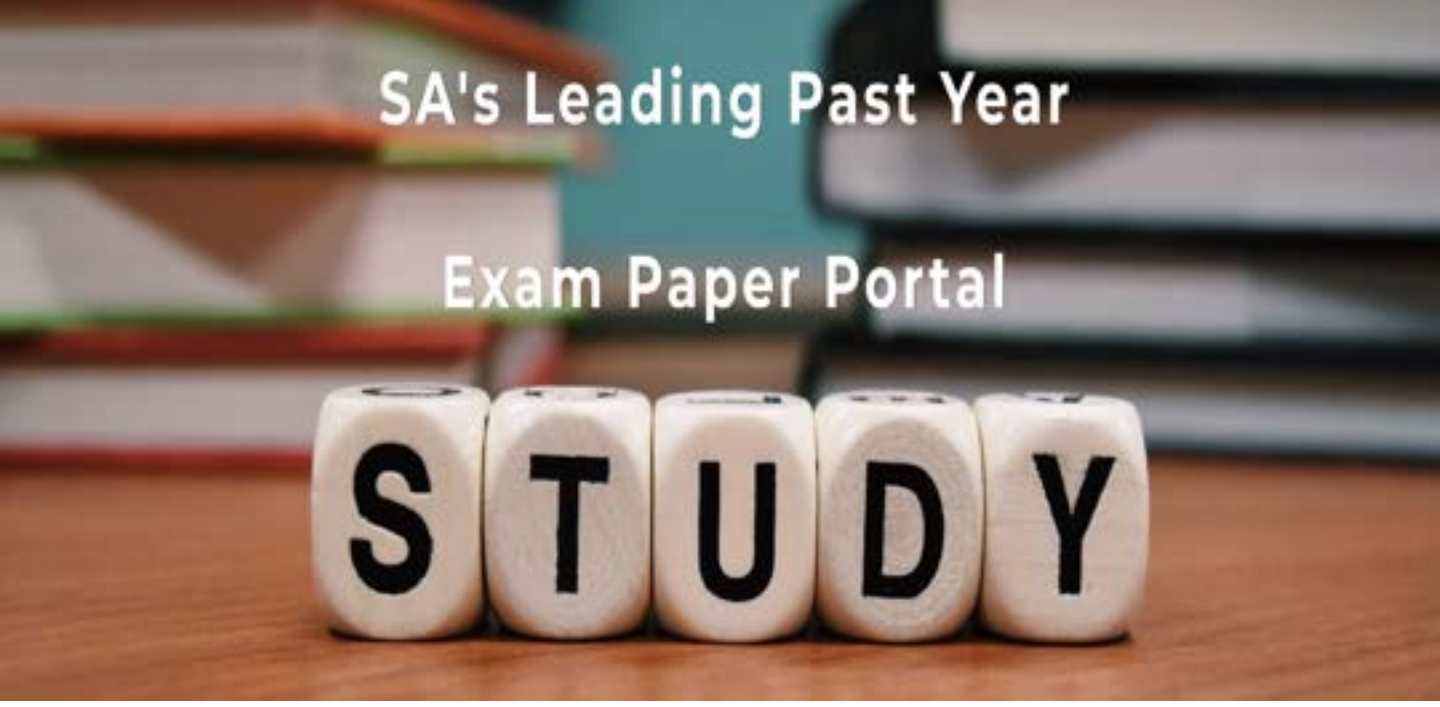

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GRADE 12

SEPTEMBER 2022

CIVIL TECHNOLOGY: CIVIL SERVICES MARKING GUIDELINE

MARKS: 200

This marking guideline consists of 14 pages, including 2 answer sheets.

INSTRUCTIONS FOR THE MARKERS

1. Markers should:

- Familiarise themselves with the question and answer before evaluating the responses of candidates.
- Always interpret the responses of the candidates within the context of the question.
- Consider any relevant and acceptable answer during pre-marking but should strictly adhere to the answers after finalisation of the marking guideline.
- There are two approaches to answering questions, these are (1) to describe and (2) to explain.
- If a candidate is required to explain e.g., a process in 4 steps, only the first 4 responses should be considered.
- If, however a candidate is required to e.g., explain or describe how to transfer heights from one point to another using a transparent pipe level we need to consider that candidates may write a long description not necessarily well organised as an intellectual response may do. In this case the marker needs to evaluate the complete statement to judge if the candidate explained the required outcome satisfactorily and allocate marks on merit. The marker should apply his/her professional judgement with these types of questions.
- Mark what the candidate wrote and do not award marks for answers that the marker thinks the candidate meant with what was written.
- Indicate the tick or cross right at the position where the mark needs to be awarded or where the candidate made the error.
- Accept the letter corresponding with the correct answer as well as the answer written in full in multiple-choice questions.
- Accept incorrect spelling in one-word answers unless the spelling changes the meaning of the answer.

2. For calculations:

- A mark is only awarded if the correct unit is written next to the answer.
- If TWO marks are awarded ONE mark is awarded for the answer and ONE mark for the correct unit.
- Where the candidate made a principle error e.g. added instead of multiplying, no marks will be awarded for the steps. If the answer is correct according to what the candidate did, the mark for the answer can be awarded for the application of skills.
- Where an incorrect answer could be carried over to the next step, the first answer will be deemed incorrect. However, should the incorrect answer be carried over correctly, the marker has to recalculate the values, using the incorrect answer from the first calculation. If correctly used, the candidate should receive the full marks for subsequent calculations.
- Markers should consider when and where a candidate has rounded off in a calculation, as well as the subsequent effect it has on the final answer obtained. The calculation should therefore be awarded marks on merit.
- Alternative methods of calculations must be considered, provided that the correct answer is obtained.

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3. When marking drawings:

- The member for which the mark should be awarded should be drawn correctly in the correct position to receive a mark.
- A member incorrectly drawn but wrongfully repeated in another position will be awarded the mark for the repeated incorrect member provided that the marking guideline provide for TWO or more marks for that member (positive marking).
- Marks can only be awarded for a label if the label is correctly indicating the correct member.
- Scale drawings should always be marked using an appropriate mask.

When a candidate drew the wrong drawing e.g.:

- A horizontal section instead of a vertical section, no marks will be allocated to the drawing as the candidate did not respond to the expected outcome.
- An orthographic view instead of sectional view, no marks will be allocated to the drawing as the candidate did not respond to the expected outcome.
- An orthographic view instead of an isometric view, no marks will be allocated to the drawing as the candidate did not respond to the expected outcome.
- If the incorrect drawing was drawn, the candidate can be awarded for only what was asked but mark/s for the correctness of the drawing will not be awarded e.g., if a King Post roof truss was asked in the question, and candidate drew SA-Howe Truss.

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

1.1 It is an unplanned/uncontrolled (1) event that occurs because of an unsafe act/unsafe conditions. (1) (2)

1.2 Steel alloy pipe (1)

1.3 1.3.1 Two (1)

1.3.2 38 mm (1)

1.3.3 900 mm (1)

1.4 Any TWO:
- To ensure that the scaffolding is stable in all directions
- Must be able to carry the mass of the load
- Free of any defects
- Similar answer (Any 2 x 1) (2)

1.5 1,8 meters (1)

1.6 3 meters (1)

1.7 1.7.1 Any ONE:
- Higher person can slip and fall on the lower person
- Can damage the ladder
- Makes it more unstable
- Similar answer (1)

1.7.2 Red or orange flag (1)

1.7.3 Any ONE:
- Aluminium
- Wood
- Metal
- Similar answer (1)

1.7.4 Any ONE:
- Defects must be visible (clean)
- Will prevent slipping accidents (oil / grease)
- Similar answer (1)

1.8 Any TWO:
- Can be applied with a brush, roller or spray-gun
- Enhances appearance of surfaces
- Easy to apply
- Makes cleaning and maintenance easier
- Dry quickly
- Marks/smudges are easily cleaned with water
- Gives elastic/flexible finish resistant to cracking (Any 2 x 1) (2)

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1.9 Any TWO:
- Increases the strength of concrete
- Decreases the permeability of concrete
- Improves the durability of concrete
- Reduces cracks
- Makes concrete more watertight
- Reduce crimping cracks in the concrete
- Provides volume stability
- Concrete can carry more weight without being damaged (Any 2 x 1) (2)

1.10 Any TWO:
- Painting
- Electroplating
- Powder coating
- Galvanising (Any 2 x 1) (2)

[20]

QUESTION 2: GRAPHICS, JOINING AND EQUIPMENT (GENERIC)

2.1 FIGURE 2.1 on ANSWER SHEET A shows the outer lines of a structure that must be built on a site. Draw the site plan on scale 1 : 200 on ANSWER SHEET A so that the structure is in the middle of the site.

The site plan must comply with the following requirements:

2.1.1 Plot size is 30 m wide from east to west and 40 m long from south to north (2)

2.1.2 Pavement of 2 m and the street of 6 m on the south side (3)

2.1.3 Building boundaries are 2 m on the east, north and west sides and 4 m on the south side (4)

2.1.4 3 m wide entrance to the site (2)

2.1.5 Datum level in the north-west corner of the site (2)

Also draw in the sewer lay-out on the structure and show the following:

2.1.6 Water closet and symbol at the abbreviation (1)

2.1.7 Sewer pipes (2)

2.1.8 Rodding eye with the abbreviation (2)

2.1.9 Inspection eye with the abbreviation (2)

2.1.10 Manhole with the abbreviation (2)

Indicate the following measurements:

2.1.11 Length and width of the site (4)

2.1.12 South and west building boundaries (2)

Use the points table on ANSWER SHEET A as reference.

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2.2 When square shoulder is driven in it resists rotation. (1)

2.3 A – Nut (1)
B – Thread (1)
C – Run-out (1)
D – Shank (1) (4 x 1) (4)

2.4 Prevents backing off. (1)

2.5 Can be tightened with fingers. (1)

2.6 2.6.1 1,61 m (1)

2.6.2 1,64 – 1,584 x 100 = 5,6 m (4)
[40]

TOTAL SECTION A: 60

QUESTION 3: SAFETY, MATERIAL AND CONSTRUCTION (SPECIFIC)

3.1 3.1.1 False (1)

3.1.2 True (1)

3.1.3 True (1)

3.1.4 False (1)

3.2 Prevent (1) falling objects from (2) injuring workers. (2)

3.3 Any TWO responsibilities:
- (1) A competent person must (2) prepare a fall protection plan.
- The (1) fall protection plan must be implemented and (2) maintained.
- (1) Ensure steps for the (2) adherence of the fall protection plan. (2 x 2) (4)

3.4 Zink is a (1) weak atomic bond (2) relative to other metals which during (3) dezincification (when zinc is removed from an alloy) (4) A weak deposit of porous/nobler/copper-rich metal will remain. (4)

3.5 3.5.1 Electrode (1)

3.5.2 Boundary (1)

3.5.3 Electrolyte (1)

3.5.4 Passive (1)

3.6 3.6.1 Manhole (1)

3.6.2 A – Benching
B – Branch channel (2)

3.6.3 (1) So that the sewage spills slide back into the channel pipe.
(2) So that vermin cannot settle there. (2)

3.7 $\frac{20}{40} = 0,5$ m (3)

3.8 3.8.1 Loose / waterlogged / saturated ground (1)

3.8.2 A – Wedge
B – Walling
C – Strut (3)

[30]

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QUESTION 4: COLD WATER SUPPLY, HOT WATER SUPPLY AND TOOLS (SPECIFIC)

4.1 4.1.1 A – Water main
B – Meter box
C – Stopcock
D – Water meter (4 x 1) (4)

4.1.2 450 mm (1)

4.1.3 Municipality (1)

4.2 4.2.1 Full-way valve (1)

4.2.2 A – Lever
B – Stem
C – Ball (3)

4.2.3 At water inlets where water needs to be shut off quickly. (1)

4.3 4.3.1 ø 110 mm (1)

4.3.2 Bend 90° with inspection eye. (1)

4.3.2 Cleaning / inspection of the system. (1)

4.4 (1) To prevent water from (2) leaking through the connection. (2)

4.5 Saves water. (1)

4.6 Operation: (1) When the hot water tap is opened, (2) first cold water is running out. The red water diverter is a (3) valve which diverts the (4) cold water to a water tank, garden, etc.

Any TWO advantages:
- Now wiring
- Do not use electricity
- No energy wastage
- No heat loss
- Saves water (6)

4.7 4.7.1 Hot water pipe (1)

4.7.2 Balancing device (Hot water control) (1)

4.7.3 Thermostatic controller (1)

4.7.4 Pressure control valve (1)

4.7.5 Valve (1)

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4.8 4.8.1 B

4.8.2 B

4.8.3 B

4.8.4 A

4.8.5 A (5 x 1) (5)

4.9 4.9.1 False (1)

4.9.2 False (1)

4.9.3 True (1)

4.10 Any FOUR caring measures for the compressed-air test apparatus.

- Check equipment regularly.
- Clean the stopper after use.
- Place the manometer in its holder after use.
- Do not bump the instrument.
- All the air must escape from the manometer pipe.
- Ensure that the inside surface of the pipe is clean. (4 x 1) (4)

[40]

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QUESTION 5: DRAINAGE AND QUANTITIES (SPECIFIC)

5.1 5.1.1 Vent valve / Air admittance valve (1)

5.1.2 (1) Valve opens and (2) reduces the vacuum and allows (3) air into the system so that (4) the water can flow away freely / without releasing gases into the building. (4)

5.2 5.2.1 Gully (1)

5.2.2 Outlet of waste water from the kitchen (sink) / from the bathroom (bath, shower and hand basin) to drainage pipes. (1)

5.2.3 Any TWO disadvantages of the fixture.
Greasy / leaves / litter residue can collects on the grating.
- Blockages can cause an overflows.
- Blockages can cause foul odours. (2 x 1) (2)

5.2.4 (1) Serves as a water lock which (2) prevent bad odours/gases emerge. (2)

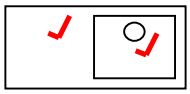
5.3 5.3.1 Septic tank (1)

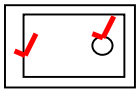
5.3.2 (1) Decomposes and liquefied by (2) anaerobic bacteria and other biological life such as maggots / worms / micro-organisms. (2)

5.3.3 Gas escape (1)

5.3.4 (1) Not disturbing (2) surface water layer. (2)

5.3.5 French drain (1)

5.4 5.4.1 Sink  (2)

5.4.2 Bidet  (2)

5.5 5.5.1 Underground sewerage pipes (1)

5.5.2 Bigger solids (1)

5.6 5.6.1 Polycop (1)

5.6.2 1 3240 mm (13,24 m) (1)

5.6.3 Polycop (1)

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5.6.4 8 800 mm (1,5 + 5,48 + 1,82 = 8,8 m) (1)

5.6.5 Copper (1)

5.6.6 1 (1)

5.6.7 Copper (1)

5.6.8 1 (1)

5.6.9 Copper (1)

5.6.10 1 (1)

5.6.11 Copper (1)

5.6.12 1 (1)

5.7 $= \pi r^2 h$ ✓
$= \frac{22}{7} \times 1,05 \times 1,05 \times 2,4$ ✓ ✓
$= 8,316\ m^3$ ✓ (4)
[40]

QUESTION 6: GRAPHIC COMMUNICATION, ROOF WORK, STORMWATER AND JOINING (SPECIFIC)

6.1 FIGURE 6.1 on ANSWER SHEET C shows the top and front elevation of a cone. Draw the development of the cone according to the radial-line method on ANSWER SHEET C. Add an allowance for the seam.
Show all construction lines. (14)

6.2 6.2.1 D

6.2.2 F

6.2.3 G

6.2.4 A

6.2.5 C (5)

6.3 Any similar answer:
- (1) Waterproofing of (2) roofs.
- (1) Junctions of walls (2) that protrude above the roof.
- (1) At joints where pipes (2) project through the roof cladding. (2)

6.4 Route stormwater to rivers / dams. (1)

6.5 Any THREE consequences:
- Discomfort of public
- Loss of life
- Damage to properties
- Pollution of the environment
- Negative environment impact (3 x 1) (3)

6.6 Keep solids out of the stormwater pipe. (1)

6.7 6.7.1 True (1)

6.7.2 False (1)

6.8 6.8.1 Rubber ring seal / Compression joint (1)

6.8.2 Compression screw (1)

[30]

TOTAL: 200

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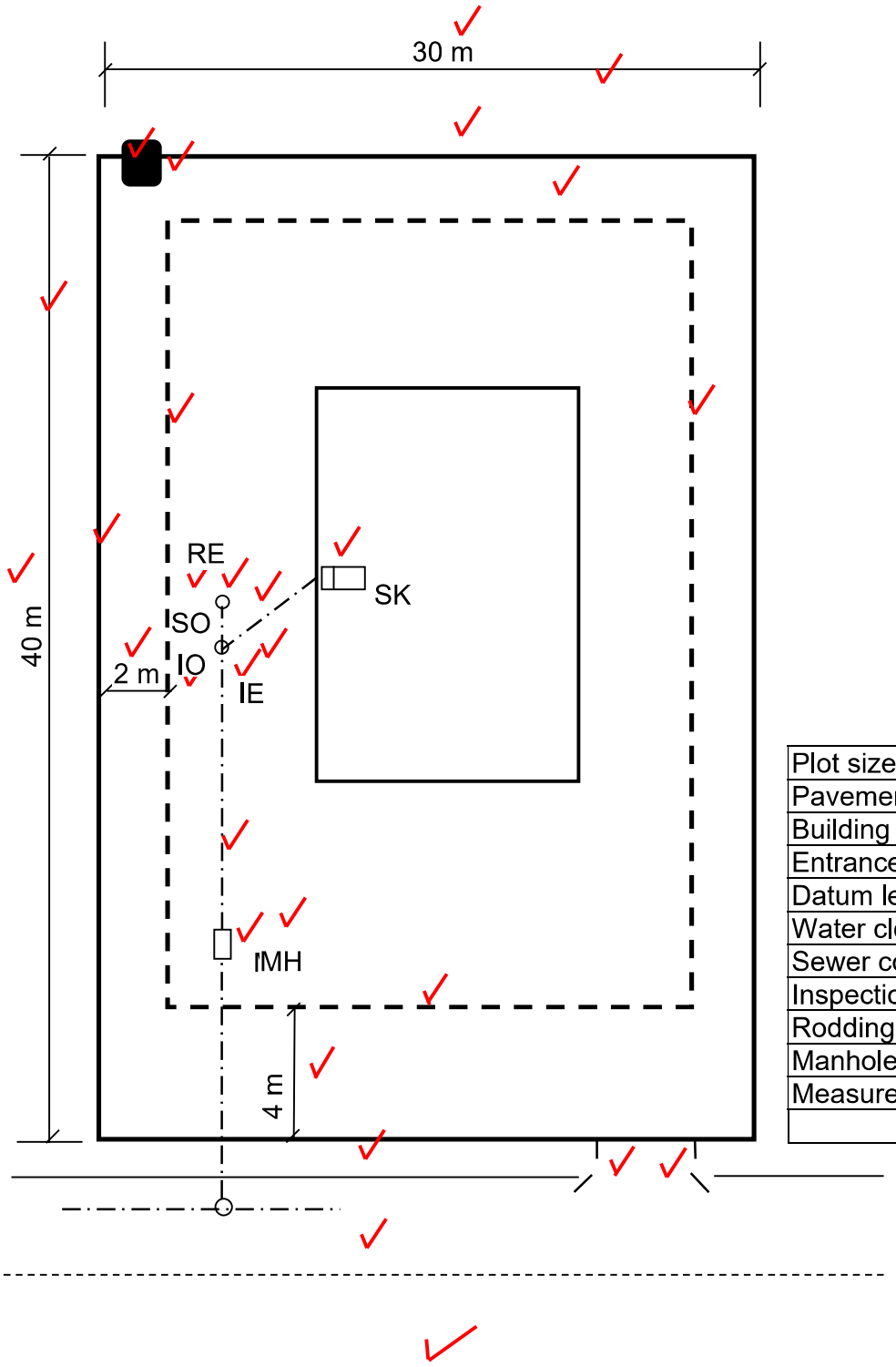
ANSWER SHEET **A**	CIVIL TECHNOLOGY GENERIC	NAME: _____

2.1 FIGURE 2.1 on ANSWER SHEET A shows the outer lines of a structure that must be built on a site. Draw the site plan on scale 1 : 200 on ANSWER SHEET A so that the structure is in the middle of the site.

(28)



Plot size	2
Pavement + street	3
Building boundaries	4
Entrance	2
Datum level	2
Water closet	1
Sewer connection	2
Inspection eye + abbr.	2
Rodding eye +abbr.	2
Manhole + abbr.	2
Measurements	6
TOTAL:	**28**

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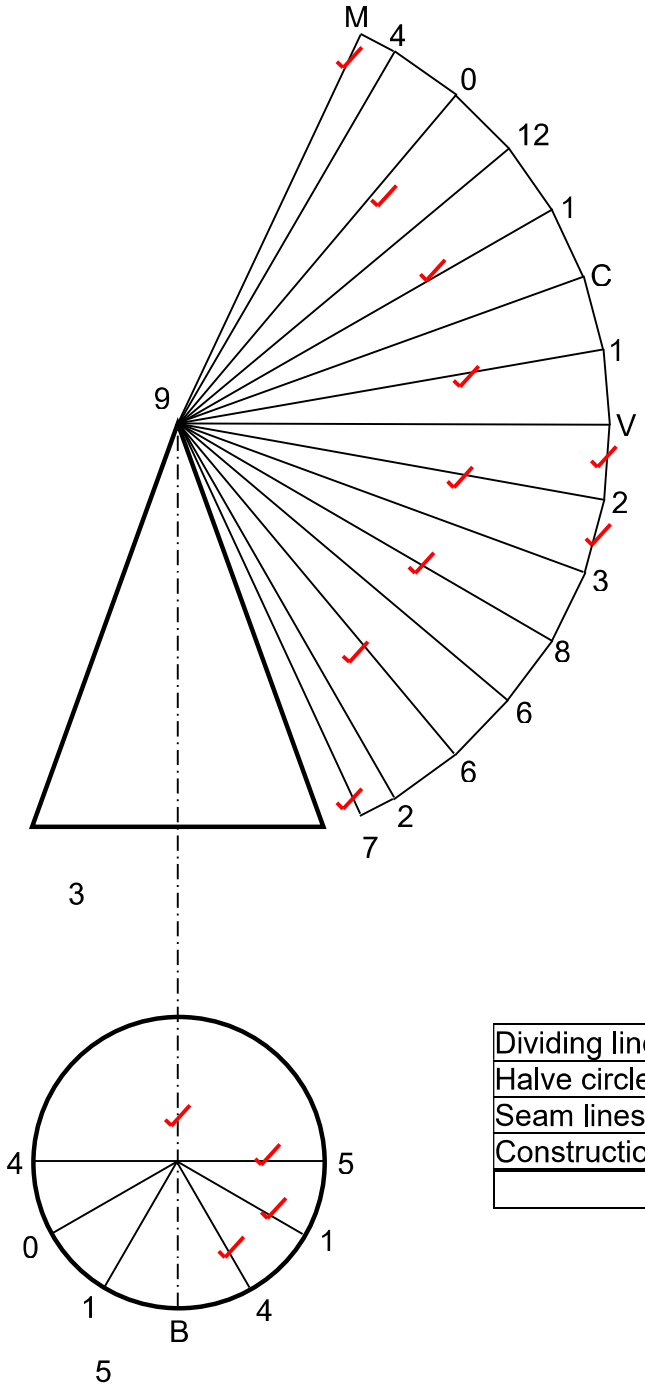
ANSWER SHEET **B**	**CIVIL TECHNOLOGY CIVIL SERVICES**	**NAME:** _____

6.1 FIGURE 6.1 on ANSWER SHEET B shows the top and front elevation of a cone.
Draw the development of the cone according to the radial-line method on ANSWER SHEET B. Add an allowance for the seam. Show all construction lines. (14)



Dividing lines 0–6 on top view	4	
Halve circle B–C	2	
Seam lines A–B and A–C	2	
Construction lines A0–A 12	6	
TOTAL:	**14**	

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