basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

CIVIL TECHNOLOGY

NOVEMBER 2016

MEMORANDUM

MARKS: 200

This memorandum consists of 16 pages.

QUESTION 1: CONSTRUCTION, SAFETY AND MATERIAL

1.1.1 The worker should have ensured that:

- the grinder and grinding blade/disc were inspected for defects before use. **√**
- the angle grinder is used for the intended purpose only. **√**
- correct blade is correctly fitted for the purpose.
- he/she is trained to use the machine correctly.
- do not force the tool. (2)
ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER

1.1.2
- Hard hat/safety helmet **√**
- Safety goggles/goggles **√**
- Overall
- Safety gloves/gloves
ANY TWO OF THE ABOVE (2)

1.1.3 The machine makes a loud noise **√** that will damage your hearing. **√**
It is the rule or regulation on a building site to protect the hearing of workers.
ANY OF THE ABOVE (2)

1.1.4
- dust mask (1)
- face shield
- ear protection/ear plugs/ear muffs
- safety shoes **√**
ANY ONE OF THE ABOVE

1.2 1.2.1
- Water **√**
- Patent sealer
- Wet sand
- Hessian
- Canvas or protective covering
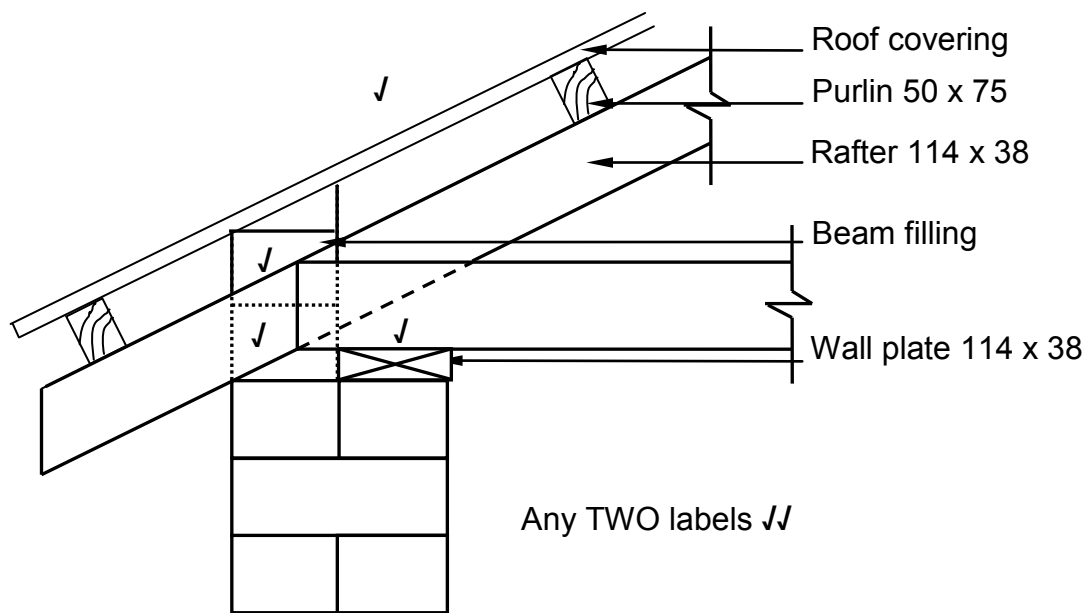- Plastic sheeting
- Straw
- Waterproof paper
ANY ONE OF THE ABOVE (1)

1.2.2 7 to 28 days **√** (1)

1.3

Roof covering
Purlin 50 x 75
Rafter 114 x 38
Beam filling
Wall plate 114 x 38

Any TWO labels ✓✓

ASSESSMENT CRITERIA	MARK	CANDIDATE'S MARK
Roof covering correctly drawn	1	
Beam filling correctly drawn	2	
Wall plate correctly drawn	1	
Any TWO labels	2	
TOTAL	**6**	

(6)

Single line for roof covering is acceptable.
Wall plate in good proportion acceptable.

1.4
- More battens are used ✓
- More roof trusses are used to carry weight of tiles ✓
- Clay/concrete tile more expensive than corrugated iron sheeting
- More labour intensive
- Needs roof underlay
  ANY TWO OF THE ABOVE

(2)

1.5
- Tiles /cladding✓
- Paint

ANY ONE OF THE ABOVE

(1)

1.6
- Tiles last longer/easy to clean/ water resistant ✓
- Paint does not last as long as tiles, easy to clean.
- Tiles/paint gives attractive/decorative appearance.
- Protect plaster.

ANY ONE OF THE ABOVE

(1)

1.7   1.7.1   Channel-iron/U beam √   (1)

         1.7.2   Exposed steel is prone to rust if not treated. √   (1)

         1.7.3   • Paint the metal. √
                    • Can be galvanised.
                    • Powder coating/ epoxy coating.
                    • Can be covered with oil.   (1)
                    ANY ONE OF THE ABOVE

         1.7.4   • Channel iron is used for bracing or as joists. √
                    • Frame of steel structures/struts/roof structures   (1)
                    OR ANY OTHER ACCEBTABLE ANSWER

1.8   1.8.1   • Three quarter bat/brick
                • 165 mm x 110 mm. ✓   (1)
        ANY ONE OF THE ABOVE

        1.8.2
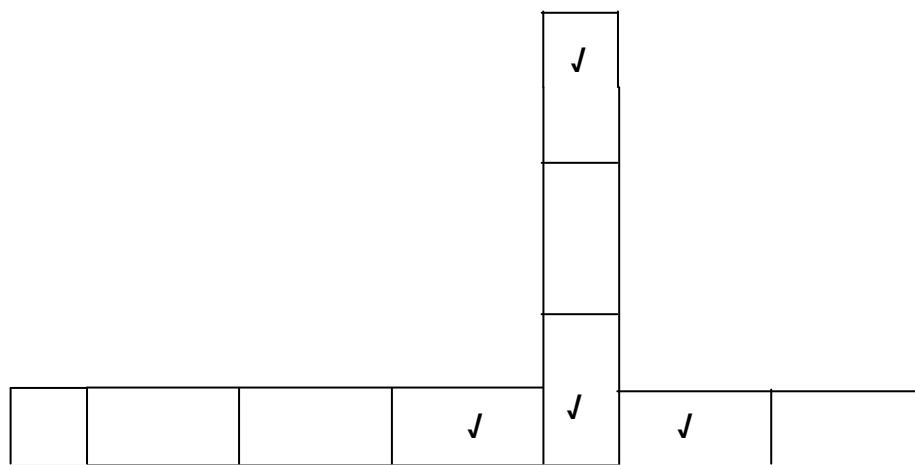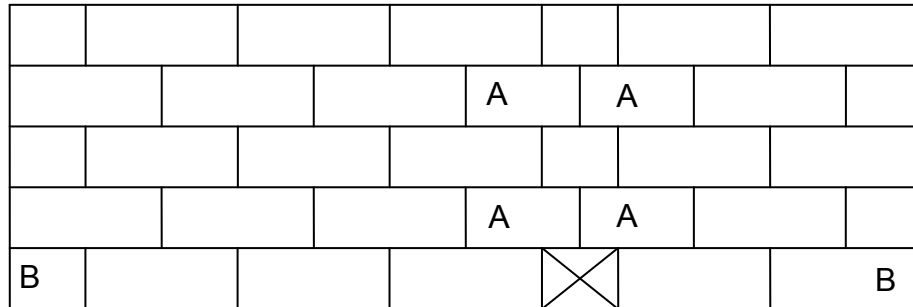
ASSESSMENT CRITERIA	MARK	CANDIDATE'S MARK
Stretcher course	2	
Header course	1	
Correctness of T-junction	1	
TOTAL	4	

                                                                                        (4)

1.9   • Cement fibre ceiling boards ✓
        • Match board ceiling boards
        • Steel ceilings
        • Gypsum boards
        • Knotty pine ceilings
        • PVC/plastic/polystyrene ceilings   (1)
        ANY ONE OF THE ABOVE

1.10   • To allow excess water or damp to escape ✓
        • keeping the inner wall dry
        • Ventilation   (1)
        ANY ONE OF THE ABOVE

                                                                                        [30]

QUESTION 2: ADVANCED CONSTRUCTION AND EQUIPMENT

2.1   2.1.1   D ✓   (1)

        2.1.2   L ✓   (1)

        2.1.3   J ✓   (1)

        2.1.4   H ✓   (1)

        2.1.5   K ✓   (1)

        2.1.6   A ✓   (1)

        2.1.7   M ✓   (1)

        2.1.8   I ✓   (1)

        2.1.9   G ✓   (1)

        2.1.10   B ✓   (1)

2.2   2.2.1   Chalk line ✓
                       USE
                       • To draw a straight line on a surface, by snapping the line. ✓
                       • Lay out walls on foundation.
                       • Some types can be used as a plumb bobs.
                       • Draw long lines on floors.   (2)
                       ANY TWO OF THE ABOVE

        2.2.2   Try square ✓
                       USE
                       • Marking lines perpendicular to surfaces of materials. ✓
                       • Testing squareness, straightness.
                       • Calibrated blade can be used for measuring.
                       • As a straight edge to test whether small surfaces are flat
                         and straight.   (2)
                       ANY TWO OF THE ABOVE

        2.2.3   Mitre square ✓
                       USE
                       • The mitre can be used to check/end marks 45°angles. ✓
                       • Test squareness of corners.
                       • Test mitre angles/and mark them.
                       • Marking lines perpendicular to surfaces are flat and straight.
                       • Testing squareness, straightness of surfaces.
                       • Calibrated blade can be used for measuring.
                       • As a straight edge to test whether surfaces of materials.
                       ANY TWO OF THE ABOVE   (2)

2.2.4 Sliding bevel ✓
USE
- The blade is adjustable for setting out and testing of any angles. ✓
- Draw inclined or oblique lines as well as for the testing of angles.
- Draw angles other than 90˚
- Copying angles from one surface to another.

ANY TWO OF THE ABOVE (2)

2.3 2.3.1
- The tensile strength of the concrete is compromised. ✓
- Weakens the structure/ structure will break easily/ collapse. ✓
- Will not be able to resist heavy loads.

ANY TWO OF THE ABOVE (2)

2.3.2 To strengthen the concrete where it is the weakest against tensile strength. ✓ (1)

2.3.3 Stirrups strengthen concrete against shear forces. ✓
Shear forces are the greatest next to the support,
Stirrups resist shear stress. (1)

2.4 2.4.1 Slump test ✓ (1)

2.4.2 This test is used to test the workability of concrete/ consistency of the concrete ✓ (1)

2.4.3 For every new/fresh batch of concrete that is mixed ✓ (1)

2.5
- Cavity walls are to prevent the penetration of water into the wall as they have better water proofing qualities. ✓
- Cavity walls help to protect the inner wall of a house against moisture. ✓
- Cavity walls provide insulation against extreme temperatures and noise.
- Avoid expensive external rendering.
- Enable the use of cheaper or alternative materials for the inner construction.

ANY TWO OF THE ABOVE (2)

2.6 2.6.1 A – Compression force/pushing forces ✓
B – Tensile force/bending forces ✓
C – Lateral force ✓ (3)

2.7 2.7.1 Round/circular/cylindrical column formwork ✓ (1)

2.7.2 Hardboard/plywood/pvc/galvanised/metal sheets ✓ (1)

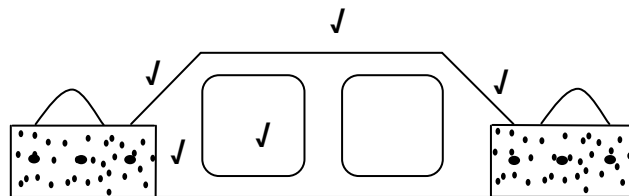2.7.3 Bolt and nut/threaded rods with nuts/clamp ✓ (1)

2.7.4 Apply form oil/emulsion oil/releasing agents to formwork ✓ (1)

2.8
- A rib and block floor is very quick to install ✓
- quicker than in situ concrete floor (1)

ANY ONE OF THE ABOVE

2.9

ASSESSMENT CRITERIA	MARK	CANDIDATE'S MARK
Ribs	2	
Block	1	
Reinforcing on top of or in the rib	☐	
Hollow in block	1	
TOTAL	**5**	

(5)

[40]

QUESTION 3: CIVIL SERVICES

3.1

P-trap √   S-trap √

Labelling not required   (2)

3.2   40/50 mm √   (1)

3.3   3.3.1   A   Ventilation pipe/breather pipe/gas escape pipe √   (1)

                    B   Inlet pipe/Inflow pipe/Influent √   (1)

                    C   Settling chamber/Chamber 1 √   (1)

                    D   Discharge chamber/Chamber 2 √   (1)

                    E   Manhole cover/Manhole lid/Cover √   (1)

                    F   Outlet pipe/Effluent √   (1)

         3.3.2   The raw sewerage will be broken down by anaerobic/bacterial
                    action. √   (1)

         3.3.3   • G allows the liquids to flow from chamber C to chamber D. √
                    • Will also balance the liquid levels.   (1)
                    ANY ONE OF THE ABOVE

         3.3.4   The liquids in D will flow out through F to a French drain. √   (1)

         3.3.5   The level of the liquids will be the same. √   (1)

         3.3.6   • The water coming from the bath or sink contains soap
                      (chemicals) that is poisonous to the bacteria and will hinder the
                      anaerobic/bacterial process. √
                    • It will fill up quicker if the frech drain gets saturated.   (1)
                    ANY ONE OF THE ABOVE

3.4   Storm water systems are used to carry storm water to rivers or low-lying
         dams. √   (1)

3.5   If you direct storm water into a sewerage system:
         • the water will flood the reticulation plant. √
         • raw sewerage will overflow into rivers and pollute water sources. √
         • it is illegal to direct rain or storm water into a sewerage system.
         ANY TWO OF THE ABOVE   (2)

3.6   Pressure control valves (pressure-reducing valves) are used to ensure that:
- a constant pressure is maintained in the water installation√
- prevent pipes from bursting
- the pressure rating is in accordance with the pressure rating of the geyser.

ANY ONE OF THE ABOVE   (1)

3.7
- An elbow will be used to change the direction of a pipe √
- A T-coupler will be used to split the water supply into two different flow directions/ to combine two different flow directions into one(shower).√   (2)

ANY TWO OF THE ABOVE

3.8   Thermostat √   (1)

3.9   Gravity geyser/Low pressure geyser √   (1)

3.10   Black √
Absorbs the most heat √
                                                                                           (2)

3.11
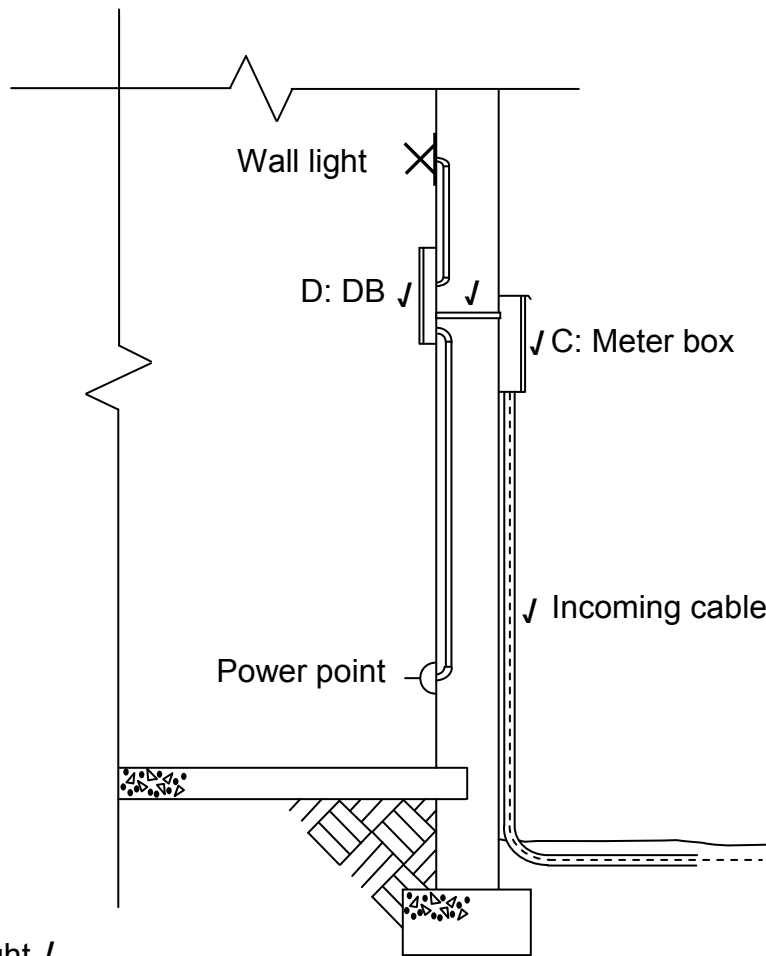
A: Wall light ✓
B: Power point/Socket outlet/Switch Socket outlet/Plug ✓ (2)

ASSESSMENT CRITERIA	MARK	CANDIDATE'S MARK
Incoming cable to meter box	1	
Incoming cable to DB	1	
Meter box	1	
Distribution board	1	
TOTAL	**4**	

(4)

ANY OTHER WAY OF INDICATING CONDUIT PIPES

[30]

QUESTION 4: QUANTITIES, MATERIALS AND JOINING

4.1	4.1.1	Door stile √	(1)
	4.1.2	50 mm/50 √	(1)
	4.1.3	600 √	(1)
	4.1.4	3 √	(1)
	4.1.5	693 mm/693 √	(1)
	4.1.6	1 907 mm/1 907 OR 1 904 mm/1 904 √	(1)
	4.1.7	20 mm/20 √	(1)
4.2	4.2.1	B √	(1)
	4.2.2	A √	(1)
	4.2.3	D √	(1)
	4.2.4	D √	(1)
	4.2.5	A √	(1)
	4.2.6	D √	(1)
	4.2.7	C √	(1)

4.3.1

A	B	C	D	
			<u>Area to be plastered:</u>	
			Length of ONE short wall: = 4 000 mm - 2(220 mm) = 3 560 mm ✓	
			Length of ONE long wall = 8 000 mm - 2(220 mm) = 7 560 mm ✓	
			Total length of one short and one long wall = 3 560 mm + 7 560 mm = 11 120 mm ✓	(3)
2/	11,12		Area of internal walls before deductions:	
	<u>2,7</u> ✓	60,05 m² ✓		(2)
1/	1,2		Area of window opening:	
	<u>0,9</u> ✓	1,08 m² ✓		(2)
1/	2,1		Area of door opening:	
	<u>0,9</u> ✓	1,89 m² ✓		(2)
			Total wall area to be plastered	
			✓ ✓ ✓ 60,05 m² – 1,08 m² - 1,89 m²	
			= 57,08 m² ✓ need to be plastered	(4)

4.3.2

A	B	C	D	
			<u>Volume of plaster:</u>	
1/	✓ 57,08 m²			
	✓ <u>0,012 m</u>	0,68 m³ ✓		(3)

If candidates did not use the dimension paper/sheet 2 marks should be deducted

[30]

QUESTION 5: APPLIED MECHANICS

5.1

       5.1.1   675 mm² ✓   (1)

       5.1.2   4 800 mm² OR 4 400 mm² ✓   (1)

       5.1.3   400 mm² ✓   (1)

       5.1.4   5 075 mm² ✓   (1)

       5.1.5   30 mm ✓   (1)

       5.1.6   95 mm ✓ ✓   (2)

       5.1.7   40 mm ✓   (1)

When the wrong unit were used the learner will be penalised with ONE mark.

5.2
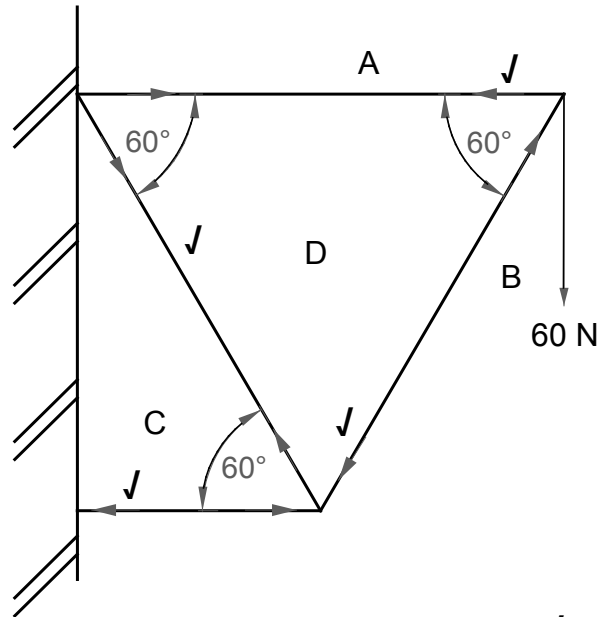
DIAGRAM A: SPACE DIAGRAM ✓ (4)
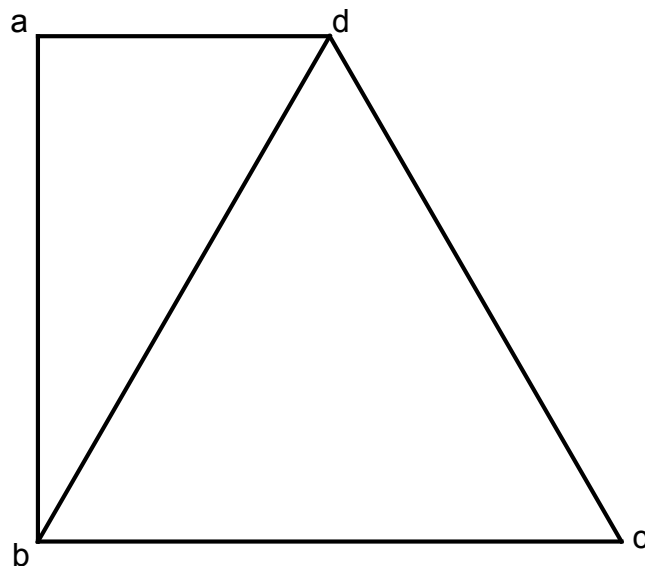
DIAGRAM B: VECTOR DIAGRAM/FORCE DIAGRAM ✓ (2)
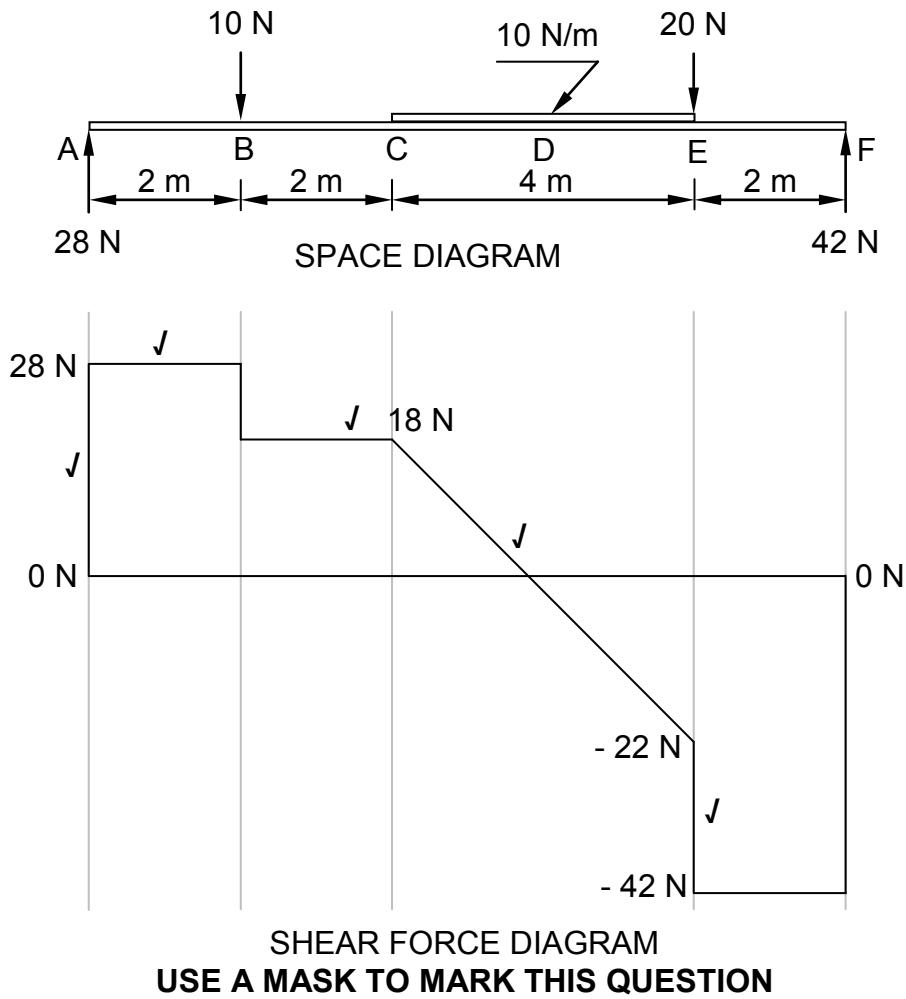
NOT ACCORDING TO SCALE

USE A MASK TO MARK THIS QUESTION

MEMBER	NATURE	MAGNITUDE
BC	Strut ✓ OR ---	65 N ✓ (Size to be determined as per vector diagram) OR 0 OR no force
CD	Tie ✓	--------------
DA	Tie ✓	32 N ✓ (Size to be determined as per vector diagram)
BD	Strut ✓	--------------

(6)

Tolerance of 1 N to either side

5.3.1

SPACE DIAGRAM

SHEAR FORCE DIAGRAM
USE A MASK TO MARK THIS QUESTION

ASSESSMENT CRITERIA	MARKS	CANDIDATE'S MARK
Drawing correct	5	
Indicate all values of shear forces on drawing	1	
Correct application of scale	1	
TOTAL	**7**	

5.3.2   Calculated from the left:
BM$_d$: = (28 x 6) - (10 x 4) - (20 x 1) ✓
        = 168   -   40   -   20 ✓
        = 108 Nm ✓
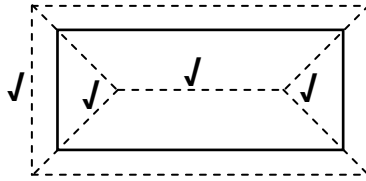
OR
Calculated from the right:
BM$_d$: = (42 x 4) - (20 x 2) - (20 x 1)
        = 168   -   40   -   20
        = 108 Nm   (3)
                                                                    [30]

ANSWER SHEET 6.1

NO.	QUESTIONS	ANSWERS	MARKS
1	Name the scale used for the site plan.	1:200 √	1
2	State the colour that you will use to indicate the proposed dwelling on the site plan.	Red √	1
3	Identify number **1**?	Rodding eye √	1
4	Identify the line at number **2**?	Building line √	1
5	Identify number **3**	Sewer pipe/drainpipe √	1
6	Determine the distance from the boundary line to the proposed dwelling on the right hand side of the building?	5 000 mm/5 m √	1
7	Identify number **4**	Manhole √	1
8	Identify number **5**	Municipal connection √	1
9	Draw the roofline of a hipped roof for the building indicated in the next column		4
10	Calculate the perimeter of the proposed dwelling.	64 000 mm/64 m √ √	2
11	What elevation will be closest to Long Street?	West elevation √	1
		TOTAL	**15**

QUESTION 6: GRAPHICS AND COMMUNICATION

ANSWER SHEET 6.2

Floor plan showing dimensions 220, 3 000, 110, 3 000, 220 and 6 110, with rooms labelled: Kitchen, Tiles, Bathroom, Storeroom, Office, Tiles/carpets.
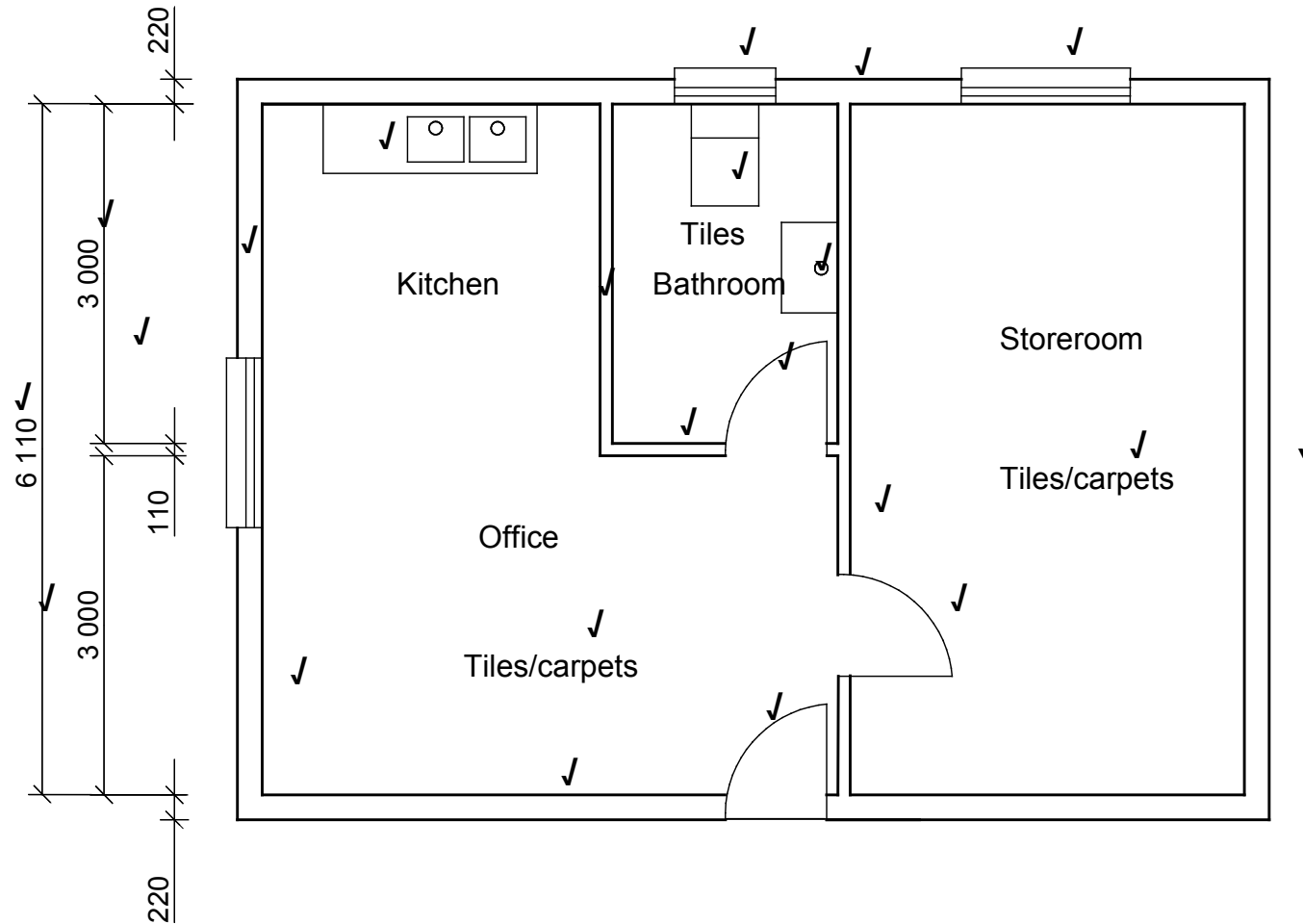
ASSESSMENT CRITERIA	MARKS	LM
External Walls	4	
Internal Walls	3	
Windows	3	
Doors	3	
Wash basin	1	
Water closet	1	
Double bowl sink	1	
Dimensions	4	
Floor coverings	2	
Application of scale One or two incorrect = 3 Three or four incorrect = 2 More than five incorrect = 1 No measurement correct = 0	3	
TOTAL	**25**	

NOT TO SCALE: USE A MASK TO MARK THIS QUESTION
ONE MARK SHOULD BE DEDUCTED IF JUNCTIONS AT WALLS ARE CLOSED
ONE MARK SHOULD BE DEDUCTED IF INTERNAL DOORS HAVE A WALL BETWEEN THE OPENING

Application of scale ✓✓✓

[40]
[200]