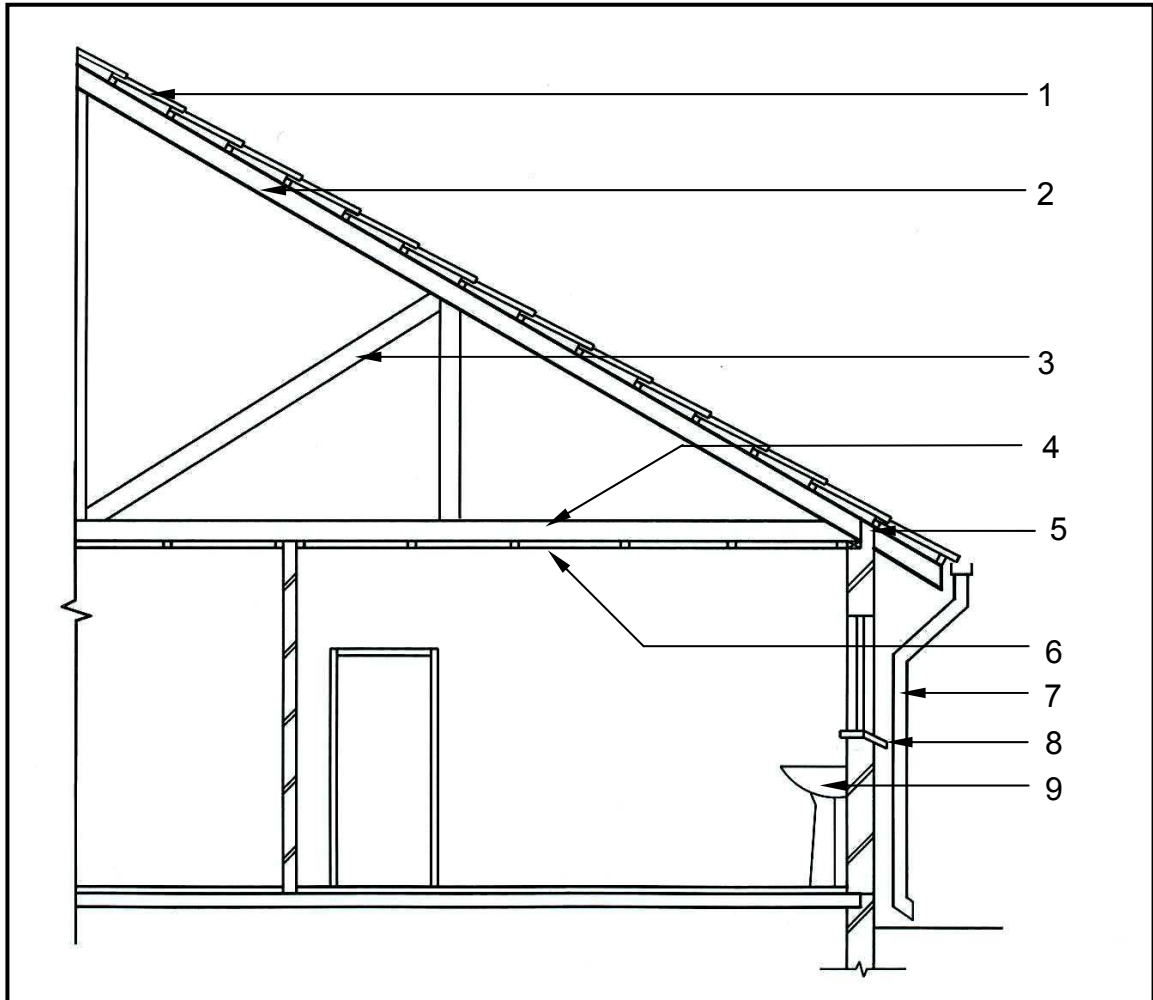


FIGURE 6.1

(15)

6.2 FIGURE 6.2 shows the floor plan of a proposed building.

6.2.1 Develop and draw to scale 1:100 on ANSWER SHEET 6.2 the WEST ELEVATION of the building. Use the specifications given below as well as the window schedule shown in FIGURE 6.3.

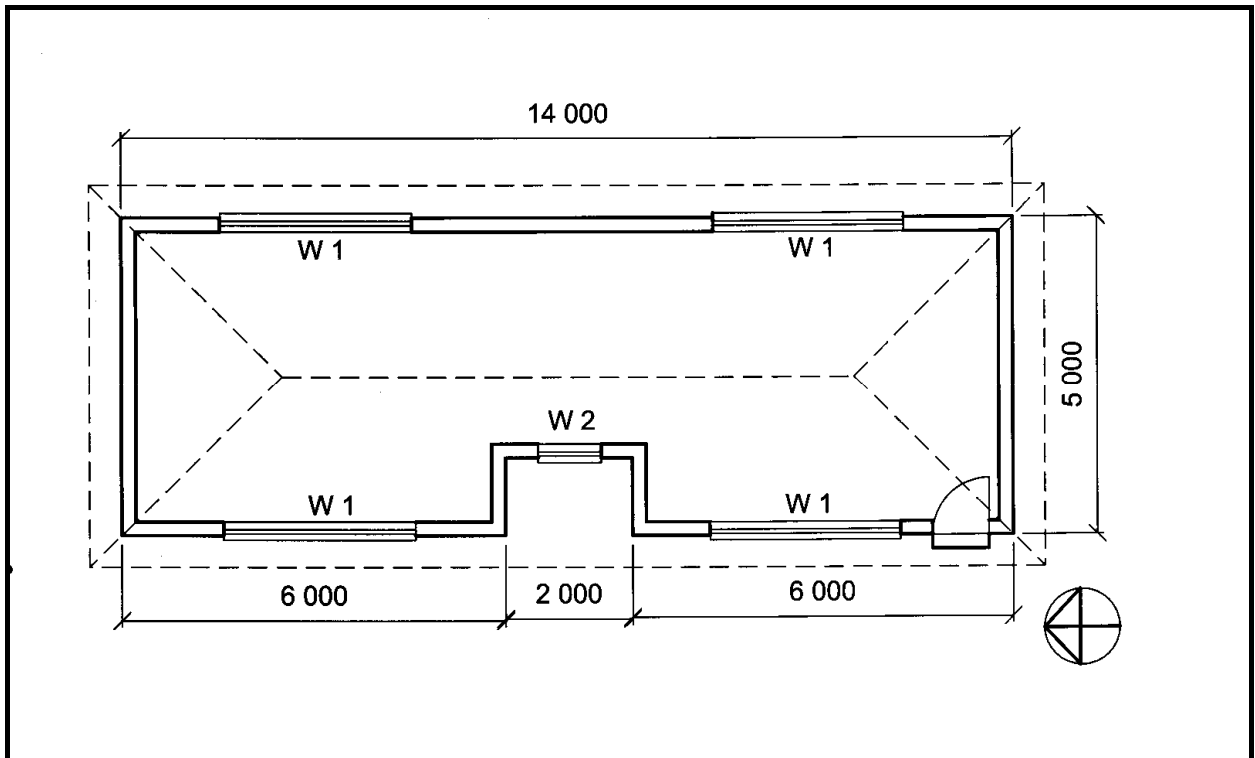


FIGURE 6.2

Specifications:

- The door is 2 000 mm high and 900 mm wide.
- The roof is covered with galvanised sheeting and is finished with 220 mm wide fascia boards.
- Rainwater pipes are 75 mm in diameter and 100 mm square gutters are used.
- The height between the top of the floor slab and the underside of the wall plate is 2 700 mm.
- The height between the natural ground level and the top of the floor slab is 300 mm.
- The eaves overhang is 500 mm.
- The door step is 150 mm high.
- The building has a hipped roof with a pitch of 30°. (21)

6.2.2 Show the following on your drawing:

The method of determining the roof height. (1)

6.2.3 Print the following labels on your drawing:

- Finished floor level (FFL) (1)
- Title (1)
- Scale (1)

WINDOW SCHEDULE			
WINDOW 1(W 1)		WINDOW 2 (W 2)	
WIDTH	HEIGHT	WIDTH	HEIGHT
3 000	1 500	1 000	1 500

FIGURE 6.3

[40]

TOTAL: 200

CENTRE NUMBER:										
-----------------------	--	--	--	--	--	--	--	--	--	--

EXAMINATION NUMBER:																			
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QUESTION 2.1

ANSWER SHEET 2.1

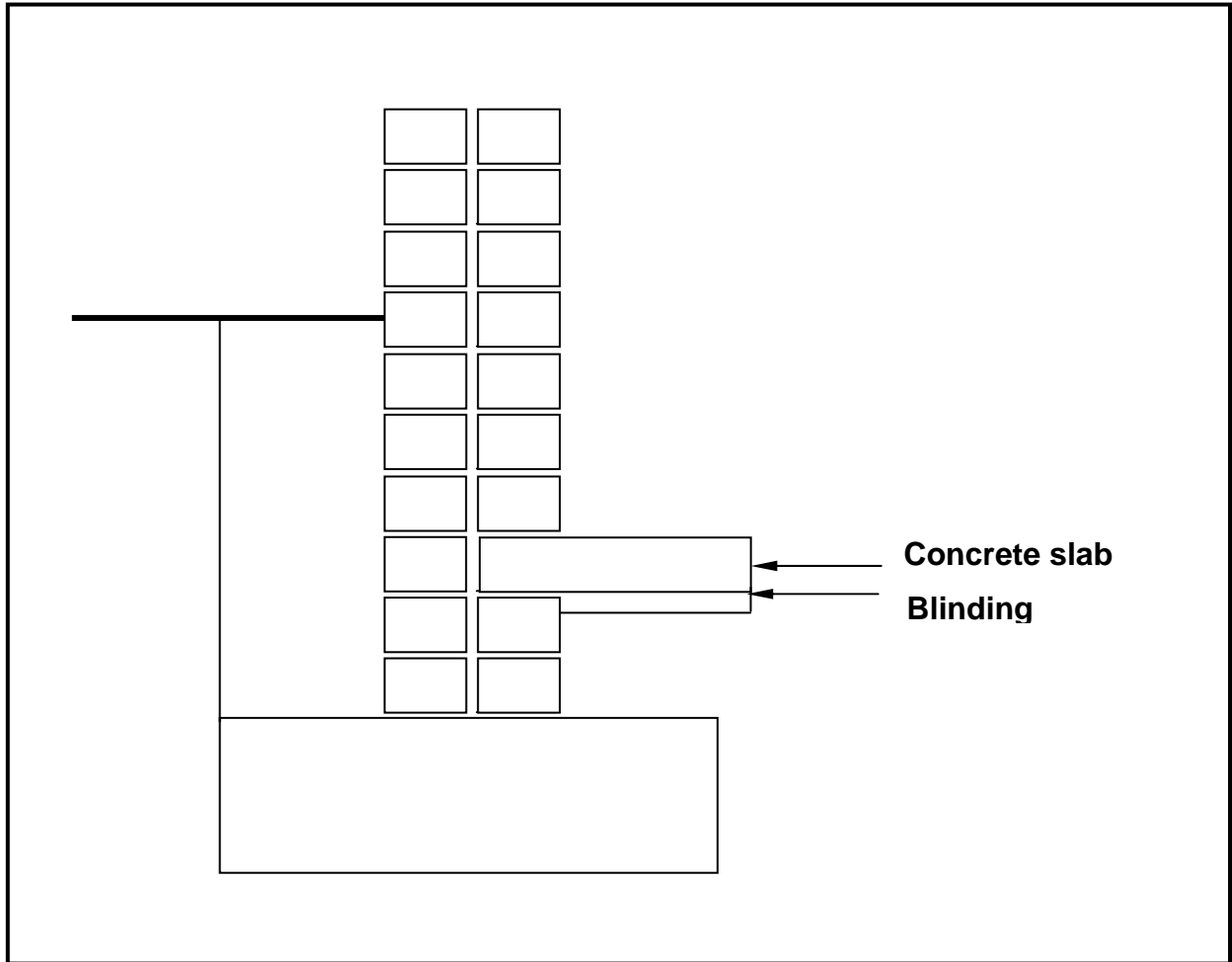


FIGURE 2.1

CENTRE NUMBER:

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EXAMINATION NUMBER:

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QUESTION 4.1

ANSWER SHEET 4.1

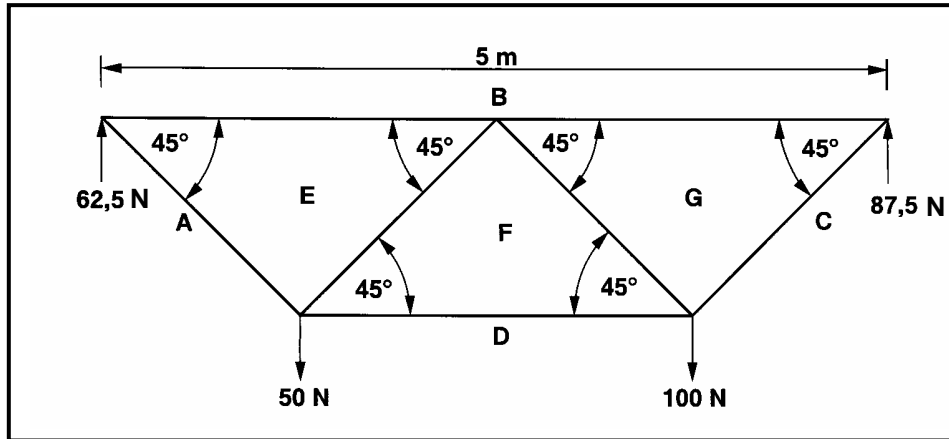
A	B	C	D
			Inside length of garage
			=
			=
			=
			Inside width of garage
			=
			=
			=
1/			Inside area of garage
1/			Area of one ceiling board
			Total number of ceiling boards required
			=
			=
			Length of cornice required for the garage
2/			Long sides
2/			Short sides
			Total length required
			=
			=

CENTRE NUMBER:

EXAMINATION NUMBER:

QUESTION 5.2

ANSWER SHEET 5.2



Space diagram

QUESTION 5.2.1

Force diagram

MEMBER	NATURE	MAGNITUDE
AE	Tie	
BE		62 N
BG	Strut	
CG		124 N

(1)

(9)

(4)

CENTRE NUMBER:									
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EXAMINATION NUMBER:														
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QUESTION 6.1**ANSWER SHEET 6.1**

NO.	QUESTIONS	ANSWERS	MARKS
1	Identify the type of roof covering (labelled 1)		1
2	What type of material is the roof covering made of?		1
3	Identify number 2.		1
4	Identify number 3.		1
5	Identify number 4.		1
6	Identify number 5.		1
7	What is wrong with the heights of the window and door?		1
8	Identify number 6.		1
9	Study the internal wall on the concrete slab and identify ONE error.		1
10	What is the width of the internal wall if it is a half brick wall?		1
11	Name ONE material that can be used to make this component indicated by number 7.		1
12	Identify number 8.		1
13	Identify number 9.		1
14	Draw a freehand symbol for a bath.		2

(15)

CENTRE NUMBER:

EXAMINATION NUMBER:

QUESTION 6.2

ANSWER SHEET 6.2

FORMULA SHEET

IMPORTANT ABBREVIATIONS

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTIONS	SYMBOL	DESCRIPTION
G	Centre of gravity	h	Height	d	Diameter
C	Centroid	b	Breadth/Width	r	Radius
L	Length	s	Side	A	Area
π	Pi = $\frac{22}{7} = 3,142$	\emptyset	Diameter	V	Volume

FORMULAE

AREA OF	FORMULA (in words)	FORMULA (In symbols)	FORMULA FOR THE POSITION OF CENTROIDS	
			X-axis	Y-axis
Square	Side x Side	s x s	$\frac{s}{2}$	$\frac{s}{2}$
Rectangle	Length x Breadth	l x b	$\frac{l}{2}$	$\frac{b}{2}$
Right-angled triangle	$\frac{1}{2}$ x base x height	$\frac{1}{2}b \times h$	$\frac{b}{3}$	$\frac{h}{3}$
Equilateral triangle/ Pyramid	$\frac{1}{2}$ x base x height	$\frac{1}{2}b \times h$	$\frac{b}{2}$	$\frac{h}{3}$
Circle	π x radius x radius	πr^2	Centroid is in the centre	
Circle	π x diameter x diameter divided by 4	$\frac{\pi d^2}{4}$		
Semi-circle	π x radius x radius divided by 2	$\frac{\pi r^2}{2}$		

$$\text{Position of centroid} = \frac{(A1 \times d) + (A2 \times d)}{\text{Total area}}$$

OR

$$X = \frac{\sum Ax}{\sum A}$$