



# basic education

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Department:  
Basic Education  
**REPUBLIC OF SOUTH AFRICA**

## **NATIONAL SENIOR CERTIFICATE**

**GRADE 11**

**CIVIL TECHNOLOGY**

**EXEMPLAR 2017**

**MARKS: 200**

**TIME: 3 hours**

**This question paper consists of 26 pages, 1 formula sheet and answer sheets (20) for the various sections.**

**REQUIREMENTS:**

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

**INSTRUCTIONS AND INFORMATION**

1. This question paper consists of FOUR sections. SECTIONS A, B, C and D.
2. SECTION A (QUESTIONS 1, 2, 3) is COMPULSORY for all learners.
3. Choose ONE of the following SECTIONS according to the area of specialisation that you have registered for.

SECTION B (QUESTIONS 4, 5 and 6) – Construction

SECTION C (QUESTIONS 7, 8 and 9) – Civil Services

SECTION D (QUESTIONS 10, 11 and 12) – Woodworking

**NOTE:** If you answer questions in SECTIONS B, C and D that you have NOT registered for, they will NOT be marked.

4. Number the answers correctly according to the numbering system used in this question paper.
5. Start the answer to EACH question on a NEW page.
6. Do NOT write in the margins of the ANSWER BOOK.
7. You may use sketches to illustrate your answers.
8. Write ALL calculations and answers in the ANSWER BOOK or on the attached ANSWER SHEETS.
9. Use the mark allocation as a guide to the length of your answers.
10. Make drawings and sketches in pencil, fully dimensioned and neatly finished off with descriptive titles and notes to conform to the *SANS/SABS Code of Practice for Building Drawings*.
11. For the purpose of this question paper, the size of a brick should be taken as 220 mm x 110 mm x 75 mm.
12. Use your own discretion where dimensions and/or details have been omitted.
13. Answer questions on the attached ANSWER SHEETS, as prescribed in each question, where applicable.
14. Drawings in the question paper are NOT to scale due to electronic transfer.

**SECTION A: GENERIC (COMPULSORY)****QUESTION 1: SAFETY, MATERIALS AND SUBSTANCE ABUSE**

- 1.1 Choose a description in COLUMN B that matches an item in COLUMN A. Write only the letter (A–M) next to the question number (1.1.1–1.1.10) in the ANSWER BOOK, for example 1.1.11 K.

COLUMN A		COLUMN B	
1.1.1	Hard hat	A	wear when working with a grinder
1.1.2	Overall	B	non-slip boots
1.1.3	Safety gloves	C	tools must be clearly marked when they are stored
1.1.4	Safety boots	D	causes troublesome behaviour
1.1.5	Mixing concrete manually	E	should be worn when working with heavy objects
1.1.6	Drowsiness	F	to protect your hands
1.1.7	Visible warning signs	G	used when practical work is done in a workshop to protect your body and clothing
1.1.8	Good housekeeping	H	used to prevent head injuries
1.1.9	Alcohol	I	symptoms of alcohol poisoning
1.1.10	Eye protection	J	placed on any building site
		K	higher productivity
		L	running shoes
		M	wear gumboots

(10 x 1) (10)

- 1.2 List THREE board products that are suitable for wall panelling. (3)
- 1.3 List THREE factors that should be considered when stacking materials. (3)
- 1.4 Distinguish between *ferrous* and *non-ferrous metals* in respect of their compositions. (2)
- 1.5 State TWO symptoms of alcohol poisoning. (2)

- 1.6 Give a reason why different types of hazardous material should be stored in a safe, separate room. (1)
- 1.7 Water is used to mix concrete. Name THREE other ingredients of concrete. (3)
- 1.8 Explain the purpose of water in a concrete mix. (2)
- 1.9 Describe one use of the following:
- 1.9.1 Screed (1)
  - 1.9.2 Plywood (1)
  - 1.9.3 Aluminium (1)
- 1.10 Explain ONE measure you can take so that you are not infected by the HIV. (1)
- [30]**

**QUESTION 2: TOOLS, EQUIPMENT AND GRAPHICS**

Start this question on a NEW page.

2.1 Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question number (2.1.1–2.1.10) in the ANSWER BOOK, for example 2.1.11 C.

- 2.1.1 A/An... may be used to sharpen steel drill bits and cold chisels.
- A angle grinder
  - B flat file
  - C electric drill
  - D bench grinder
- (1)
- 2.1.2 A ... may be used to drive in screws fast.
- A flat screwdriver
  - B power screwdriver
  - C Phillips screwdriver
  - D crow bar
- (1)
- 2.1.3 A/An ... is used to cut grooves into brick walls.
- A portable circular saw
  - B club hammer
  - C angle grinder
  - D electric drill
- (1)
- 2.1.4 A ... may be used to cut the rafters of an installed roof truss to the correct length.
- A radial arm saw
  - B portable circular saw
  - C rip saw
  - D cutting gauge
- (1)
- 2.1.5 A ... is the most effective tool to mix large quantities of concrete on a building site.
- A round-nose shovel
  - B square-nose shovel
  - C spade
  - D concrete mixer
- (1)
- 2.1.6 A ...is used to compact loose soil up to a depth of 300 mm.
- A plate compactor
  - B concrete vibrator
  - C rammer
  - D straight edge
- (1)

- 2.1.7 ... may be used to tighten cup nuts in difficult-to-reach spaces behind sanitary appliances.
- A Water pump pliers
  - B A basin wrench
  - C A corner trowel
  - D Universal pliers
- (1)
- 2.1.8 A ... may be used to drive in small nails, like panel pins.
- A club hammer
  - B claw hammer
  - C ball-pene hammer
  - D cross-pene hammer
- (1)
- 2.1.9 A ... may be used to copy angles to transfer them to other surfaces.
- A sliding bevel
  - B mitre square
  - C combination square
  - D combination plane
- (1)
- 2.1.10 A ... may be used to plane long planks to obtain a straight surface.
- A smoothing plane
  - B jack plane
  - C trying plane
  - D All the above-mentioned
- (1)

2.2 FIGURE 2.2 below shows a hand tool and one piece of site equipment.



FIGURE 2.2

- 2.2.1 Identify **A** and **B**. (2)
- 2.2.2 Explain ONE use of **A** and **B**. (2)
- 2.2.3 Explain the care of a used cold chisel. (1)

2.3 Use ANSWER SHEET 2.3 and draw to scale 1 : 2 an isometric view of a common brick. (5)

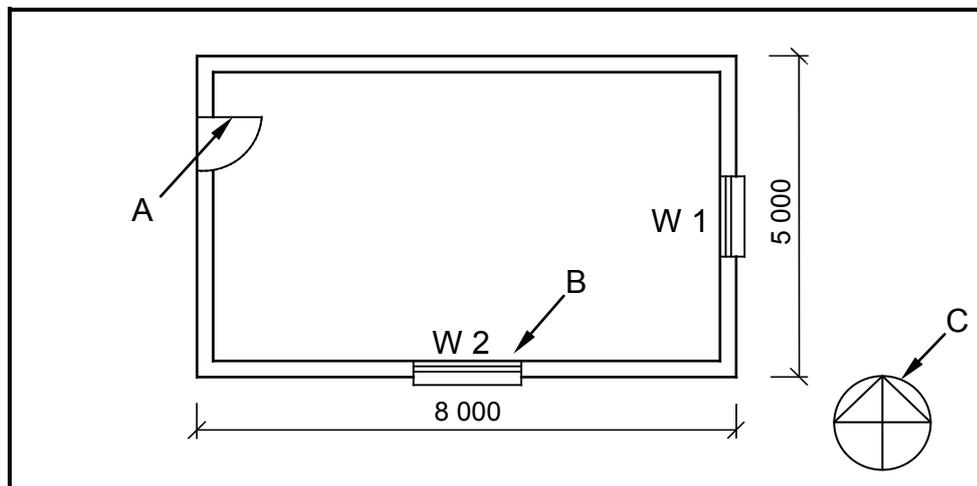
2.4 Use ANSWER SHEET 2.4 and make a neat freehand drawing, in good proportion, of the sectional view part of the superstructure of a building.

Show the following on your drawing:

- Part of the wall below the window
- External window sill
- Internal window sill
- Window frame
- TWO lintels above the window
- Part of the wall above the window

(9)

2.5 FIGURE 2.5 below shows the floor plan of a building. Study the drawing and answer the questions that follow.



**FIGURE 2.5**

2.5.1 Identify parts **A**, **B** and **C**. (3)

2.5.2 Use ANSWER SHEET 2.5.2 and develop and draw, to scale 1 : 50, the east elevation of the building.

Use the following specifications:

- The building has a gable roof with a pitch of 30°.
- Window 1 is 1 500 mm wide and 1 200 mm high.
- Window 2 is 2 000 mm wide and 1 200 mm high.
- All windows are placed in the middle of the walls.
- The door is 2 000 mm high and 900 mm wide.
- The height from the natural ground level to the finished floor level is 300 mm.
- The height of the superstructure is 2 700 mm.
- The roof is finished off with 220 mm barge boards and no gutters are fitted.

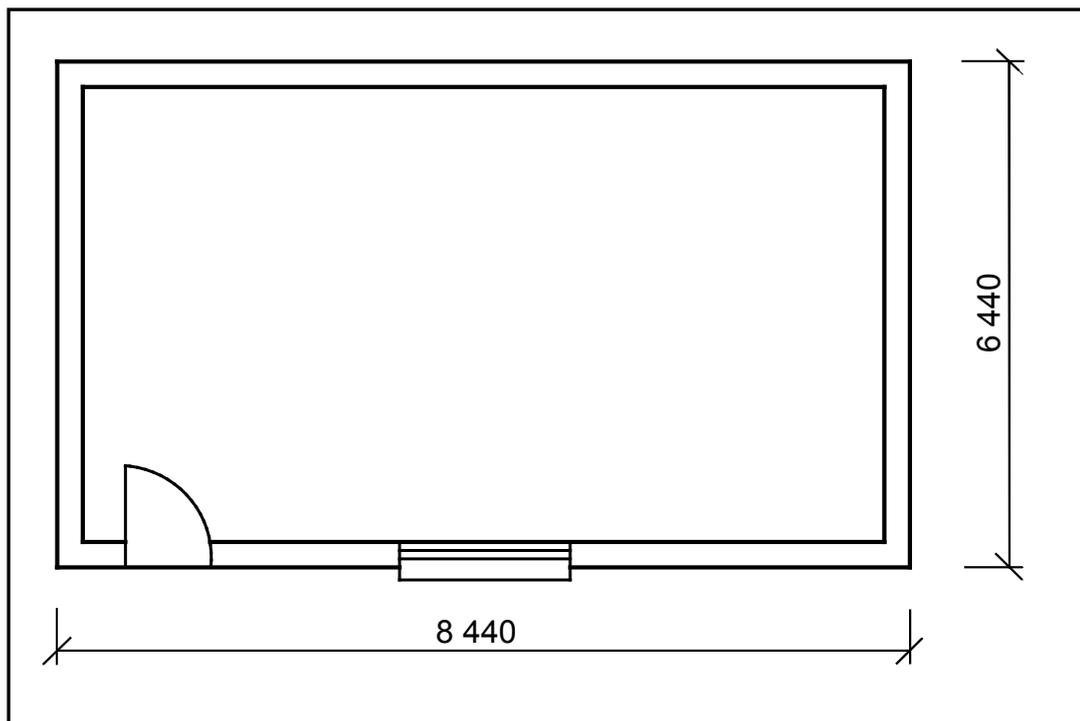
(8)

**[40]**

**QUESTION 3: QUANTITIES AND JOINING**

Start this question on a NEW page.

- 3.1 Formulas are used to calculate quantities. Write down the formula that you will use to calculate:
- 3.1.1 Area (1)
- 3.1.2 Volume (1)
- 3.2 In which unit are the lengths of skirtings and quarter round mouldings measured? (1)
- 3.3 A foundation with a length of 28 m, width of 450 mm and a thickness of 150 mm need to be cast with concrete. Calculate the volume of concrete required for the foundation in  $m^3$ . (4)
- 3.4 FIGURE 3.4 below shows the floor plan of a single-room building.



**FIGURE 3.4**

Specifications:

- The width of the wall is 220 mm.
- The opening for the door is 2 100 mm x 900 mm
- The opening for the window is 2 000 mm x 1 200 mm
- The height of the superstructure is 2 700 mm
- Use 50 bricks per square metre for a half-brick wall.

Use ANSWER SHEET 3.4 and calculate the following:

- 3.4.1 Centre lines of the walls in metres (5)
- 3.4.2 Number of bricks required to build the walls of the superstructure (10)

3.5 Complete the following sentences by using the words in the list below. Write down the word next to the question number (3.5.1–3.5.5) in the ANSWER BOOK.

PVC adhesives; contact glue; water; timber; epoxy
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- 3.5.1 PVA glue is used to join ... (1)
- 3.5.2 ... glue consists of a resin and a hardener. (1)
- 3.5.3 Silicone glue may be used as a basic sealant against the penetration of ... (1)
- 3.5.4 ... glue dries quickly and once the parts come together they cannot be separated. (1)
- 3.5.5 Plastic pipes are bonded by means of ... (1)

3.6 State ONE property of EACH of the following adhesives:

- 3.6.1 Contact glue (1)
- 3.6.2 PVA glue (1)
- 3.6.3 Silicone (1)

**[30]**

**TOTAL SECTION A: 100**

**SECTION B: CONSTRUCTION****QUESTION 4: EXCAVATIONS AND FOUNDATIONS**

Start this question on a NEW page.

4.1 Use ANSWER SHEET 4.1 and draw an isometric view of a queen closer to scale 1 : 2. Show ONE dimension on your drawing using the correct drawing technique. Start your drawing in the position indicated on the ANSWER SHEET. (5)

4.2 State TWO uses of malleable cast iron. (2)

4.3 Distinguish between *copper* and *lead* according to their use and colour. Tabulate your answer as follows:

MATERIAL	COLOUR	USE
Copper		
Lead		

(4)

4.4 FIGURE 4.4 below shows a rammer. Refer to the figure and answer the questions that follow.

**FIGURE 4.4**

4.4.1 Name TWO pieces of personal safety equipment that a worker may use when working with a rammer. (2)

4.4.2 State TWO uses of the rammer. (2)

4.5 FIGURE 4.5 on ANSWER SHEET 4.5 shows an incomplete vertical sectional view of an open-eaves roof construction. Complete the drawing of the vertical sectional view on ANSWER SHEET 4.5.

Show the following on your drawing:

- Roof covering
- Tie beam
- Wall plate
- Purlin
- Fascia board
- Galvanised roof covering (5)

4.6 You want to build a boundary wall on one side of your site. The height of the wall is 2 m and the length is 15 m. The wall is a one-brick wide wall. Fifty bricks are needed to build one square metre of a half-brick wall.

4.6.1 Calculate the area of the wall. (2)

4.6.2 Calculate the total number of bricks required to build the wall. (2)

4.7 Name TWO types of reinforced-concrete suspended floors. (2)

4.8 Many accidents happen during excavations. State TWO causes of accidents that may occur during excavations. (2)

4.9 Explain under what circumstances you would use the following foundations:

4.9.1 Pad foundation (1)

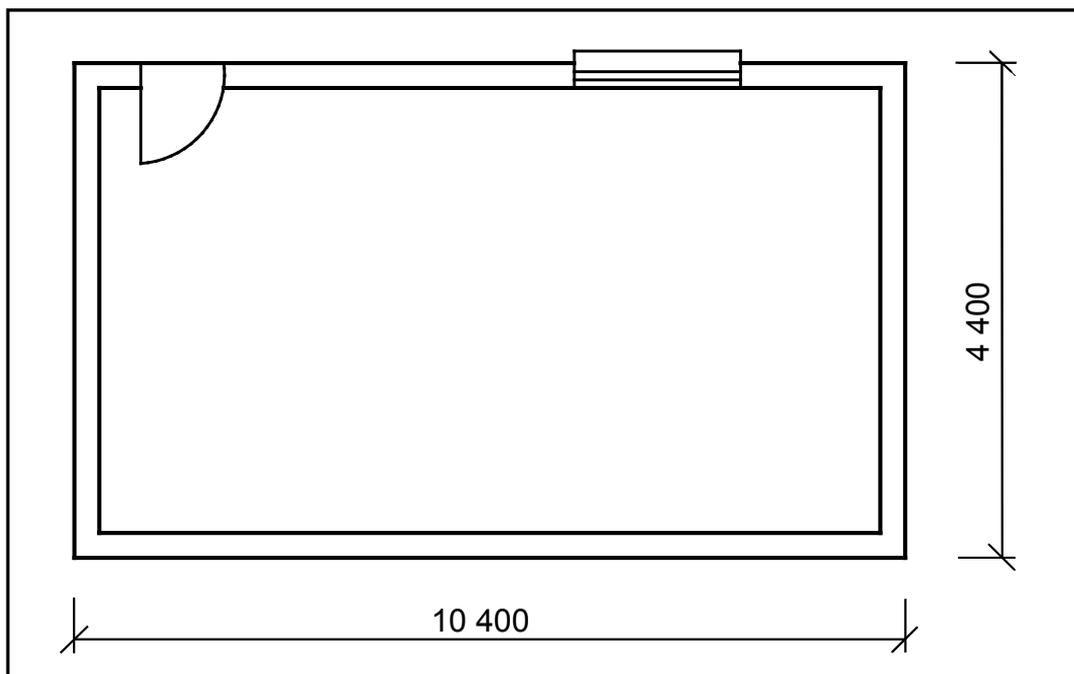
4.9.2 Short-bored pile foundation (1)

**[30]**

**QUESTION 5: FORMWORK, CONSTRUCTION STEEL AND CAVITY WALLS**

Start this question on a NEW page.

- 5.1 Explain TWO safety precautions that must be adhered to when using a power float on site. (2)
- 5.2 What safety practice should you apply when adhesives are used that give off toxic fumes? (1)
- 5.3 FIGURE 5.3 below shows the floor plan of a one-room building.

**FIGURE 5.3**

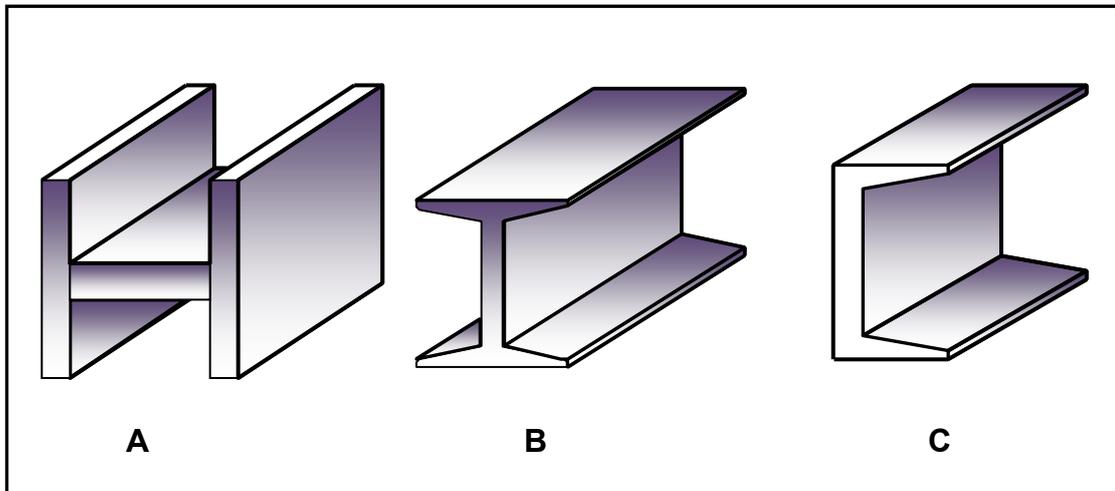
Specifications:

- The width of the wall is 220 mm
- The opening for the door is 2 100 mm x 900 mm
- The minimum overhang of the lintel on each side of an opening is 150 mm

Use ANSWER SHEET 5.3 and calculate the following:

- 5.3.1 The length of the lintel needed above the opening of the door (2)
- 5.3.2 The area of floor covering needed (5)

5.4 FIGURE 5.4 below shows illustrations of steel profiles that are used on a construction site.



**FIGURE 5.4**

5.4.1 Identify **A**, **B** and **C**. (3)

5.4.2 Explain ONE use of EACH steel profile. (3)

5.5 Use ANSWER SHEET 5.5 and complete a drawing, to scale 1 : 10, of a horizontal sectional view of the formwork of a square column.

Use the following specifications:

- Size of the column is 500 mm x 500 mm
- Shuttering board 21 mm thick
- Two clamps 76 mm x 50 mm
- Two yokes 76 mm x 50 mm
- Four wedges
- Two 16 mm diameter ( $\varnothing$ ) threaded rods with nuts

Label ONE part of the drawing. (6)

5.6 FIGURE 5.6 below is a photograph of construction site equipment.



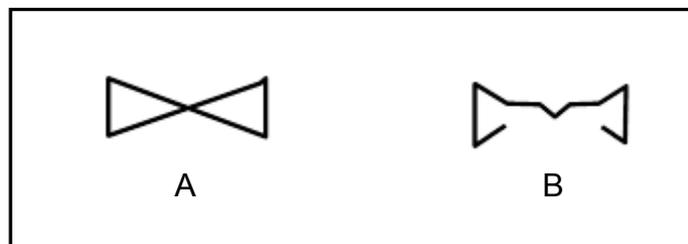
**FIGURE 5.6**

5.6.1 Identify the construction site equipment. (1)

5.6.2 Suggest ONE precautionary measure that should be in place if the equipment in FIGURE 5.6 breaks down. (1)

5.7 Complete FIGURE 5.7 on ANSWER SHEET 5.7 to illustrate the centre of a flat arch. (2)

5.8 FIGURE 5.8 below is a sketch of TWO types of wall ties that may be used in a cavity wall. Identify wall ties **A** and **B**.



**FIGURE 5.8**

5.9 Explain TWO regulations in terms of the horizontal and vertical spacing of wall ties in a cavity wall. (2)  
**[30]**

**QUESTION 6: BRICKWORK, STAIRCASES AND ROOF COVERING**

Start this question on a NEW page.

- 6.1 Recommend TWO types of protective clothing that one may wear when working with cement. (2)
- 6.2 When developing a table for a cutting list, the heading of each column must be indicated. Name THREE headings for a cutting list. (3)
- 6.3 Describe TWO methods that may be used to join a timber window frame stile onto brickwork. (2)
- 6.4 State THREE hand tools that you will need to make the formwork for a square column. (3)
- 6.5 Name ONE type of nail that you will use to join roof truss members to one another. (1)
- 6.6 The sketch on ANSWER SHEET 6.6 shows a plan course of a one-brick wide corner junction wall (quoin) built in English bond.

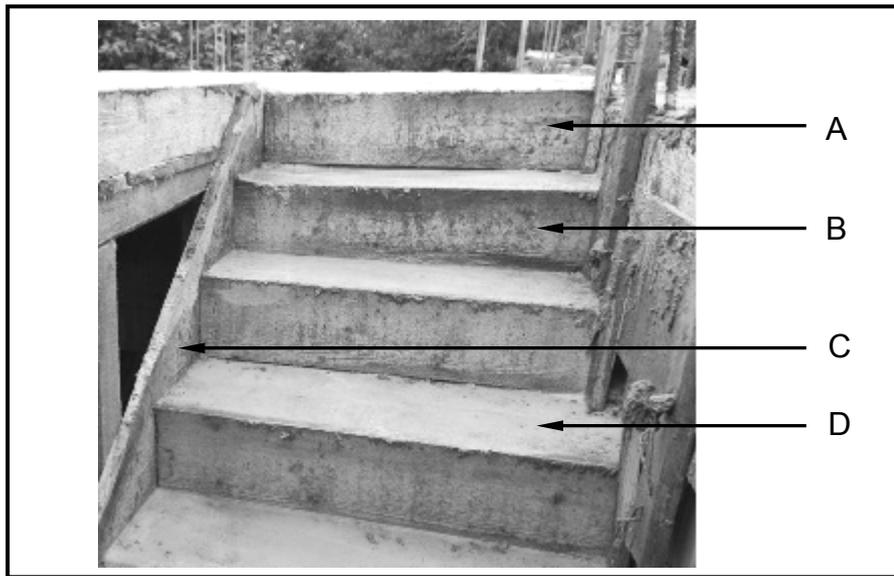
Use ANSWER SHEET 6.6 to project and draw, from the given view, the alternate plan course of the wall in good proportion.

Label the following on the drawing:

- Header course
- Queen closer

**NOTE:** Proportion and line work will count two marks. (9)

- 6.7 FIGURE 6.7 below shows the formwork for a concrete staircase. Study the picture and answer the questions that follow.



**FIGURE 6.7**

- 6.7.1 Identify part **A**. (1)
- 6.7.2 Recommend a suitable height for **B**. (1)
- 6.7.3 Identify part **C**. (1)
- 6.7.4 Identify part **D**. (1)
- 6.7.5 Draw the symbol for concrete. (2)
- 6.8 Describe the purpose of roof covering in a building (2)
- 6.9 Name TWO types of profiles of metal roof sheeting that are used in the building industry. (2)
- 6.10 FIGURE 6.10 on ANSWER SHEET 6.10 shows an incomplete gauged segmental arch with construction lines. The incomplete courses of surrounding brickwork are also shown on the right-hand side.
- 6.10.1 Use ANSWER SHEET 6.10 and complete the gauged segmental arch by drawing the voussoirs (bricks) just past the centre of the arch. (3)
- 6.10.2 Label the key voussoir (brick). (1)
- 6.10.3 Complete the surrounding brickwork in stretcher bond on the right-hand side of the arch within THREE of the given courses. (2)
- 6.10.4 Indicate the rise on your drawing. (1)
- 6.10.5 Indicate the span on your drawing. (1)
- 6.10.6 Indicate the intrados on your drawing. (1)
- 6.10.7 Indicate the extrados on your drawing. (1)

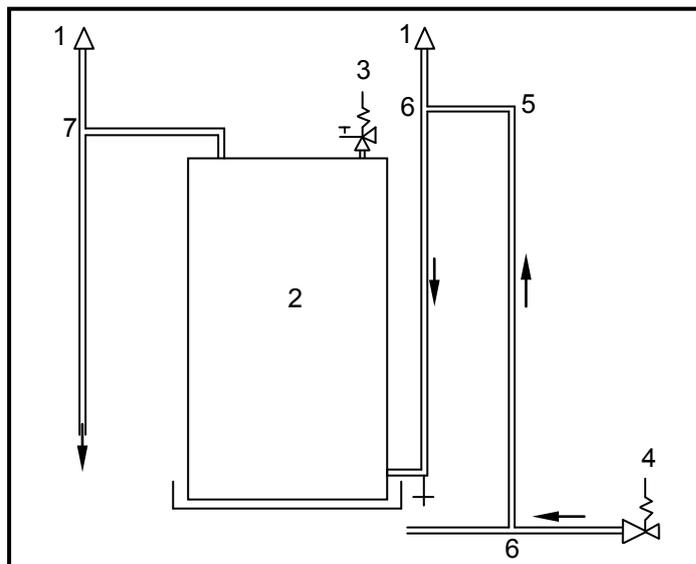
**[40]**

**TOTAL SECTION B: 100**

**SECTION C: CIVIL SERVICES****QUESTION 7: CONSTRUCTION IN CIVIL SERVICES, COLD-WATER AND HOT-WATER SUPPLY**

Start this question on a NEW page.

- 7.1 Explain the term *placing of concrete*. (2)
- 7.2 Name TWO methods that may be used to compact concrete. (2)
- 7.3 Motivate why it is necessary to cure concrete. (1)
- 7.4 FIGURE 7.4 on ANSWER SHEET 7.4 shows the top view of two consecutive courses of the T-junction of a half-brick wall in stretcher bond. Project and draw from the given view the front elevation of the wall, as seen from the side of the branch wall. Show THREE brick courses. (6)
- 7.5 FIGURE 7.5 below shows a system that supplies cold and hot water to a house. Polycop pipe is used for the cold-water supply and copper pipe for the hot-water supply. Study the drawing and complete the quantity list below to complete the plumbing installation. Write only the answer next to the question number (7.5.1–7.5.5) in the ANSWER BOOK.

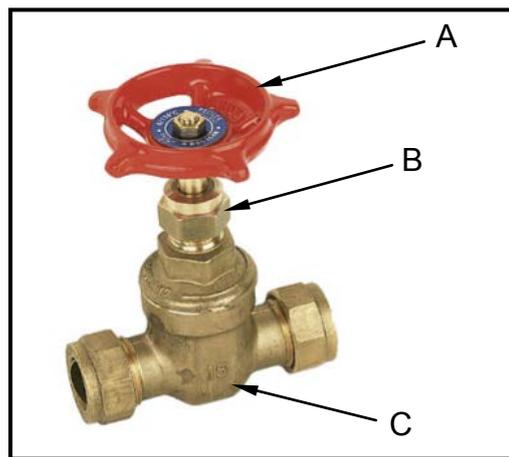


**FIGURE 7.5**

ITEM	NAME OF SANITARY WARE OR FITTING	MATERIAL	SIZE	QUANTITY
1	7.5.1	Brass	22 mm	2
2	High-pressure geyser	---	150 litres	1
3	Temperature and pressure safety valve	Brass	22 mm	1
4	Pressure reducing valve	Brass	22 mm	1
5	Compression elbow	---	22 mm	2
6	Compression T-joint	7.5.2	22 mm	7.5.3
7	Capillary T-joint	7.5.4	22 mm	7.5.5

(5)

- 7.6 State ONE advantage of copper pipe. (1)
- 7.7 State ONE disadvantage of high-density polyethylene pipes. (1)
- 7.8 You have to repair a copper pipe that is leaking and of which the water supply cannot be totally shut off. Recommend the type of fitting that will be most appropriate to join this pipe. (1)
- 7.9 FIGURE 7.9 below shows a valve. (1)



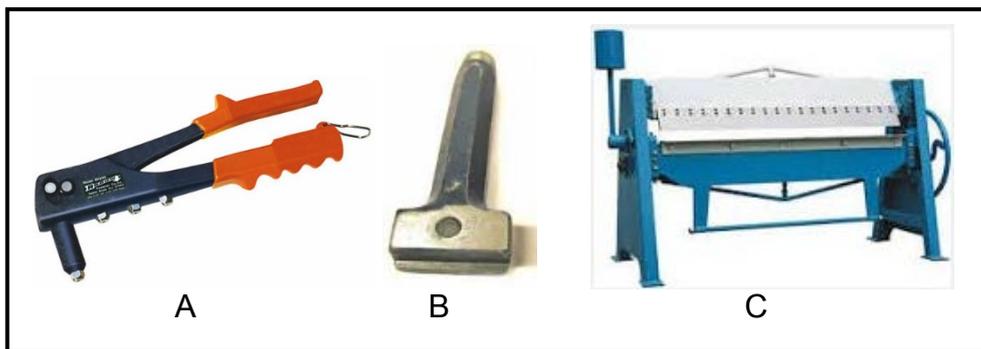
**FIGURE 7.9**

- 7.9.1 Identify the valve shown in FIGURE 7.9. (1)
- 7.9.2 Label **A** to **C** correctly. (3)
- 7.10 Explain TWO regulations that should be adhered to when installing high-pressure electrical geysers. (2)
- 7.11 Make neat freehand drawings of the following symbols used in hot-water installations:
- 7.11.1 Non-return valve (2)
- 7.11.2 Stopcock (2)
- 7.12 State ONE disadvantage of solar geysers. (1)
- [30]**

**QUESTION 8: GRAPHICS, ROOF WORK AND STORM WATER**

Start this question on a NEW page.

- 8.1 State TWO safety rules that must be observed while soldering. (2)
- 8.2 State TWO uses of soldering wire. (2)
- 8.3 State ONE use of ceramics. (1)
- 8.4 FIGURE 8.4 below shows different tools used in sheet metalwork.



**FIGURE 8.4**

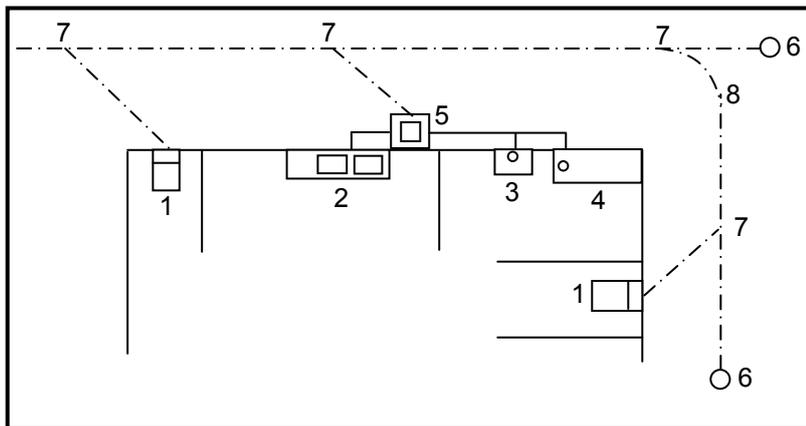
- 8.4.1 Identify tools **A–C** in FIGURE 8.4. (3)
- 8.4.2 Explain ONE use of EACH of these tools. (3)
- 8.5 Make a neat freehand sketch of a grooved seam lap joint with edges interlocked before it is finished with tool B, in FIGURE 8.4. (2)
- 8.6 Make a neat freehand drawing of the development of the stopped end of a square gutter with an open top.
- Show the following on your drawing:
- End cap
  - THREE sides unfolded
  - Seam allowance for soldering at the bottom
- (4)
- 8.7 Explain what *storm water* is. (1)
- 8.8 FIGURE 8.8 on ANSWER SHEET 8.8 is a drawing of the shoe of a square gutter. Use ANSWER SHEET 8.8 to develop and draw the development of part A of the shoe. Use scale 1 : 1. Show 4 mm for the seam allowance on either side of the development. (12)

**[30]**

**QUESTION 9: DRAINAGE (SEWERAGE) AND SANITARY FITMENTS**

Start this question on a NEW page.

- 9.1 Exposure to raw sewage is a health risk for workers. State TWO safety precautions that must be adhered to, to prevent infections when working with raw sewage. (2)
- 9.2 Name the hand tool that you would use to bevel the edges of pipes to ease connection of the pipes to pipe fittings, when laying uPVC drain pipes. (1)
- 9.3 FIGURE 9.3 below is the layout of a drainage (sewerage) system drawn to scale 1 : 100. The diameter of the soil pipe is 110 mm and that of the waste pipes 50 mm. Study the drawing and complete the take-off list below to complete the plumbing installation. **For calculation of pipe lengths use scale 1 mm on the drawing = 100 mm of pipe.**  
Write down only the answers next to the question numbers (9.3.1–9.3.5) in the ANSWER BOOK.



**FIGURE 9.3**

ITEM	NAME OF SANITARY WARE/FITTING	MATERIAL	SIZE	QUANTITY	LENGTH
1	<b>9.3.1</b>	<b>9.3.2</b>	---	2	---
2	Kitchen sink double bowl	Stainless steel	1 500 mm	1	---
3	Wash basin	---	---	1	---
4	Bath	---	1 800 mm	1	---
5	<b>9.3.3</b>	---	---	1	---
6	<b>9.3.4</b>	uPVC	110 mm	<b>9.3.5</b>	---
7	Junction 135°	uPVC	110 mm	4	---
8	Bend 135°	uPVC	110 mm	1	---
9	Soil pipe (including branch pipes)	uPVC	110 mm	---	<b>9.3.6</b>

- 9.4 Explain how you will join two pieces of 50 mm diameter uPVC waste pipe using PVC adhesive. (3)
- 9.5 Distinguish between *soil water* and *wastewater*. (2)

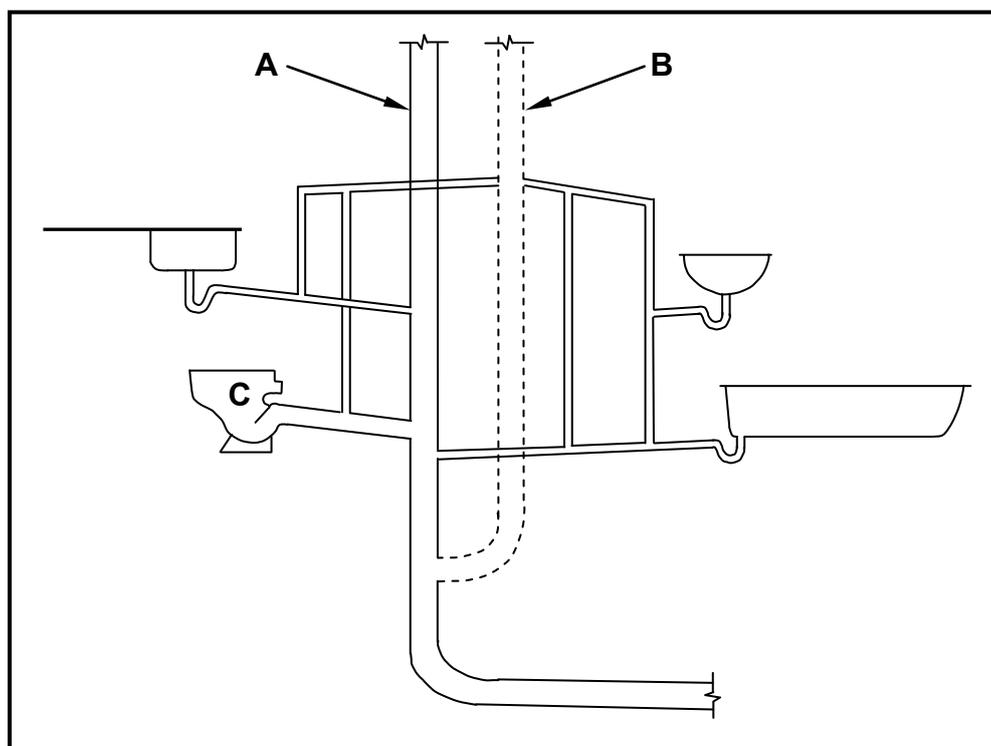
9.6 What does EACH of the following abbreviations stand for?

- |       |      |     |
|-------|------|-----|
| 9.6.1 | IL   | (1) |
| 9.6.2 | uPVC | (1) |
| 9.6.3 | WT   | (1) |
| 9.6.4 | WP   | (1) |

9.7 Draw the symbol for EACH of the following:

- |       |                              |     |
|-------|------------------------------|-----|
| 9.7.1 | Shower, as used for pipework | (2) |
| 9.7.2 | Sink single                  | (2) |

9.8 FIGURE 9.8 below shows a group of sanitary fitments connected to a one-pipe system. Study the drawing and answer the questions that follow.



**FIGURE 9.8**

- 9.8.1 Explain what will happen in the total pipe system when water is discharged from C. (Refer to the correct names of pipes A and B, the discharge, syphon action and ventilation taking place in the system.) (5)
- 9.8.2 When a range of fitments is horizontally aligned, the system must be ventilated. What is the minimum diameter of the following in this respect? (2)
- Soil pipes
  - Wastewater discharge pipes

- 9.9 Categorise the following sanitary fittings in terms of *waste fixtures* and *soil fixtures* in a table:
- Sink
  - Bath
  - Urinal
- 9.10 List THREE requirements of an efficient water trap.
- 9.11 Distinguish between a *cistern* and a *flush valve* in terms of the advantages of each. Tabulate your answer.
- TOTAL SECTION C: 100**

**SECTION D: WOODWORKING****QUESTION 10: CASEMENTS, DOORS AND WALL PANELLING**

Start this question on a NEW page.

- 10.1 Give ONE reason why a carpenter should use seasoned timber to make a door. (1)
- 10.2 In your ANSWER BOOK draw one quarter of a log to show how quarter-sawn boards are obtained. (2)
- 10.3 The drawing on ANSWER SHEET 10.3 shows the horizontal sectional view of a mullion with two adjacent casement stiles and glass in position. Label any SIX parts of the drawing. (6)
- 10.4 Name ONE machine that may be used to form rebates on frame members. (1)
- 10.5 Use drawing instruments and draw in your ANSWER BOOK, in good proportion, a sketch of the horizontal section through a 50 mm x 40 mm ground and two 12 mm thick plywood panels to show how the joint is finished with a 12 mm thick cover strip, as used in wall panelling. (4)
- 10.6 Use ANSWER SHEET 10.6 and draw, to scale 1 : 10, the front elevation of a one-panel door. The panels are placed in a 12 mm wide rebate and secured with a bead.
- Use the following specifications:
- The door is 2 032 mm high and 813 mm wide
  - The top rail and stiles are 114 mm x 44 mm
  - The bottom rail is 220 mm x 44 mm
  - 16 mm flat plywood panel
- Print a title for the door. (6)
- 10.7 Name ONE joint that may be used to join the stiles to the top rail of a door. (1)
- 10.8 Name the safety equipment you will use to protect your eyes when using an electric drill. (1)
- 10.9 Calculate the size of the plywood that will be required for the panel of the door in QUESTION 9.6 if the panel is set in a 12 mm groove of each member of the door.

Write down the following formula in your ANSWER BOOK as a guide for your calculation:

$$\text{Width of panel} = \underline{\hspace{2cm}} - (\underline{\hspace{1cm}} + \underline{\hspace{1cm}}) + \underline{\hspace{1cm}} = \underline{\hspace{2cm}}$$

$$\text{Length of panel} = \underline{\hspace{2cm}} - (\underline{\hspace{1cm}} + \underline{\hspace{1cm}}) + \underline{\hspace{1cm}} = \underline{\hspace{2cm}}$$

(8)  
**[30]**

**QUESTION 11: CENTERING, FORMWORK, SHORING**

Start this question on a NEW page.

- 11.1 Explain the term *centre*, as used in civil technology. (1)
- 11.2 Use drawing instruments and draw, in your ANSWER BOOK, a neat, labelled sketch to differentiate between *open lagging on one end* and *closed lagging on the other end* that are fixed to the rib of the centre of a flat arch. Label any TWO parts of the drawing. (5)
- 11.3 State ONE safety precaution that must be observed by a worker using electric tools. (1)
- 11.4 Recommend ONE electrical tool that may be used to cut the rib of a semi-circular centre to shape. (1)
- 11.5 Define the term *formwork*. (2)
- 11.6 Name ONE material that may be used in the construction of formwork. (1)
- 11.7 Motivate why it is not necessary to drive home nails when joining formwork members. (1)
- 11.8 FIGURE 11.8 on ANSWER SHEET 11.8 shows a part of the vertical section through the formwork of a concrete floor slab. Complete the drawing to show the following:
- TWO props
  - Sole plate
  - Wedges
  - Bearers
  - Joist
  - Label the props and wedges. (10)
- 11.9 Explain TWO instances when it would be necessary to install raking shore in a building. (2)
- 11.10 FIGURE 11.10 on ANSWER SHEET 11.10 shows the external walls of two bindings. Flying shores must be installed between the two walls. Complete the drawing to show the horizontal shore, wall plate, wedges, needle, cleat and straining sill. Ignore the strut. (6)

**[30]**

**QUESTION 12: SUSPENDED FLOORS, CEILINGS, STAIRCASES, CUPBOARDS AND IRONMONGERY**

Start this question on a NEW page.

- 12.1 Give ONE reason for using treated timber for suspended floor construction. (1)
- 12.2 Use ANSWER SHEET 12.2 and draw, to scale 1 : 10, a labelled vertical section through a suspended timber floor showing the following details (do NOT draw the foundation):
- 330 mm foundation wall
  - 220 mm external wall
  - Ant guard and DPC located 150 mm below the wall plate
  - 114 mm x 38 mm wall plate
  - 220 mm x 50 mm floor joists
  - 150 mm x 30 mm tongue and groove floor board
  - 70 mm x 22 mm skirting against the 12 mm thick plastered internal wall
  - Print the title of the drawing.
  - Label any ONE part of the drawing (9)
- 12.3 Use drawing instruments and draw, in your ANSWER BOOK, in good proportion, a sketch to illustrate the term *secret nailing*, as used in floor construction. Show any TWO floor boards. (3)
- 12.4 Name ONE hand tool that you will use to install a ceiling. (1)
- 12.5 Name ONE piece of safety attire you will wear while you are cutting material for a cupboard. (1)
- 12.6 Use ANSWER SHEET 12.6 and drawing instruments and draw, in good proportion, a sketch of a part of the vertical section through a ceiling construction. Show the following on your sketch:
- Tie beam
  - Brandering
  - Gypsum board ceiling
  - Label the brandering. (5)
- 12.7 Calculate the total length of cornice required for a room that is 5 metres long and 3 metres wide on the inside. (3)
- 12.8 Distinguish between the terms *rise* and *riser*, as used in staircase construction. (2)
- 12.9 Name ONE string that is used in staircase construction. (1)

- 12.10 A cabinet, 800 mm high, 1 000 mm wide and 500 mm deep, is to be fitted between two walls and under a counter.
- 12.10.1 Use ANSWER SHEET 12.10 and indicate the following labels on the drawing:
- Base
  - Door frame
  - Top
  - Middle shelf
  - Bottom shelf
  - Plywood back (6)
- 12.10.2 Recommend an alternate material for the back of the cabinet. (1)
- 12.10.3 Recommend THREE materials that may be used to make the cabinet. (3)
- 12.11 Recommend a hinge that will you use to hang the doors for the cabinet in QUESTION 12.10. (1)
- 12.12 Name ONE other ironmongery item needed for the cabinet. (1)
- 12.13 Recommend an ironmongery item that you will use for the following instances:
- 12.13.1 An entrance door that must open 180° to its frame (1)
- 12.13.2 Added security to doors besides a lock (1)
- [40]**
- TOTAL SECTION D: 100**  
**GRAND TOTAL: 200**

**FORMULA SHEET****FORMULAE**

<b>AREA OF</b>	<b>FORMULA (in words)</b>	<b>FORMULA (in symbols)</b>
Square	side x side	$s \times s$
Rectangle	length x breadth	$l \times b$
Right-angled triangle	$\frac{1}{2}$ x base x height	$\frac{1}{2}b \times h$
Equilateral triangle/ Isosceles triangle	$\frac{1}{2}$ x base x height	$\frac{1}{2}b \times h$

**Calculation of volumes of individual aggregates for concrete:**

Volume of material = Volume of concrete required x  $\frac{\text{Mix ratio of material}}{\text{Total mix ratio}}$

**SECTION A: GENERIC - ANSWER SHEETS**

<b>SURNAME AND NAME:</b>	
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<b>CLASS:</b>	
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**SECTION A: ANSWER SHEET 2.3**

**SURNAME AND NAME:** **CLASS:** **SECTION A: ANSWER SHEET 2.4**

<b>ASSESSMENT CRITERIA</b>	<b>MARKS</b>	<b>LEARNER'S MARK</b>
Wall above window	1	
Wall below window	1	
Lintels	2	
Window frame	1	
External window sill	1	
Internal window sill	1	
Reveals	2	
<b>TOTAL</b>	<b>9</b>	

<b>SURNAME AND NAME:</b>	
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<b>CLASS:</b>	
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**SECTION A: ANSWER SHEET 2.5.2**

<b>ASSESSMENT CRITERIA</b>	<b>MARKS</b>	<b>LEARNER'S MARK</b>
External walls	2	
Natural ground level	1	
Finished floor level	1	
Window	1	
Window sill	1	
Barge board	1	
Verge overhang	1	
<b>TOTAL</b>	<b>8</b>	

SURNAME AND NAME: CLASS: 

## SECTION A: ANSWER SHEET 3.4

A	B	C	D	
			Centre lines of walls:	
			2/ _____ = _____	
			2/ _____ = _____	
			_____ = _____	
			Minus 4/ _____ = _____	
			Total length of centre line = _____	(5)
			= _____	
			Area of walls before deductions	
1/	_____		Centre line of wall = _____	
	_____	_____	Height of wall = _____	(2)
			Area of door	
1/	_____		Door opening is 2 100 mm x 900 mm	
	_____	_____		(2)
			Area of window	
1/	_____		Window opening is 2 000 mm x 1 200 mm	
	_____	_____		(2)
			Area of walls after deductions	
			Area of walls – area of window – area of door	
			_____ - _____ - _____	
			= _____	(1)
2/	_____		Number of bricks required	
	_____	_____ bricks	50 bricks per m <sup>2</sup> for a half-brick wall	(3)

**SECTION B: CONSTRUCTION – ANSWER SHEETS**

<b>SURNAME AND NAME:</b>	
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<b>CLASS:</b>	
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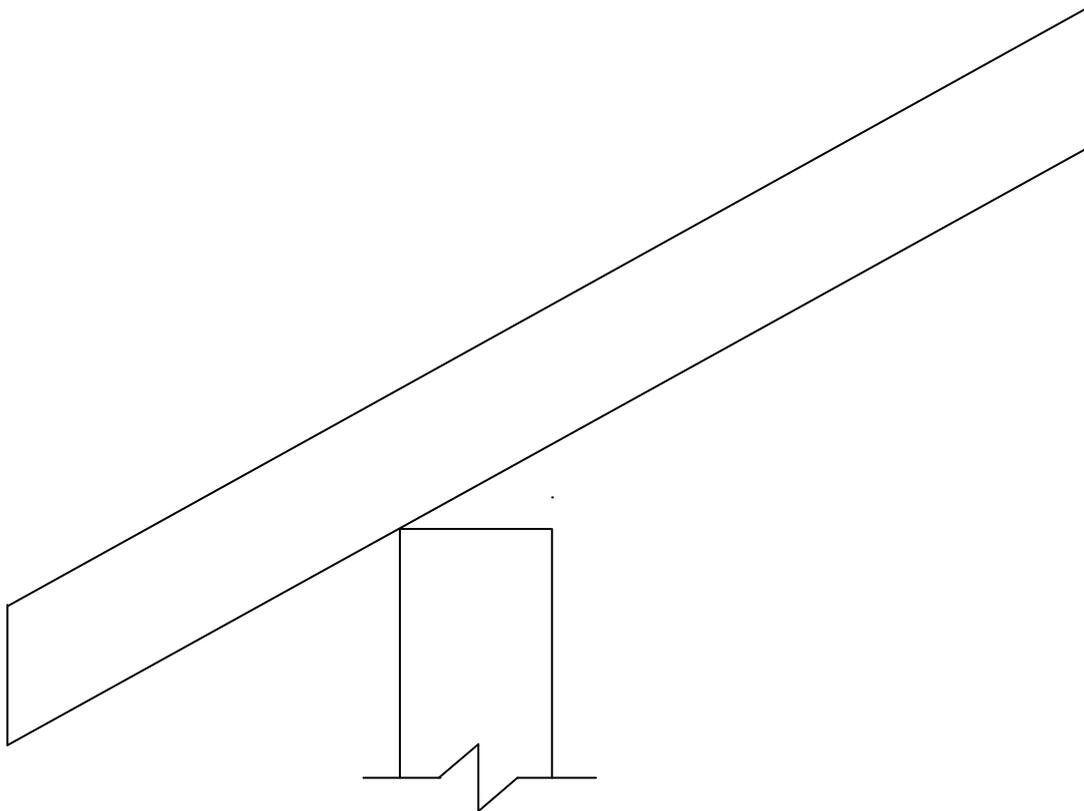
**SECTION B: ANSWER SHEET 4.1**

<b>ASSESSMENT CRITERIA</b>	<b>MARKS</b>	<b>LEARNER'S MARK</b>
Front view	1	
Top view	1	
Left view	1	
One dimension	1	
Application of scale 1 : 2	1	
<b>TOTAL:</b>	<b>5</b>	



<b>SURNAME AND NAME:</b>	
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<b>CLASS:</b>	
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**SECTION B: ANSWER SHEET 4.5****FIGURE 4.5**

<b>ASSESSMENT CRITERIA</b>	<b>MARK</b>	<b>LEARNER'S MARK</b>
Any correct labels	1	
Roof covering drawn correctly	1	
Wall plate drawn correctly	1	
Purlin drawn correctly	1	
Neatness	1	
<b>TOTAL:</b>	<b>5</b>	

<b>SURNAME AND NAME:</b>		<b>CLASS:</b>	
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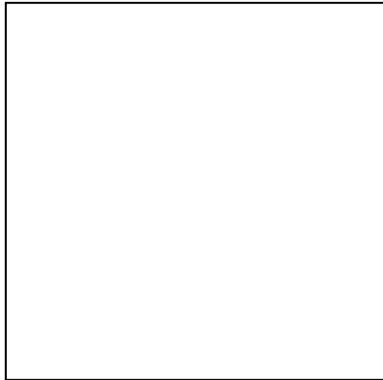
**SECTION B: ANSWER SHEET 5.3**

<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
			Length of lintel needed above the door opening
			Width of door = 900 mm
			Length of lintel = opening + 2(overhang)
			=            +
			=
			Internal measurements of the interior walls
			Internal length of long wall = 10 400 mm – 220 mm – 220 mm
			=
			Internal length of short wall = 4 400 mm – 220 mm – 220 mm
			=
			Area of floor covering needed
1/			Internal length of long wall = 9 960 mm
			Internal length of short wall = 3 960 mm

<b>SURNAME and NAME:</b>	
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<b>CLASS:</b>	
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**SECTION B: ANSWER SHEET 5.5**

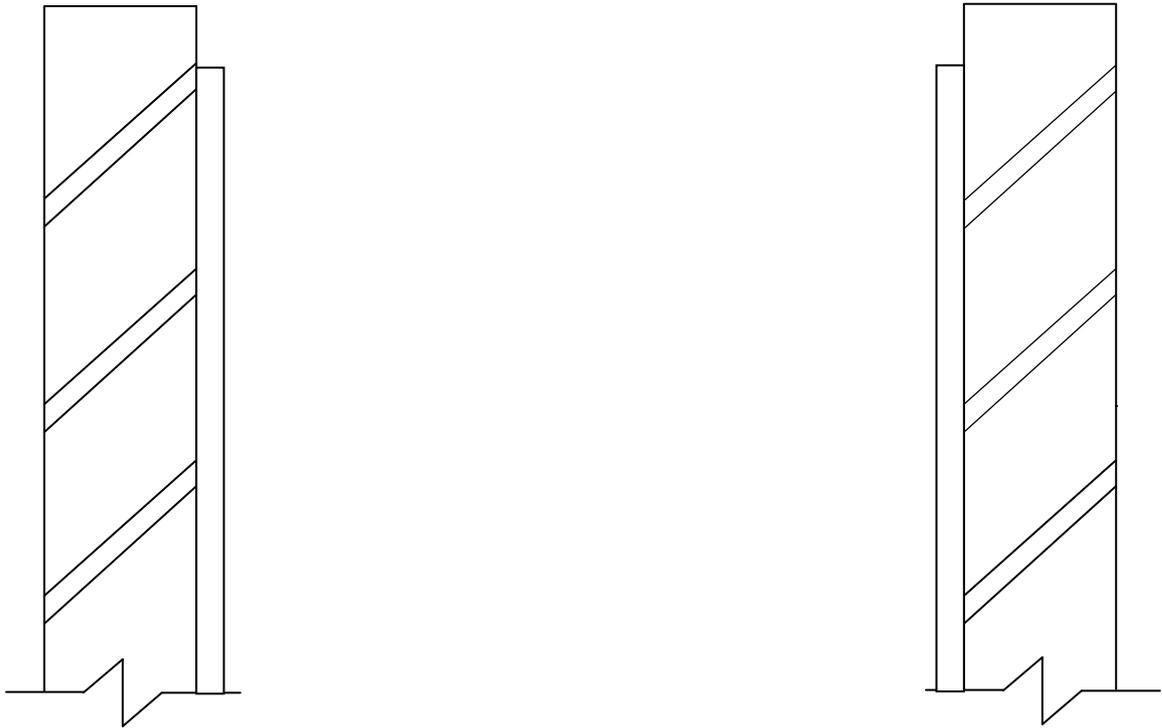


**FIGURE 5.5**

<b>SURNAME AND NAME:</b>	
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<b>CLASS:</b>	
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**SECTION B: ANSWER SHEET 5.7**



**FIGURE 5.7**

**SURNAME AND NAME:**

**CLASS:**

**SECTION B: ANSWER SHEET 6.6**

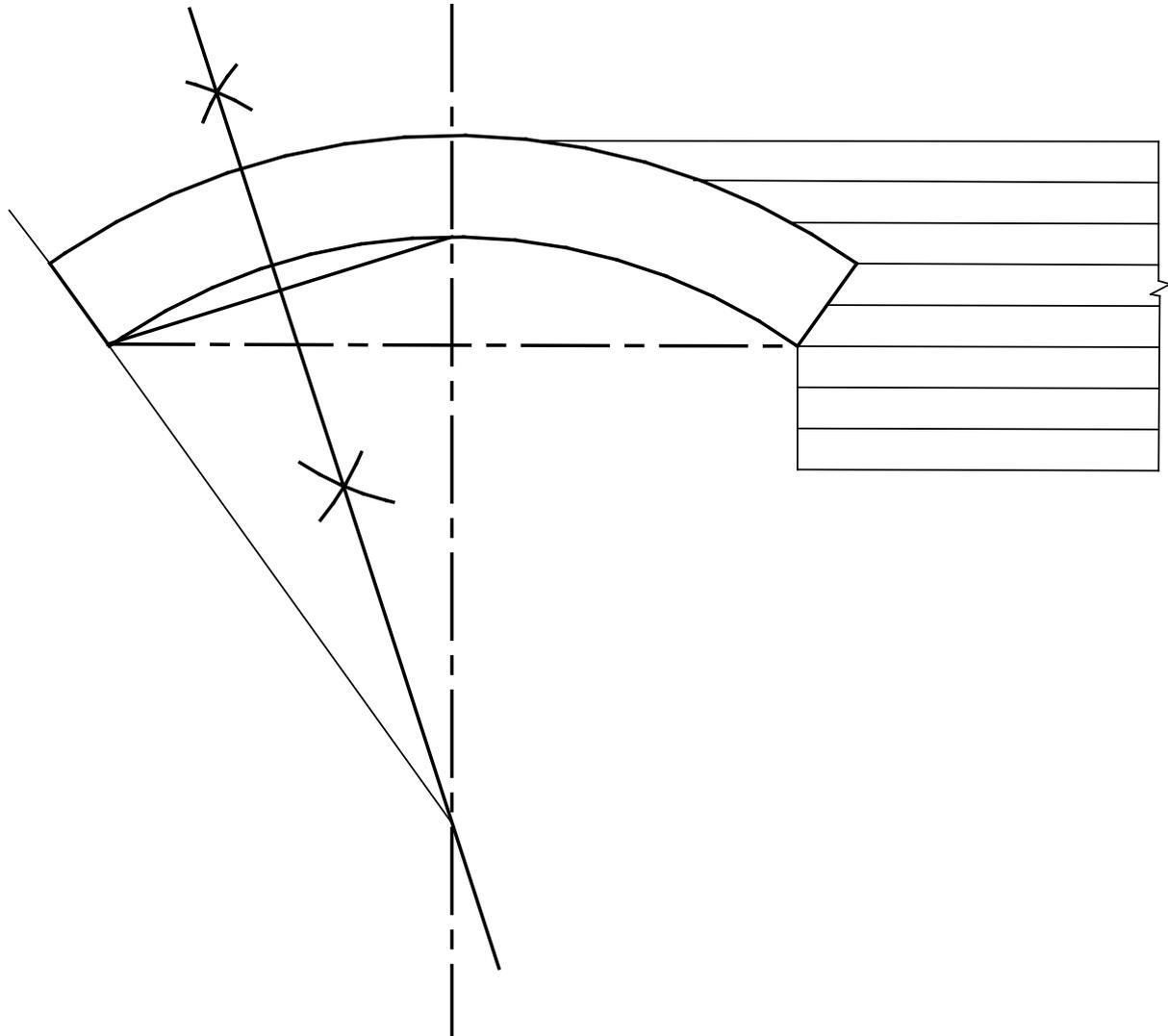
ASSESSMENT CRITERIA		LM
Header course	2	
Stretcher course	2	
Queen closer	1	
Proportion and line work	2	
Label: Header	1	
Label: Queen closer	1	
<b>TOTAL</b>	<b>9</b>	

**LM = Learner's mark**


**SURNAME AND NAME:**

**CLASS:**

**SECTION B: ANSWER SHEET 6.10**



**FIGURE 6.10**

ASSESSMENT CRITERIA	MARKS	LEARNER'S MARK
Voussoirs	3	
Key voussoir	1	
Surrounding brickwork	2	
Rise (indicate and label)	1	
Span (indicate and label)	1	
Intrados (indicate and label)	1	
Extrados (indicate and label)	1	
<b>TOTAL</b>	<b>10</b>	

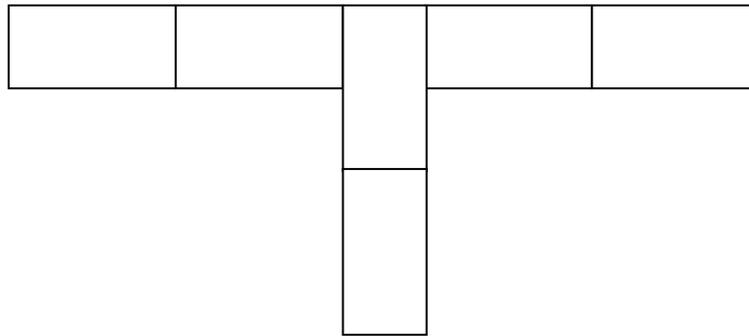
(10)

**SECTION C: CIVIL SERVICES – ANSWER SHEETS**

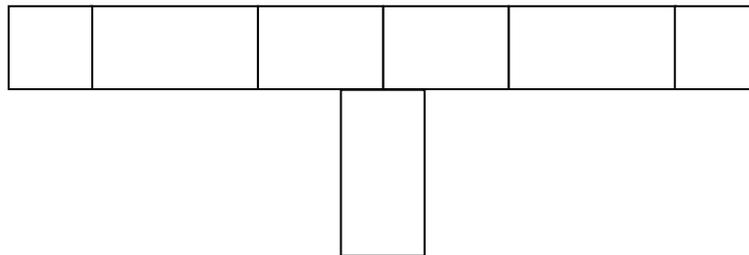
<b>SURNAME AND NAME:</b>	
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<b>CLASS:</b>	
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**SECTION C: ANSWER SHEET 7.4**



**FIRST COURSE**

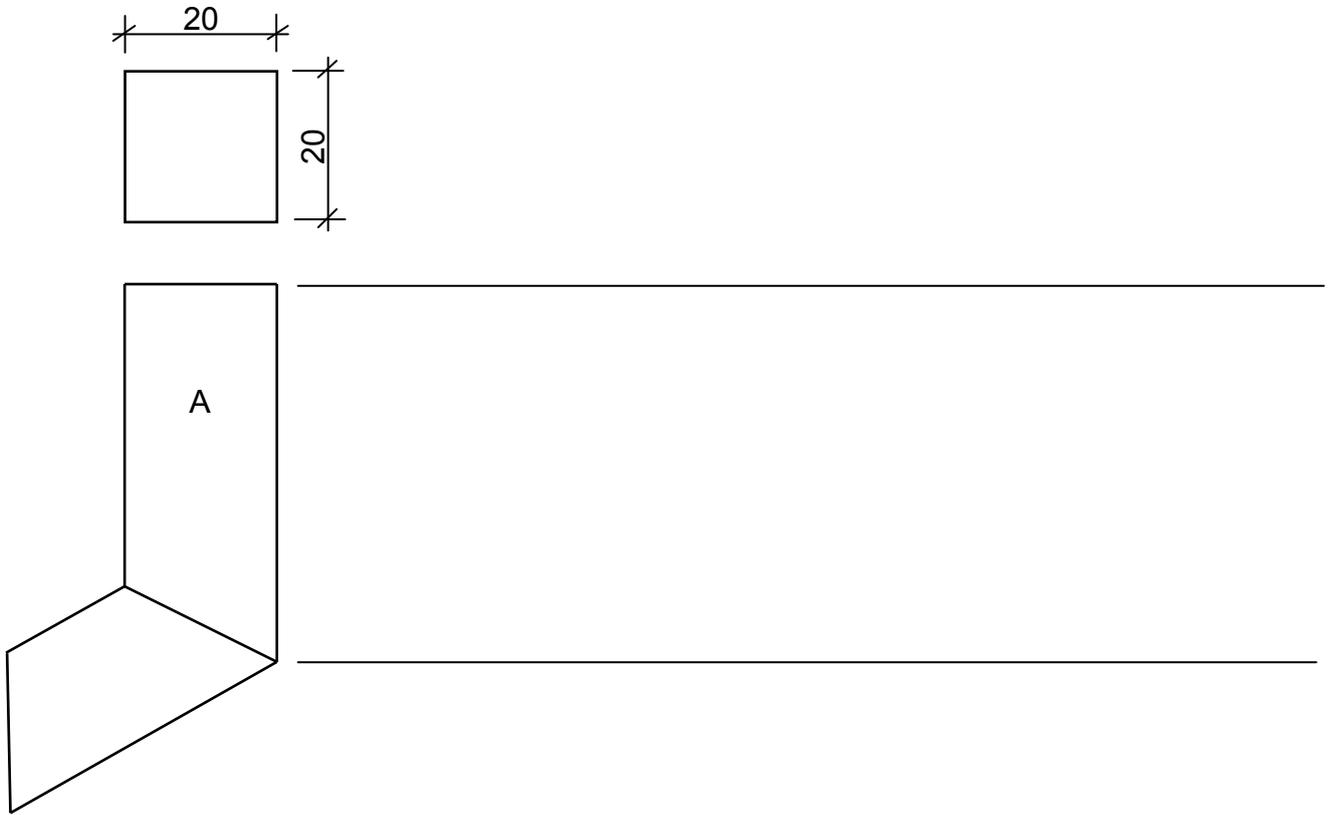


**FIGURE 7.4**

**SURNAME AND NAME:**

**CLASS:**

**SECTION C: ANSWER SHEET 8.8**



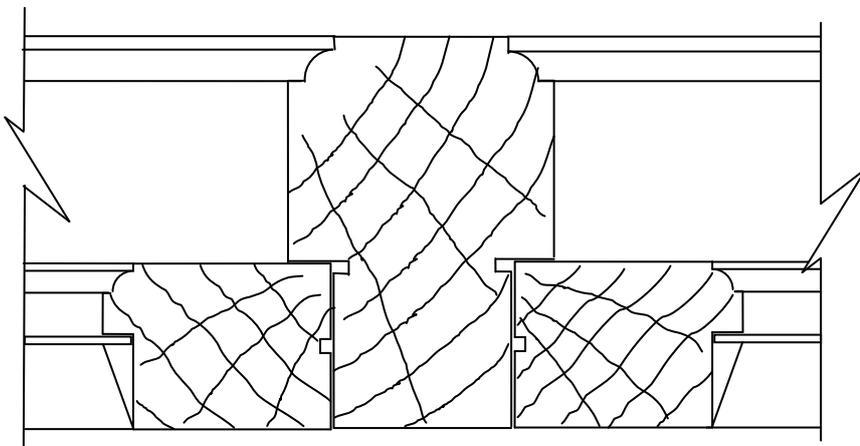
**FIGURE 8.8**

**SECTION D: WOODWORKING – ANSWER SHEETS**

**SURNAME AND NAME:**

**CLASS:**

**SECTION D: ANSWER SHEET 10.3**



<b>SURNAME AND NAME:</b>	
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<b>CLASS:</b>	
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**SECTION D: ANSWER SHEET 10.6**

<b>ASSESSMENT CRITERIA</b>	<b>MARK</b>	<b>LM</b>
Top rail	1	
Stiles	2	
Bottom rail	1	
Correct scale	2	
<b>TOTAL</b>	<b>6</b>	

SURNAME AND NAME: CLASS: 

## SECTION D: ANSWER SHEET 11.8

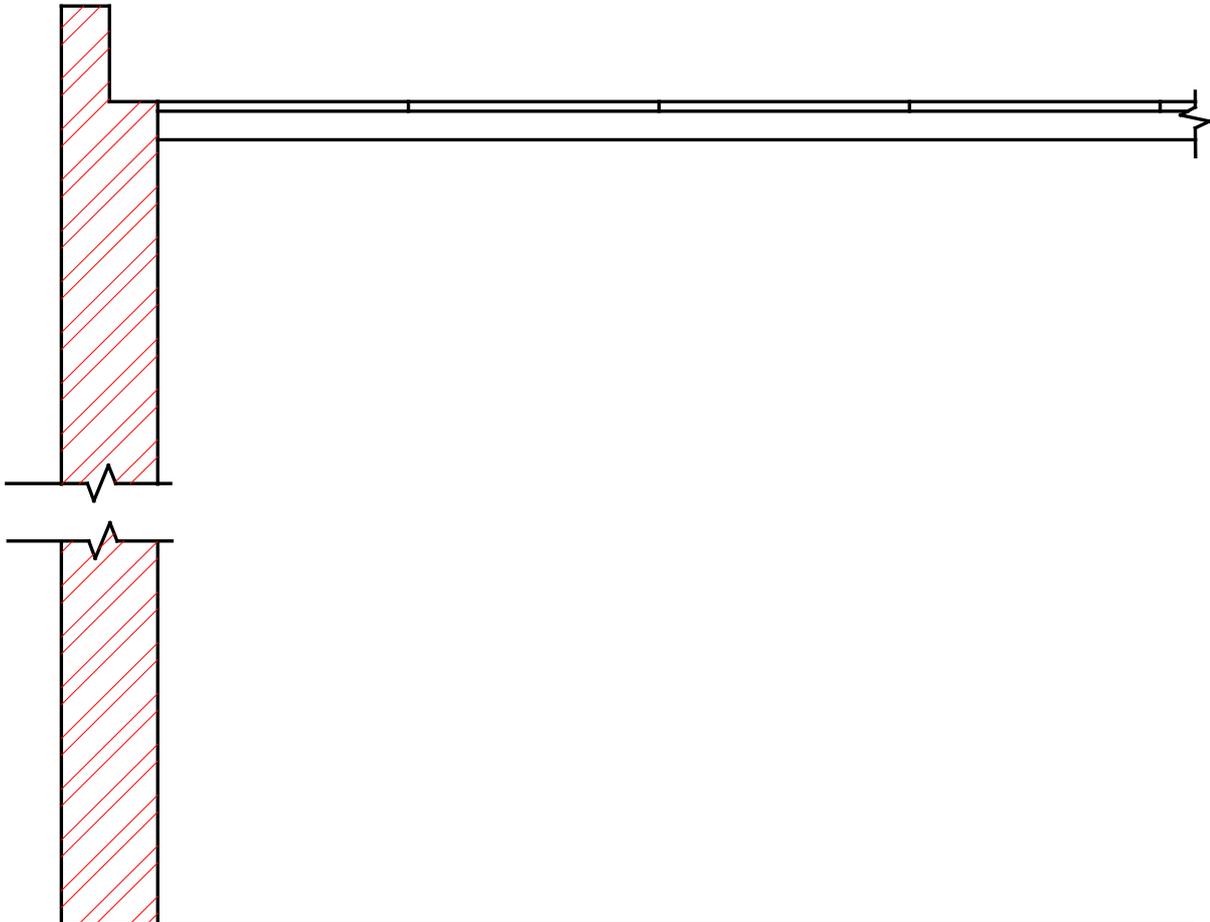
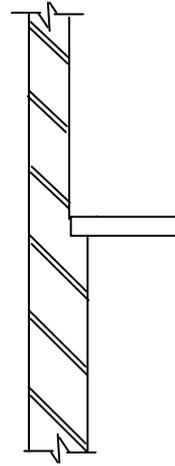
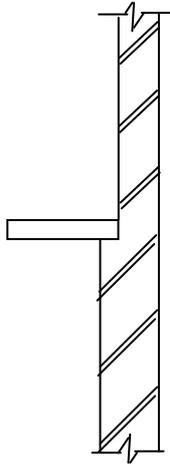


FIGURE 11.8

ASSESSMENT CRITERIA	MARKS	LEARNER'S MARK
Props	2	
Sole plate	2	
Wedges	2	
Bearers	1	
Joist	1	
Label: Prop	1	
Label: Wedges	1	
<b>TOTAL</b>	<b>10</b>	

SURNAME AND NAME: CLASS: **SECTION D: ANSWER SHEET 11.10**

ASSESSMENT CRITERIA	MARKS	LEARNER'S MARK
Wall plate	1	
Cleat	1	
Needle	1	
Horizontal shore	1	
Wedges	1	
Straining sill/beam	1	
<b>TOTAL</b>	<b>6</b>	

<b>SURNAME AND NAME:</b>	
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<b>CLASS:</b>	
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**SECTION D: ANSWER SHEET 12.2**

<b>ASSESSMENT CRITERIA</b>	<b>MARKS</b>	<b>LEARNER'S MARK</b>
Foundation wall	1	
DPC	1	
Ant guard	1	
Wall plate	1	
Floor joist	1	
Floor boards	1	
Skirting	1	
External wall	1	
One label	1	
<b>TOTAL</b>	<b>9</b>	

**SURNAME AND NAME:** **CLASS:** **SECTION D: ANSWER SHEET 12.6**

<b>ASSESSMENT CRITERIA</b>	<b>MARKS</b>	<b>LM</b>
Tongue and groove board	1	
Secret nailing	1	
Joist	1	
<b>TOTAL</b>	<b>3</b>	

**SURNAME AND NAME:**

**CLASS:**

**SECTION D: ANSWER SHEET 12.10**

