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# basic education

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

## NATIONAL SENIOR CERTIFICATE

**GRADE 12**

**CIVIL TECHNOLOGY: CONSTRUCTION**

**NOVEMBER 2022**

**MARKS: 200**

**TIME: 3 hours**

**This question paper consists of 13 pages and 7 answer sheets.**

**REQUIREMENTS:**

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

**INSTRUCTIONS AND INFORMATION**

1. This question paper consists of SIX questions.
2. Answer ALL the questions.
3. Read ALL the questions carefully.
4. Answer each question as a whole. Do NOT separate subsections of questions.
5. Number the answers correctly according to the numbering system used in this question paper.
6. Start the answer to EACH question on a NEW page.
7. Do NOT write in the margins of the ANSWER BOOK.
8. You may use sketches to illustrate your answers.
9. Write ALL calculations and answers in the ANSWER BOOK or on the attached ANSWER SHEETS.
10. Use the mark allocation as a guide to the length of your answers.
11. 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*.
12. For the purpose of this question paper, the size of a brick should be taken as 220 mm x 110 mm x 75 mm.
13. Use your own discretion where dimensions and/or details have been omitted.
14. Answer QUESTIONS 2, 3.5, 3.6, 4.7, 5.4, 5.5 and 6.7 on the attached ANSWER SHEETS using drawing instruments, where necessary.
15. 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.
16. Drawings in the question paper are NOT to scale due to electronic transfer.
17. Google Images was used as the source of all photographs and pictures.
18. Write neatly and legibly.

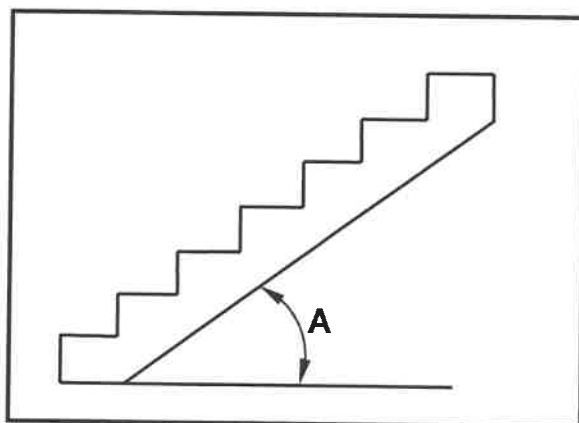
**QUESTION 1: OHSA, MATERIALS, TOOLS, EQUIPMENT AND JOINING (GENERIC)**

Start this question on a NEW page.

- 1.1 Choose the correct word(s) from those given in brackets. Write only the word(s) next to the question numbers (1.1.1. to 1.1.5) in the ANSWER BOOK, e.g. 1.1.6 casement.

- 1.1.1 (Oil or water-based paint/Silicone/Acid) is used to protect metal against corrosion. (1)
- 1.1.2 Curing (increases the strength of concrete/increases the density of concrete/allows concrete to set faster). (1)
- 1.1.3 Electroplating can be applied using (electrodes/electro jacks/electrolysis). (1)
- 1.1.4 Powder coating is the process of applying a layer of (plastic/paint/zinc) to a metal. (1)
- 1.1.5 Galvanising is the process of applying a (zinc/copper/tin) coating to the base of metals. (1)

- 1.2 FIGURE 1.2 below shows an incomplete construction of a staircase.



**FIGURE 1.2**

- 1.2.1 Name the maximum angle of A. (1)
- 1.2.2 How will you ensure the safety of workers when using the treads? (1)
- 1.2.3 Explain the purpose of metal pan treads as part of the construction of a staircase. (1)
- 1.3 Discuss TWO safety precautions that must be adhered to when transporting long ladders. (2)
- 1.4 Name ONE safety component that can be positioned above workers to protect them against falling objects. (1)

- 1.5 Name the component that will ensure stability to scaffolding in all directions. (1)
- 1.6 Predict what could happen if the ends of scaffold planks exceed 230 mm beyond the last support. (1)
- 1.7 Determine the maximum height of stacked material if the width of the stack is 1 m. (1)
- 1.8 By means of sketches, explain the difference between a Rawl bolt with a hook and a Rawl bolt with an eye. (4)
- 1.9 You have been asked to do renovations in a bathroom. Name the tool you will use to:
- 1.9.1 Detect existing copper pipes in a wall (1)
- 1.9.2 Align mirrors horizontally against a wall (1)
- [20]**

**QUESTION 2: GRAPHICS AS MEANS OF COMMUNICATION (GENERIC)**

Start this question on a NEW page.

FIGURE 2 on the next page shows drawings that appear on a building plan. Analyse the drawings and complete the table on ANSWER SHEET 2.

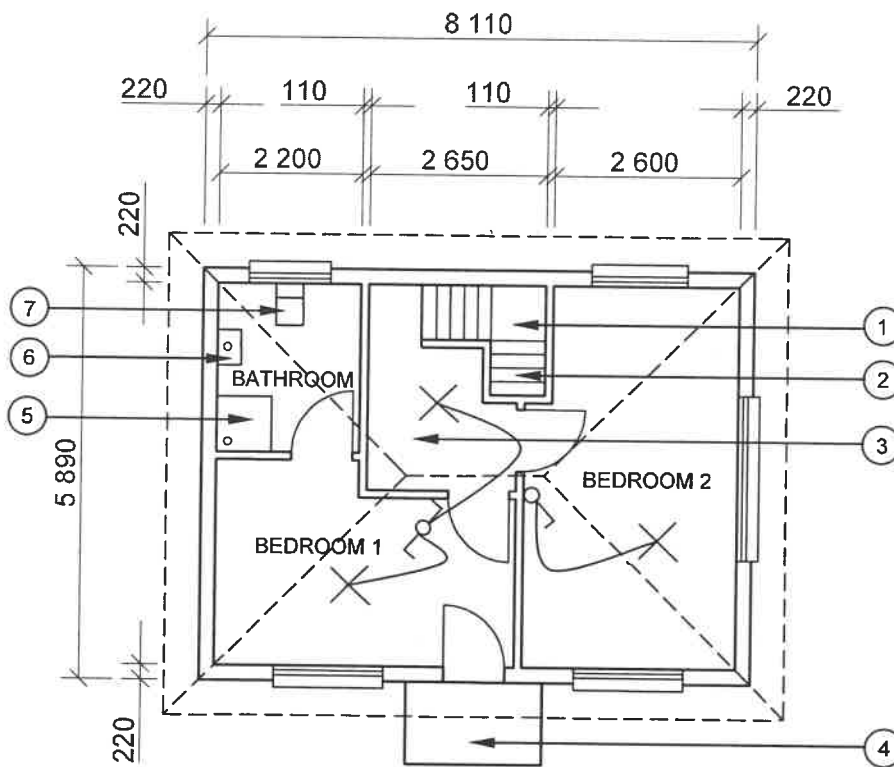


FIGURE A

**NOTES:**

Contractors must verify all dimensions and levels on site before commencing work.  
Architects to be notified of any discrepancies immediately.

Wall thickness: External = 220 mm  
Internal = 110 mm

Architect's signature .....

Client's signature .....

Concrete stairs must be according to engineering specifications.

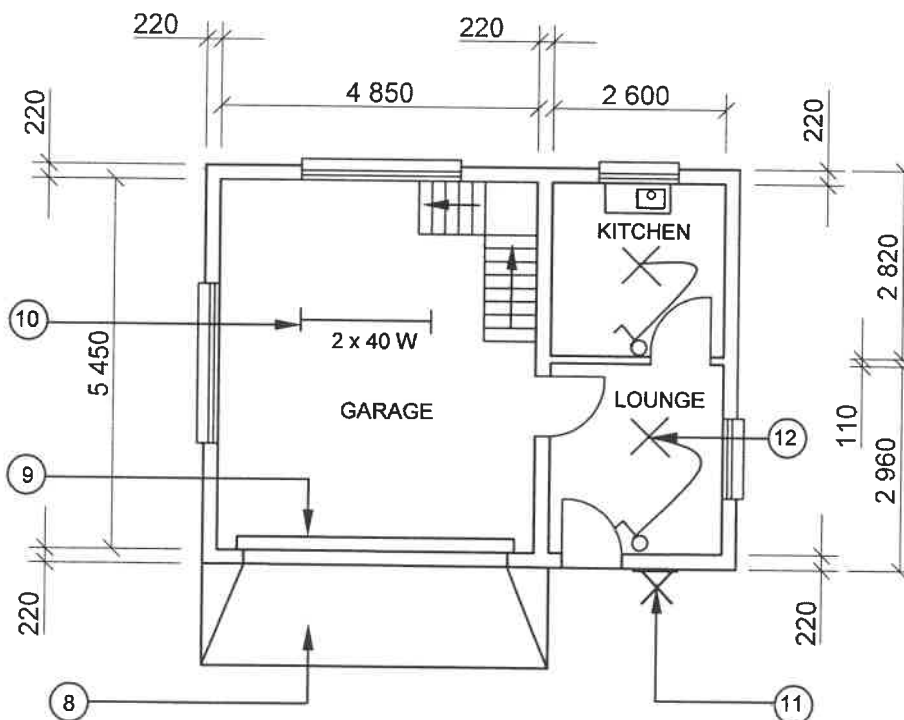


FIGURE B

REVISION 1	DATE: 24/06/2022	DRAWING OF SANITARY FITMENTS
REVISION 2	DATE: 26/06/2022	DRAWING OF STAIRCASE
PRINTED BY: XENO PRINTERS		DATE OF PRINT: 27/06/2022
DRAWING TITLE: FLOOR PLAN PLOT 36		
PROJECT: PROPOSED DWELLING ON PLOT 36, BENONI		
PROJECT NO.: GR 288-620		DRAWING NO.: 446P5
DATE: 20/06/2022	DRAWN: HB NEL	CHECKED: K KLEIN
FLOOR PLAN		SCALE 1 : 100
REFERENCE CODE QP 6 – 2022		

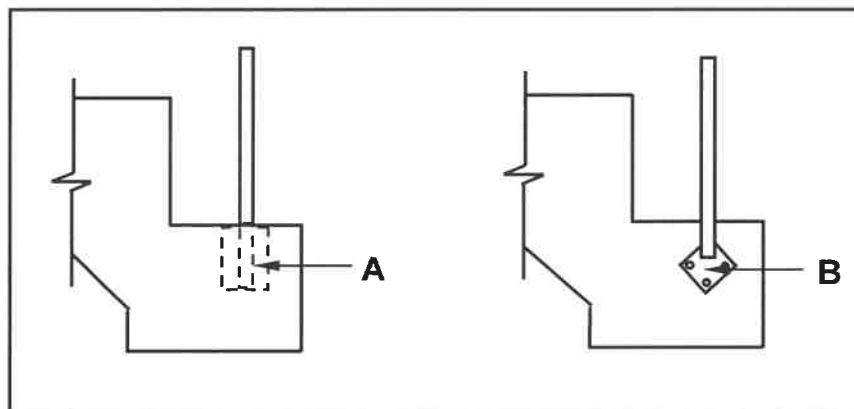
**[40]**

FIGURE 2

**QUESTION 3: ROOFS, STAIRCASES AND JOINING (SPECIFIC)**

Start this question on a NEW page.

- 3.1 Name ONE type of roof covering that requires the roof trusses to be spaced 760 mm apart. (1)
- 3.2 What is the maximum span of a closed-couple roof truss? (1)
- 3.3 Name TWO methods that can be used to secure a wall plate to a wall. (2)
- 3.4 FIGURE 3.4 below shows TWO different methods used to mount balusters to staircases. Identify methods A and B. (2)



**FIGURE 3.4**

- 3.5 Use ANSWER SHEET 3.5 and complete the sectional view of a straight flight of concrete stairs. (8)
- Draw the top part of the concrete staircase with a landing.
  - Draw the handrail and supporting members for the entire staircase.
- 3.6 Use ANSWER SHEET 3.6 and draw to a scale of 1 : 10 a couple roof truss with supporting walls. Show ALL members.

Specifications:

- Span = 2 000 mm
- Supporting walls = 220 mm
- Pitch of roof = 30°
- Overhang = 150 mm

(16)  
[30]

**QUESTION 4: EXCAVATIONS, FORMWORK, TOOLS, EQUIPMENT AND MATERIALS (SPECIFIC)**

Start this question on a NEW page.

- 4.1 Choose a description from COLUMN B that matches an item in COLUMN A. Write only the letter (A–L) next to the question numbers (4.1.1 to 4.1.8) in the ANSWER BOOK, e.g. 4.1.9 M.

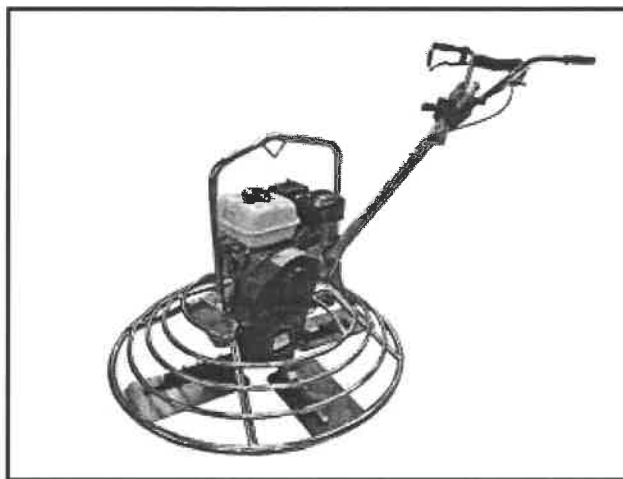
COLUMN A		COLUMN B	
4.1.1	Dismantling	A	removing of shuttering from the bottom of the excavation
4.1.2	Walling boards	B	safe distance to operate machinery from a trench
4.1.3	A wheel stopper	C	horizontal member of shuttering
4.1.4	Warning lights	D	vertical member of shuttering
4.1.5	Poling boards	E	maintaining a safe distance from the trench edge
4.1.6	1,5 metres	F	soil must be levelled
4.1.7	1 metre	G	red and orange at excavations
4.1.8	Preparing of site	H	ensuring wheels are locked
		I	kept in position with vertical poling boards
		J	the maximum depth of a trench without the sides being braced
		K	the minimum depth of a trench without the sides being braced
		L	loose soil must not be levelled

(8 x 1)

(8)



- 4.2 Show by means of pictorial views the difference between a *wedge* and *folding wedges*. Print the title below each drawing. (6)
- 4.3 The slump test is used to test concrete.
- 4.3.1 Name any TWO apparatus used to carry out a slump test. (2)
- 4.3.2 Show a collapsed slump by means of a sketch. (2)
- 4.3.3 Describe the reason for the collapsed slump. (1)
- 4.4 FIGURE 4.4 below shows a construction machine that is used on a building site. Study FIGURE 4.4 and answer the questions that follow.



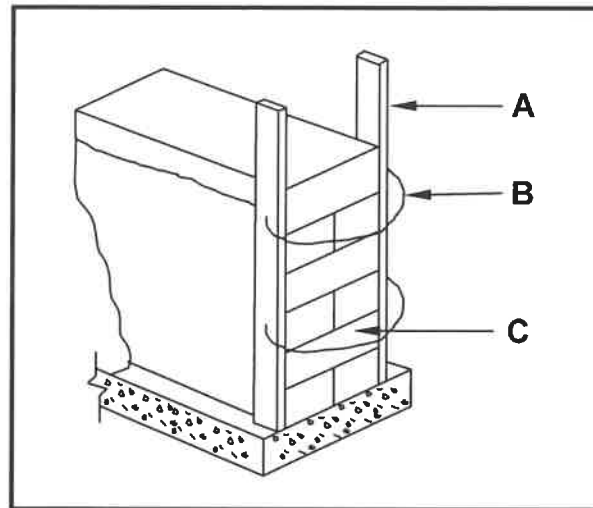
**FIGURE 4.4**

- 4.4.1 Identify this machine. (1)
- 4.4.2 Explain TWO ways of taking care of this machine after use. (2)
- 4.4.3 Describe TWO safety aspects that must be adhered to while the blade of the machine is rotating. (2)
- 4.5 State the number of days it will take for high-strength concrete to reach the minimum compression strength of 30 MPa. (1)
- 4.6 Name the material that can be used as an alternative to glass in buildings. (1)
- 4.7 Use ANSWER SHEET 4.7 and complete the drawing of a vertical section of the formwork for a concrete beam above the bearer/head tree. (14)
- [40]**

**QUESTION 5: PLASTER AND SCREED, BRICKWORK AND GRAPHICS AS MEANS OF COMMUNICATION (SPECIFIC)**

Start this question on a NEW page.

- 5.1 Name the machine that is used to create a splatter-dash finish. (1)
- 5.2 FIGURE 5.2 below shows the construction detail to plaster the reveals at a door opening.



**FIGURE 5.2**

- 5.2.1 Identify A to C. (3)
- 5.2.2 Explain why a stronger plaster mixture is needed to finish off the reveals. (1)
- 5.2.3 Name the tool used to finish off the sharp edges after A has been removed. (1)
- 5.3 Draw in the ANSWER BOOK a neat sketch showing half of a wooden turning piece/centre for a semi-circular arch with closed laggings. (4)
- 5.4 ANSWER SHEET 5.4 shows the lintel above the window in a cavity wall. Draw, to scale 1 : 5, the sectional view of the cavity wall above the lintel. (10)
- Show ALL constructional details excluding the wall plate.
- 5.5 ANSWER SHEET 5.5 shows the outlines of two consecutive brick courses of a one-and-a-half-brick pier built in stretcher bond. (10)
- Use ANSWER SHEET 5.5 and complete the consecutive brick courses of the brick pier. [30]

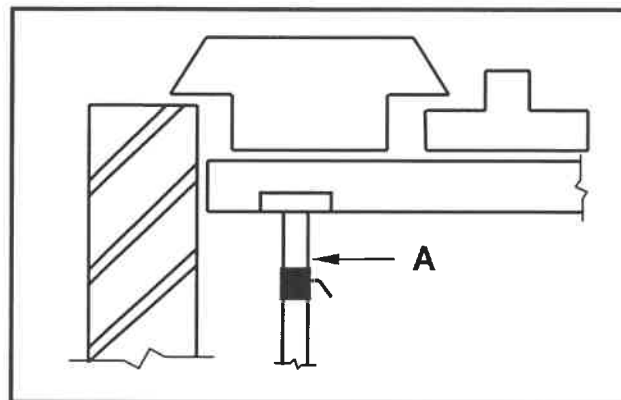
**QUESTION 6: REINFORCEMENT IN CONCRETE, FOUNDATIONS, CONCRETE FLOORS AND QUANTITIES (SPECIFIC)**

Start this question on a NEW page.

6.1 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 numbers (6.1.1 to 6.1.5) in the ANSWER BOOK, e.g. 6.1.6 D.

- 6.1.1 A factor to consider when planning a rib and block floor:
- A Weather conditions
  - B Maximum span
  - C Rain resistance
  - D Minimum span
- (1)
- 6.1.2 A rib and block floor consists of pre-cast ... which is spaced with blocks between them.
- A concrete blocks
  - B lintels
  - C ribs
  - D concrete slabs
- (1)
- 6.1.3 The final ... in-situ cast concrete slab can only be cast after the installation has been checked by a building inspector.
- A 40 mm to 70 mm
  - B 50 mm to 80 mm
  - C 50 mm to 90 mm
  - D 60 mm to 100 mm
- (1)
- 6.1.4 The temporary props for a rib and block floor can be removed after the concrete slab has reached a crushing strength of ...
- A 5 MPa.
  - B 7 MPa.
  - C 10 MPa.
  - D 17 MPa.
- (1)
- 6.1.5 An advantage of using rib and block floors:
- A Requires minimal formwork
  - B Requires mechanical handling
  - C No skilled labour is needed
  - D A and C are correct
- (1)

- 6.2 FIGURE 6.2 below shows a faulty installation of a rib and block floor construction.



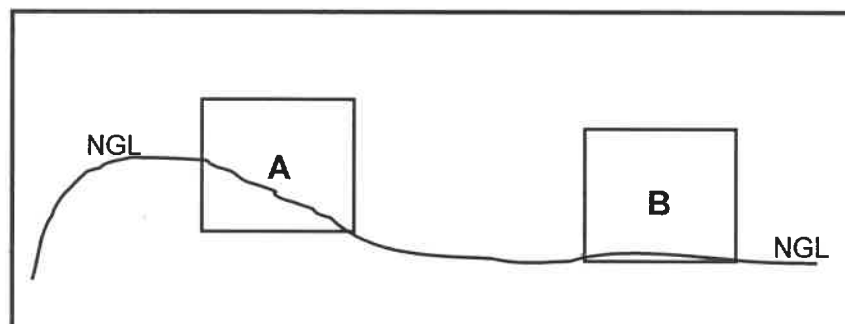
**FIGURE 6.2**

- 6.2.1 Identify THREE mistakes in the construction. (3)

- 6.2.2 Identify A. (1)

- 6.3 Make a neat sketch of the tool used to drive a precast pile into the ground. Label any ONE part. (4)

- 6.4 FIGURE 6.4 below shows the slope of the natural ground level on a site with a sand dune at A sloping down to firm rocky ground at B.



**FIGURE 6.4**

- 6.4.1 Recommend the foundation to be used for building A. (1)

- 6.4.2 Recommend the foundation to be used for building B. (1)

6.5 FIGURE 6.5 below shows a sectional view of a reinforced concrete column.

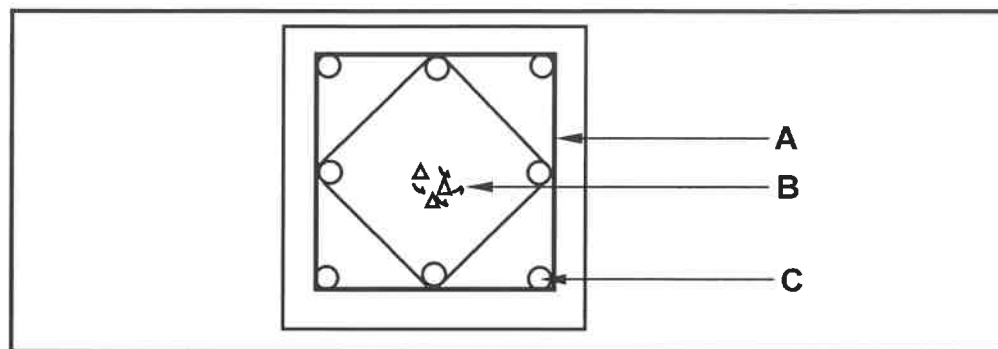


FIGURE 6.5

- 6.5.1 Identify **A** and **B**. (2)
- 6.5.2 What will be the minimum concrete cover depth for the column above if the concrete is exposed to salt in the air? (1)
- 6.5.3 Name TWO methods of joining the steel bars. (2)
- 6.5.4 Motivate why you would use ribbed bars instead of plain round bars at **C**. (1)
- 6.5.5 By means of a neat sketch, illustrate how shear force works on a concrete beam. (3)
- 6.5.6 By means of neat sketches, differentiate between the shape of anchor bars and main bars for reinforced concrete. (4)

6.6 FIGURE 6.6 below shows an incomplete reinforced concrete beam.

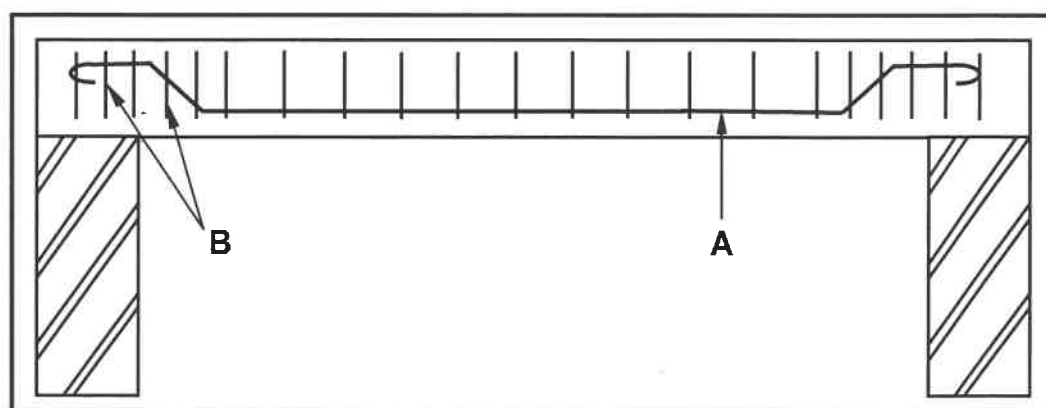
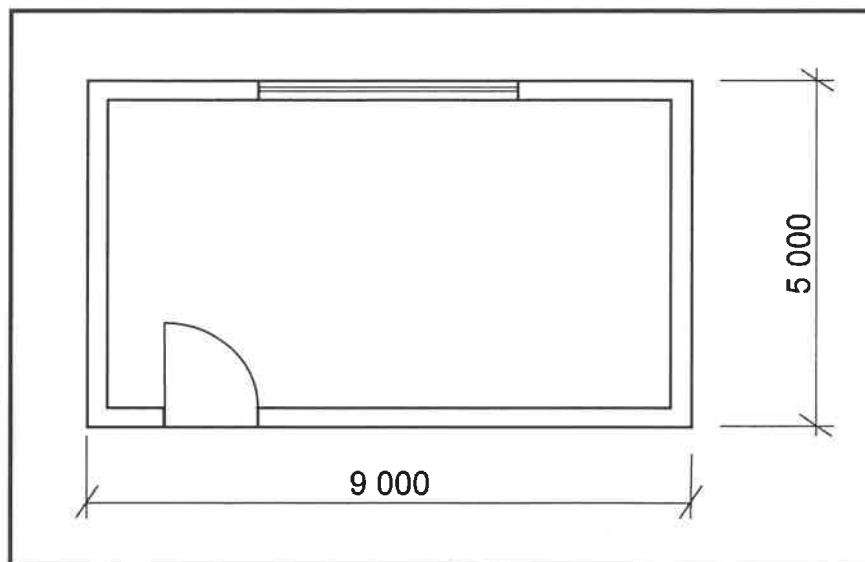


FIGURE 6.6

- 6.6.1 Identify **A**. (1)
- 6.6.2 Explain why **B** is spaced closer to one another at the ends of the beam. (1)

- 6.7 FIGURE 6.7 below shows the floor plan of a store room with a window and a door.



**FIGURE 6.7**

Use the following specification:

- The width of the external walls is 220 mm.

Use the dimension paper on ANSWER SHEET 6.7 and calculate the centre line of the external walls. Round off your answer to TWO decimals.

(9)

**NOTE:** Marks will be awarded for the correct use of the dimension paper.

(1)

**[40]**

**TOTAL: 200**

CENTRE NUMBER: 

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EXAMINATION NUMBER: 

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**ANSWER SHEET 2**

NO.	QUESTIONS	ANSWERS	MARKS
1.	Name the FIGURE that represents the ground floor. Give ONE reason for your answer.		2
2.	Deduce the scale that was used to draw the floor plan of the house from the given building plan.		1
3.	Identify number 1.		1
4.	Identify number 4.		1
5.	Identify number 5.		1
6.	Identify number 6.		1
7.	Give the abbreviation for the symbol at number 7.		1
8.	Identify number 8.		1
9.	Identify number 9.		1
10.	Identify number 10.		1
11.	Identify the number that indicates the wall-mounted light.		1
12.	Give the abbreviations for the following: <ul style="list-style-type: none"> <li>Finished floor level</li> <li>Natural ground level</li> </ul>		2
13.	Name a suitable material that can be used for constructing number 2.		1

CENTRE NUMBER: 

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EXAMINATION NUMBER: 

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14.	Recommend ONE use for the area indicated by number 3.		1
15.	Recommend ONE permanent fixture for bedroom 1 that can be used for storage.		1
16.	Who is the architect that was responsible for the drawing?		1
17.	Describe what is indicated by the arrows on the staircase in FIGURE B.		1
18.	State what was done during revision 1 and revision 2 of the house plan.		2
19.	Deduce the reference code from the building plan.		1
20.	Who must be notified when a contractor sets out levels on a site and there are variances?		1
21.	Identify ONE important fixture that is omitted in the bathroom.		1
22.	Draw the symbol for face brick.		2
23.	Draw the electrical symbol for earth.		2



CENTRE NUMBER: 

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EXAMINATION NUMBER: 

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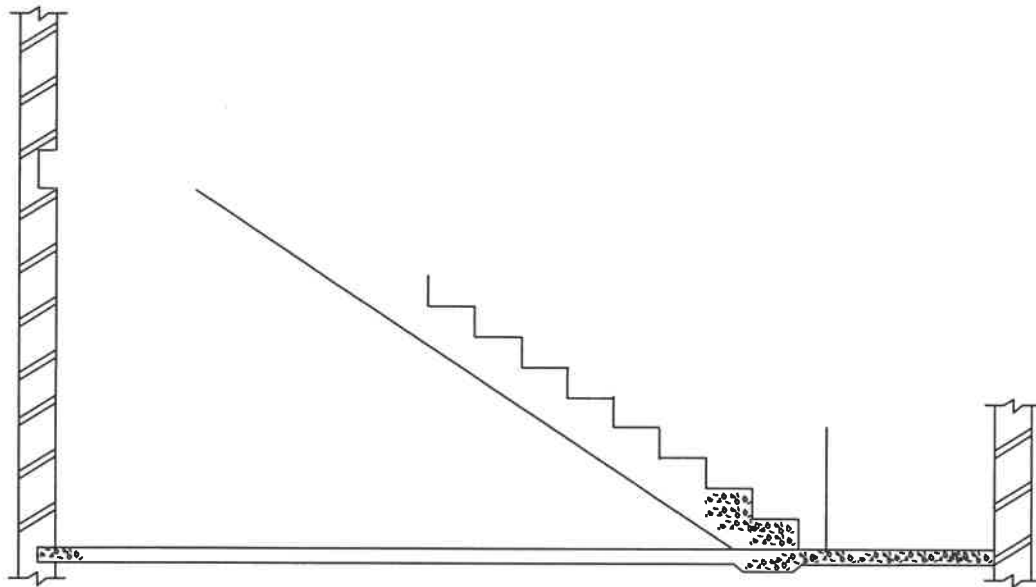
24.	Draw the symbol for a grease trap.		2
25.	Prove, by means of a control test, that the total vertical dimensions on the left and right of the plan in FIGURE B are equal.		7
26.	Calculate the area of the first floor. Show ALL calculations. Give your answer in m <sup>2</sup> .		3
		<b>TOTAL:</b>	<b>40</b>

**CENTRE NUMBER:**

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**EXAMINATION NUMBER:**

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**ANSWER SHEET 3.5**

ASSESSMENT CRITERIA	MARK	CM
Correctness of staircase	1	
Members	7	
<b>TOTAL:</b>	<b>8</b>	

[illegible]

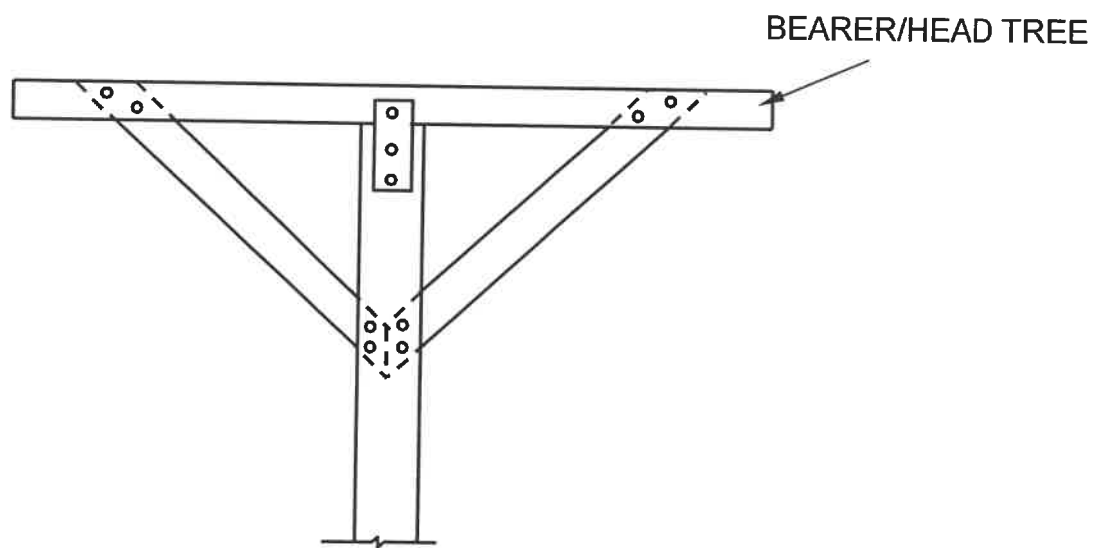
ASSESSMENT CRITERIA	MARK	CM
Correctness of roof truss	2	
Members	11	
Application of scale	3	
<b>TOTAL:</b>	<b>16</b>	

CENTRE NUMBER: 

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EXAMINATION NUMBER: 

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**ANSWER SHEET 4.7****FIGURE 4.7**

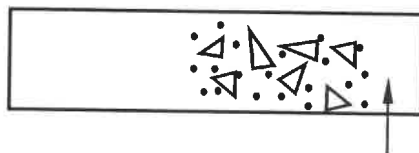
ASSESSMENT CRITERIA	MARK	CM
Correctness of formwork	2	
Members	12	
<b>TOTAL:</b>	<b>14</b>	

CENTRE NUMBER: 

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EXAMINATION NUMBER: 

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**ANSWER SHEET 5.4**

LINTEL ABOVE WINDOW

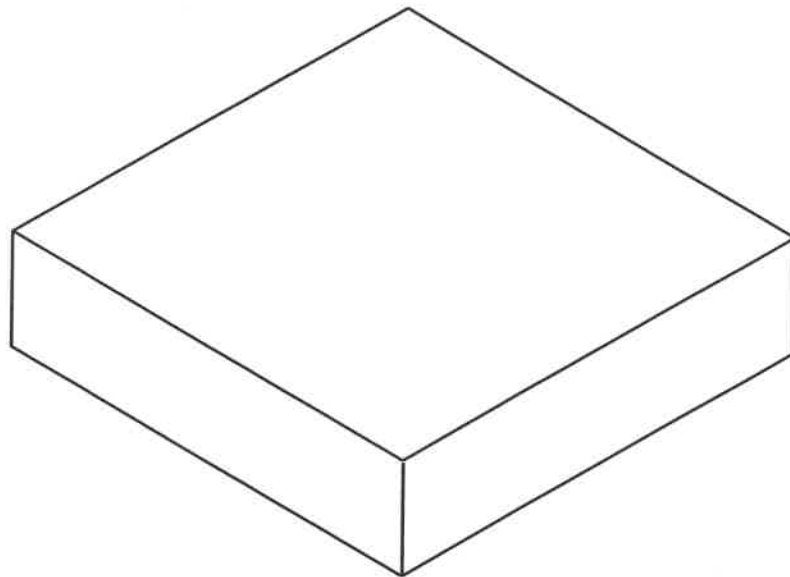
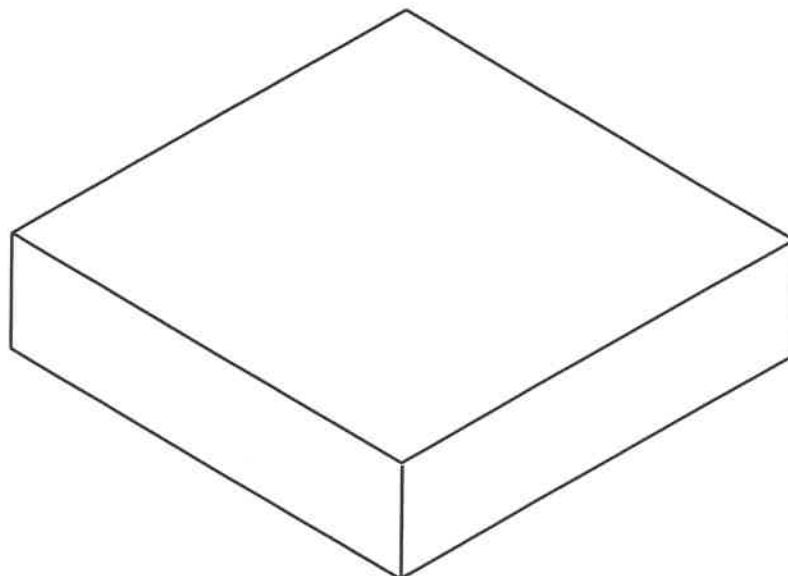
ASSESSMENT CRITERIA	MARK	CM
Correctness of cavity wall	1	
Members	7	
Application of scale	2	
<b>TOTAL:</b>	<b>10</b>	

CENTRE NUMBER: 

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EXAMINATION NUMBER: 

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**ANSWER SHEET 5.5****SECOND COURSE****FIRST COURSE**

ASSESSMENT CRITERIA	MARK	CM
Correctness of courses	2	
First course	4	
Second course	4	
<b>TOTAL:</b>	<b>10</b>	

**CENTRE NUMBER:**

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**EXAMINATION NUMBER:**

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**ANSWER SHEET 6.7****DIMENSION PAPER****6.7 CORRECT USE OF DIMENSION PAPER****(1)**

A	B	C	D

**(9)**