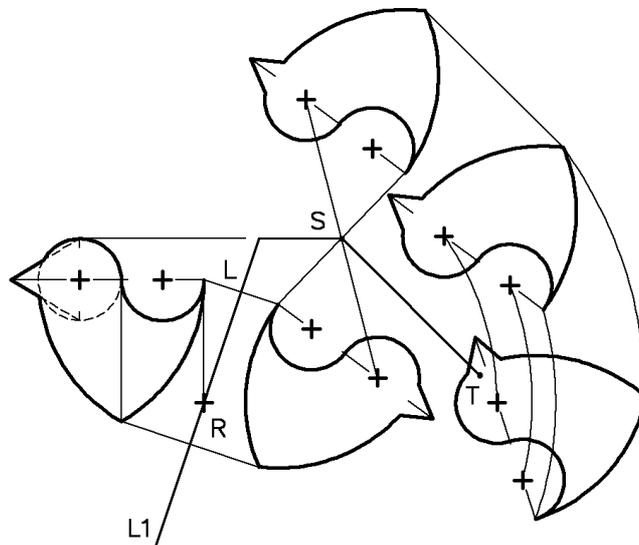




**Coimisiún na Scrúduithe Stáit  
State Examinations Commission**

# TECHNICAL GRAPHICS — HIGHER LEVEL

## MARKING SCHEME 2003

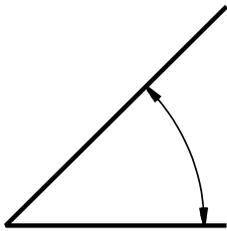


## Section A

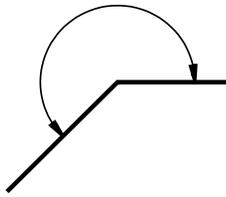
<b>Q1.</b>	12	Four diagrams, 3 marks for each correct label.
<b>Q2.</b>	6	Bisect any two sides. (3,3)
	6	Locate centre and draw circle. (3,3)
<b>Q3.</b>	4	Trim command.
	4	Offset command. (2 marks for circle command)
	4	Erase command
<b>Q4.</b>	12	290° angle $\pm$ 4° variation. (8 marks for supplementary angle of 70°)
<b>Q5.</b>	6	Drawing of an internal tangent (3 marks for an external tangent)
	6	Drawing of both normals to fix points of contact (3,3)
<b>Q6.</b>	4	Rotating AB in plan parallel to X-Y line.
	4	Projection of rotated position from plan to elevation.
	4	Fixing true length in elevation. (2,2)
<b>Q7.</b>	4	Locus of points 10mm from circumference of circle
	4	Bisecting angle between lines L and M.
	4	Fixing and indicating the required point P. (-2 marks if not indicated)
<b>Q8.</b>	4	Projections required from end view to elevation and plan views. (2,2)
	4	Projections from plan to elevation.
	4	Completion of elevation.
<b>Q9.</b>	4	Setting out the required number of parts on a dividing line (twelve in total).
	4	Locating the required divisions on the given line P.
	4	Constructing the required triangle.
<b>Q10.</b>	4	Locating focal points.
	4	Construction of tangent.
	4	Location of point of contact.
<b>Q11.</b>	12	Solids depicted in a <u>good quality</u> freehand pictorial sketch
<b>Q12.</b>	12	Shading used appropriately and <u>effectively</u> to enhance the given sketch.
<b>Q13.</b>	4	Conversion of area into a triangle.
	4	Conversion of area into a rectangle.
	4	Conversion of area into a square.
<b>Q14.</b>	4	Translation of school or library position equal to road width
	4	Construction to determine location of crossing position.
	4	Drawing of pedestrian crossing in its correct location.
<b>Q15.</b>	6	Angle A = 30° ( $\pm$ 4° variation acceptable where protractor is used).
	6	Angle B = 144° ( $\pm$ 4° variation acceptable where protractor is used).

1. Correctly fill in the labels for each of the diagrams by selecting from the table shown.

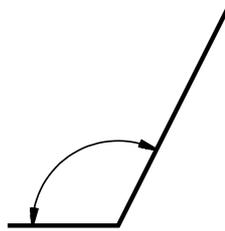
TABLE			
Acute angle	Complementary angle	Obtuse angle	Reflex angle



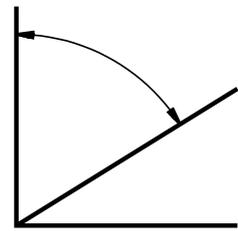
**Acute Angle**



**Reflex Angle**

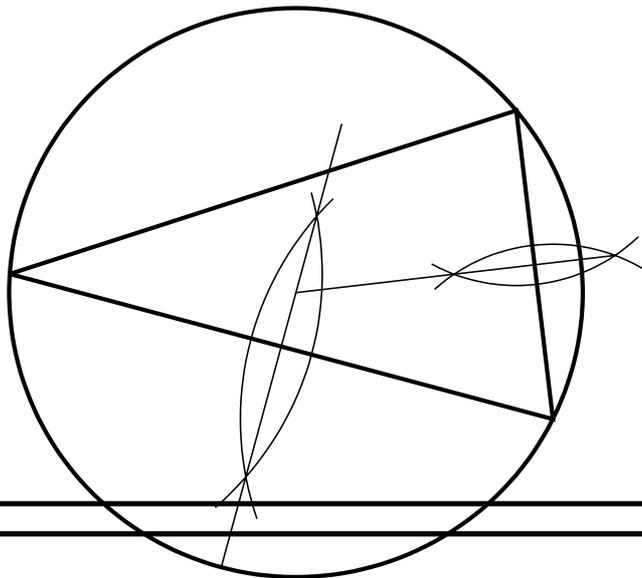


**Obtuse Angle**

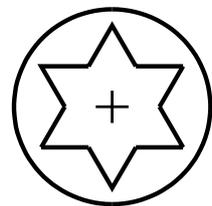
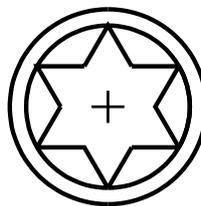
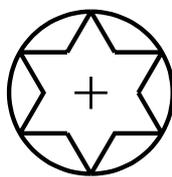


**Complementary Angle**

2. Describe a circle about the triangle shown.



3. List the CAD commands used to edit the figure as shown in the sequence below.



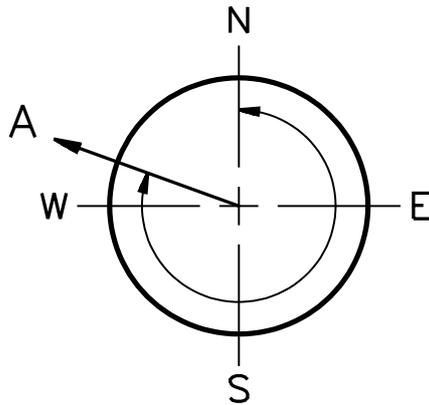
**Commands used:**

**Trim**

**Offset**

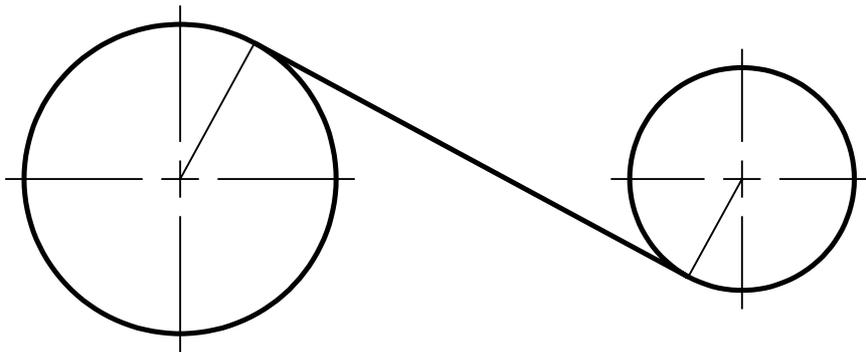
**Erase**

4. The figure shows a compass. Use a protractor to determine the bearing of the direction A with reference to North as shown. Write your answer in the box provided.

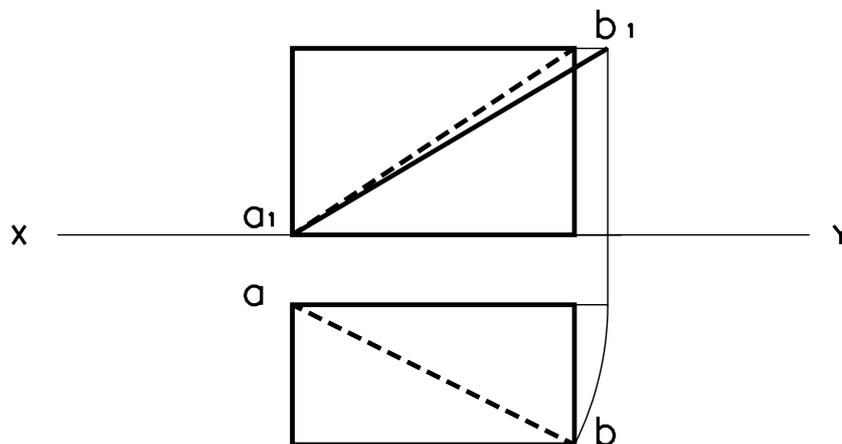


290°

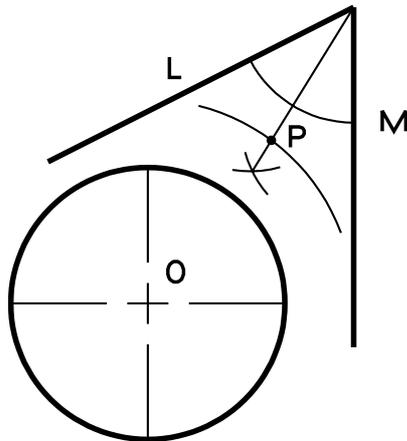
5. Construct an internal tangent to the two circles shown. Show clearly how both points of contact are determined.



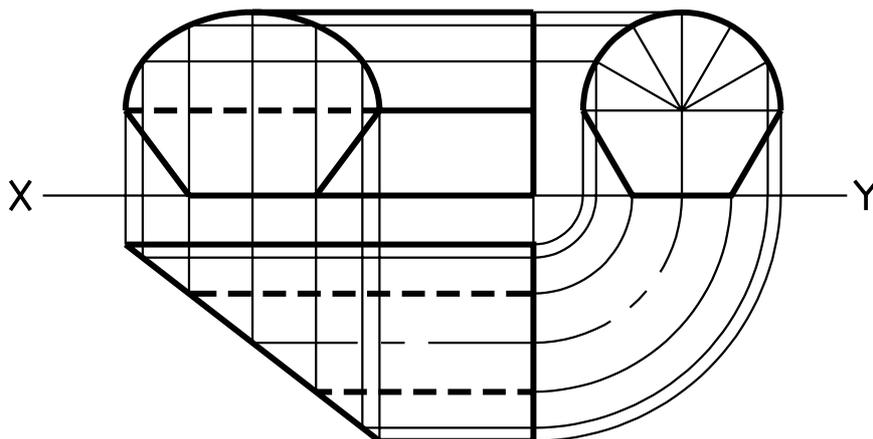
6. Shown are the elevation and plan of a prism. Determine the true length of the diagonal AB.



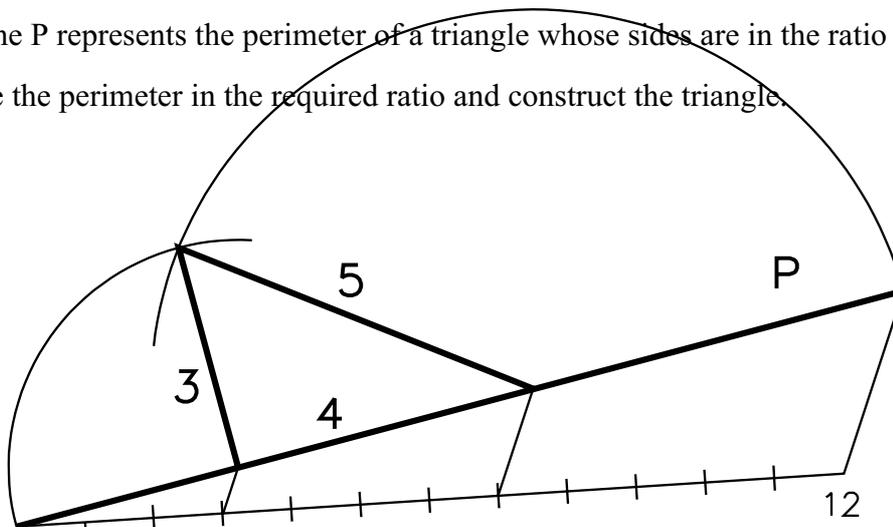
7. Shown is a circle with centre O and the lines L and M. Locate a point P which is 10mm from the circumference of the circle and equidistant from both lines.



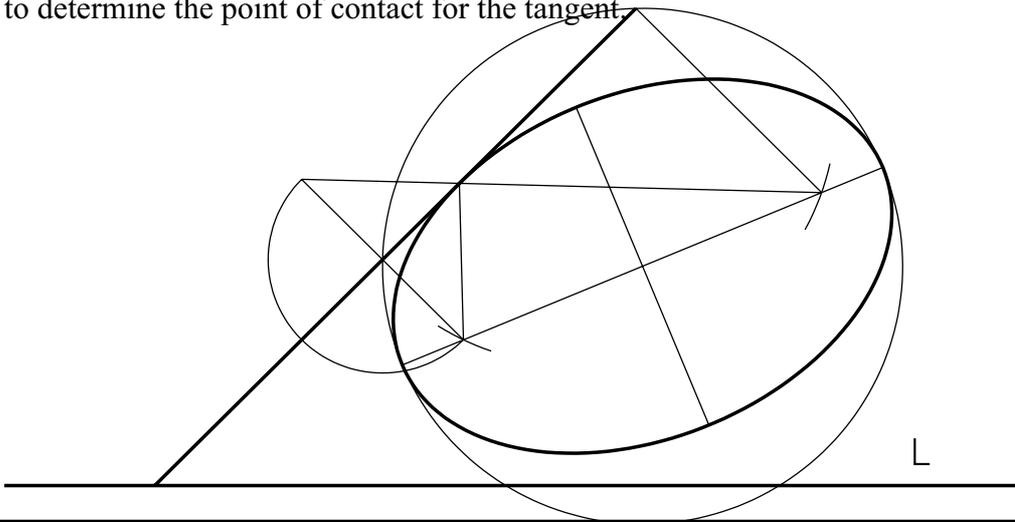
8. The plan and end view of a cut solid are shown. Project the elevation on the given X-Y line.



9. The line P represents the perimeter of a triangle whose sides are in the ratio 3:4:5. Divide the perimeter in the required ratio and construct the triangle.

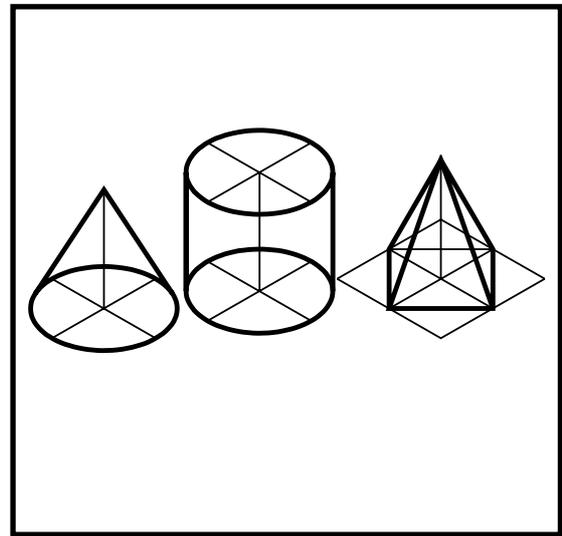
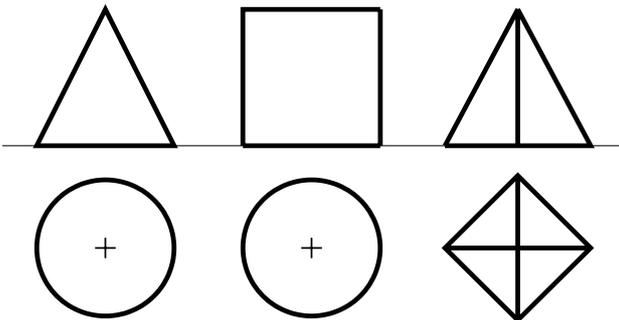


10. Draw a tangent to the ellipse which makes an angle of  $45^\circ$  to the line L. Show clearly how to determine the point of contact for the tangent.

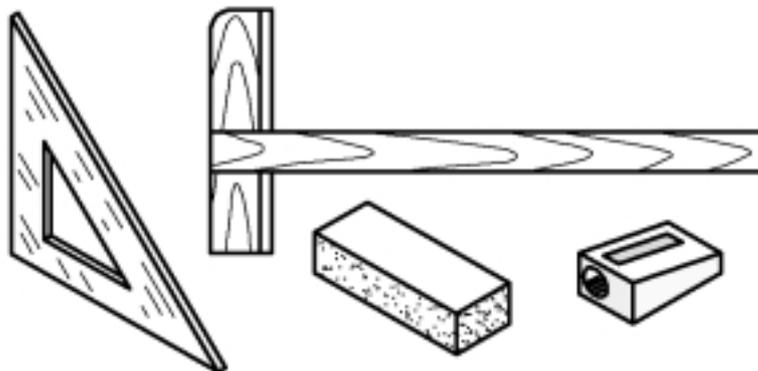


11. Shown is the elevation and plan of a cone, a cylinder and a pyramid.

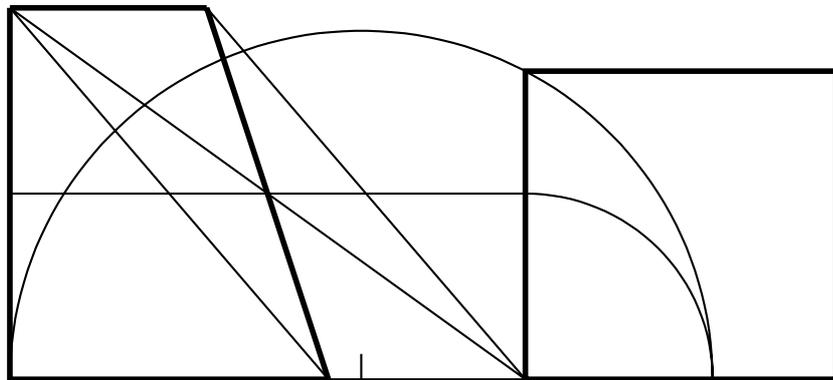
Make a freehand pictorial sketch of the solids in the space provided.



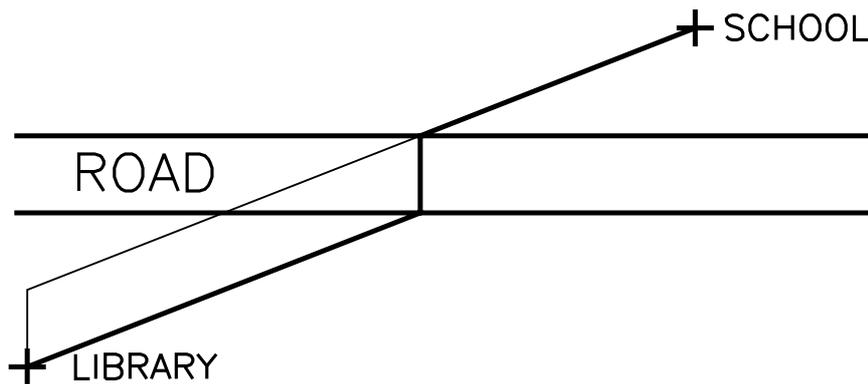
12. Apply shading and texture to enhance the sketch of the Technical Graphics equipment shown.



13. Convert the given quadrilateral into a square of equal area.



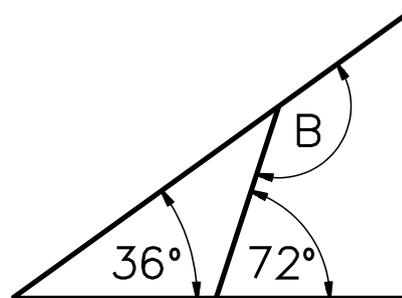
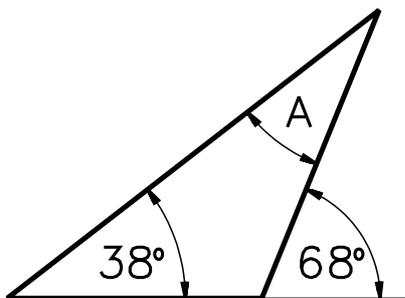
14. A pedestrian crossing is to be provided in order to facilitate students walking between the school and a library at the other side of the road, as shown in the figure. Determine the position for the crossing which will result in the shortest possible journey.



15. Write in the measure of the angles A and B in the spaces provided below.

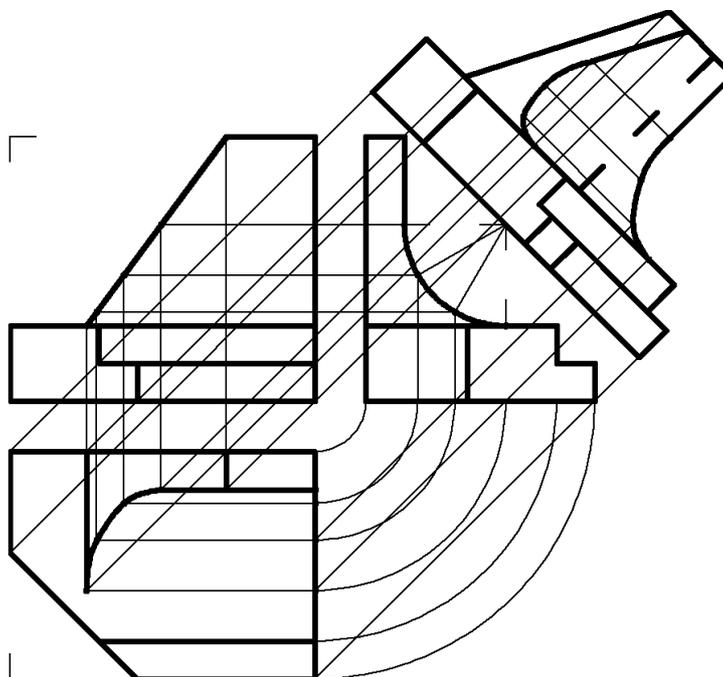
**A = 30°**

**B = 144°**



Section B

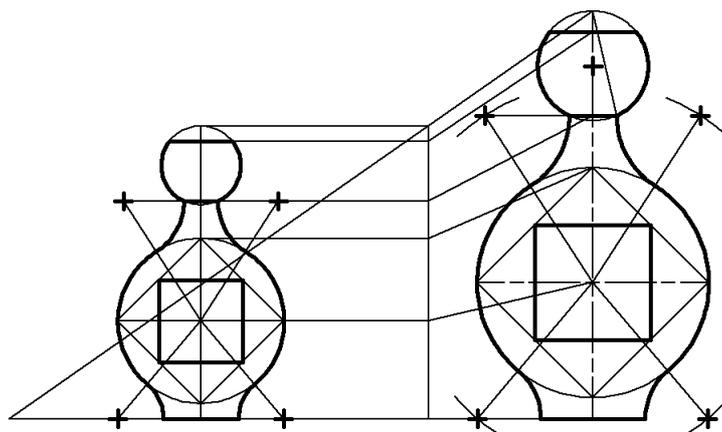
Q.1 Section B — Orthographic Projection



<b>Elevation (10)</b>	
10	Eight orthogonal lines @ 1 mark each, one sloping lines @ 2 marks.
<b>End View (11)</b>	
11	Nine orthogonal lines @ 1 mark each, two marks for curve.
<b>Plan (13)</b>	
13	Nine orthogonal lines @ 1 mark each, 4 marks for plotting & drawing curve.
<b>Auxiliary Elevation (28)</b>	
2	X1—Y1 (deduct 1 mark for incorrect angle)
2	Projections from plan (Deduct 1 mark if not perpendicular to X1—Y1)
3	Applying three key heights, taken from elevation.
13	Twelve visible edges and one hidden edge @ 1 mark each.
8	Plotting and drawing of both curves. (4 marks each).
<b>8</b>	<b>Draughtsmanship</b>

Total marks = 70

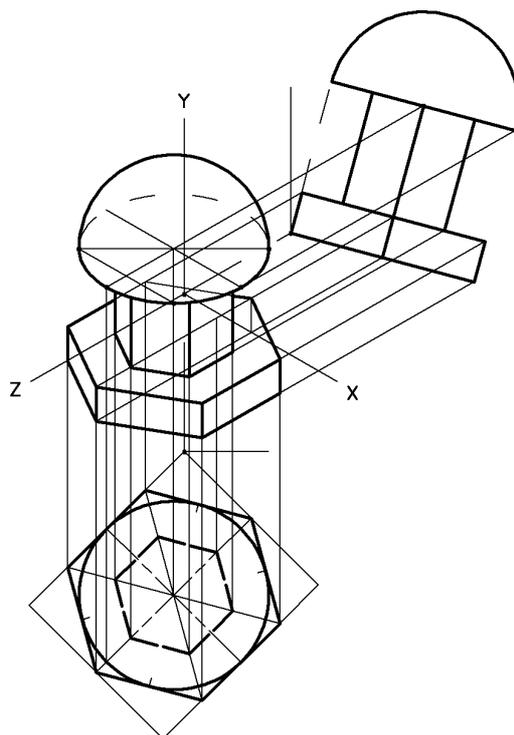
**Q.2 Section B — Circles in Contact / Similar Figures**



<b>Given Figure (35)</b>	
4	Setting up positions on centre line. (four measurements)
2	Radius 55 circle
4	Square label. (2 marks for outer square & 2 marks for inner label square)
8	Radius 30 arcs. (2 marks for locating each centre)
8	Radius 40 arcs. (2 marks for locating each centre)
4	Location of centre for top circle. (drawing and bisecting of chord).
2	Drawing of top circle.
3	Completion. (three horizontal lines)
<b>Similar Figure (27)</b>	
2	New height of 140mm.
8	Proportional division of 140mm into required parts.
8	Establishing centres for arcs using any suitable method.
9	Completion of similar figure (2,3,2,2 taken in four sections from base to top).
<b>8</b>	<b>Draughtsmanship</b>

**Total marks = 70**

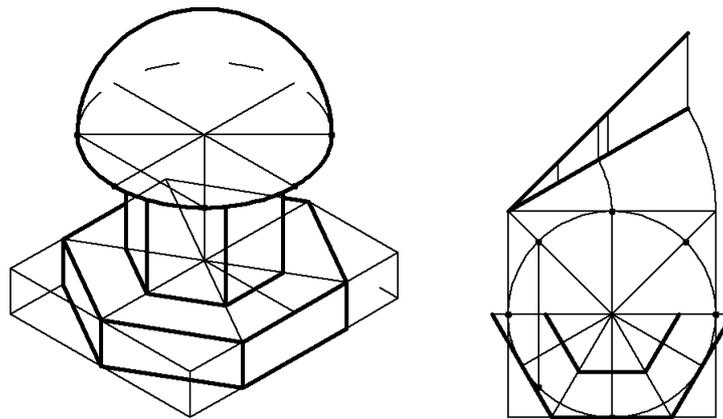
**Q.3 (a) Section B — Isometric Projection (Axonometric Axes Method)**



Axonometric Axes Method	
<b>Plan (16)</b>	
2	Setting-up (position and orientation at 45°).
14	Completion of plan (12 for lines, 2 for circle).
<b>Side Elevation (12)</b>	
2	Setting-up (position and orientation at 15°).
10	Completion of side elevation (1 mark per line, 2 marks for curve).
<b>Completion of Isometric Projection (34)</b>	
13	Base (1 mark per visible line).
7	Hexagonal column (1 mark per visible line).
6	Projection of hemi-sphere (centre 2, correct radius 2, drawing 2).
6	Location of points on base of hemi-sphere (axes end-points 4, other points 2).
2	Drawing of curve to represent base of hemi-sphere.
<b>8</b>	<b>Draughtsmanship</b>

**Total marks = 70**

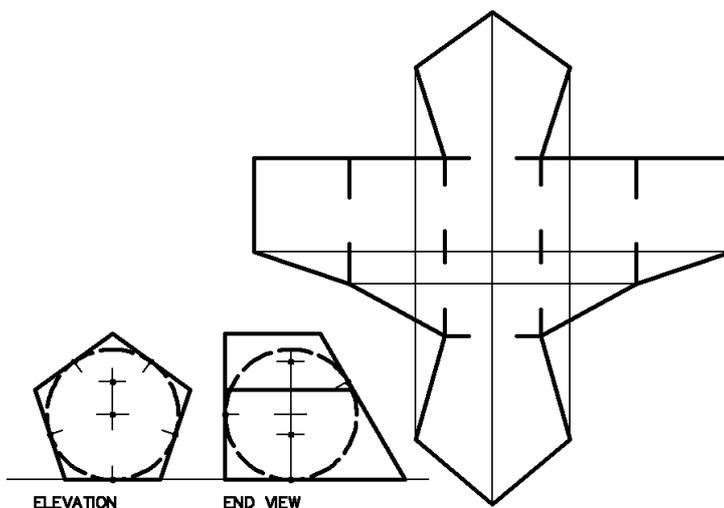
**Q.3 (b) Section B — Isometric Projection (Isometric Scale Method)**



Isometric Scale Method	
<b>Isometric Scale (12)</b>	
4	Setting up isometric scale (2 marks for 30° line and 2 marks for 45° line)
4	Applying dimensions on 45° line
4	Projecting from 45° line onto 30° line
<b>Projection of hemi-sphere and hexagonal blocks (10)</b>	
2	Drawing base circle of hemi-sphere as a separate diagram.
2	Division of base circle in order to assist in the location of points.
3	Drawing projection of hexagonal base. (Deduct 1 mark for incorrect size)
3	Drawing projection of hexagonal column. (Deduct 1 mark for incorrect size)
<b>Isometric Projection (6)</b>	
3	Direction of axes (1,1,1)
3	Axes lengths applied from isometric scale.
<b>Completion of Isometric Projection (34)</b>	
13	Base (1 mark per visible line).
7	Hexagonal column (1 mark per visible line).
6	Projection of hemi-sphere (centre 2, correct radius 2, drawing 2).
6	Location of points on base of hemi-sphere (axes end-points 4, other points 2).
2	Drawing of curve to represent base of hemi-sphere.
<b>8</b>	<b>Draughtsmanship</b>

**Total marks = 70**

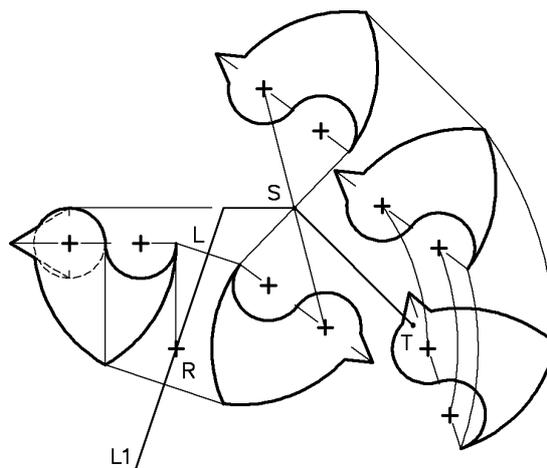
**Q.4 Section B — Development**



<b>Elevation (11)</b>	
2	Sphere in elevation
4	Construction to determine edge length of pentagon
5	Pentagonal prism in elevation
<b>End view (7)</b>	
7	End View (sphere 2, prism 5)
<b>Points of Contact (12)</b>	
12	Points of contact with all seven sides required in both projections.
<b>Development (32)</b>	
15	Five quadrilateral sides (widths 2, lengths 3, drawing 10).
5	Regular pentagonal side
7	Irregular pentagonal side (2 marks for sloping lengths, 5 marks for drawing).
3	Indicating fold lines (Use of broken lines).
2	Layout of development (Zero if all surfaces are drawn separately).
<b>8</b>	<b>Draughtsmanship</b>

**Total marks = 70**

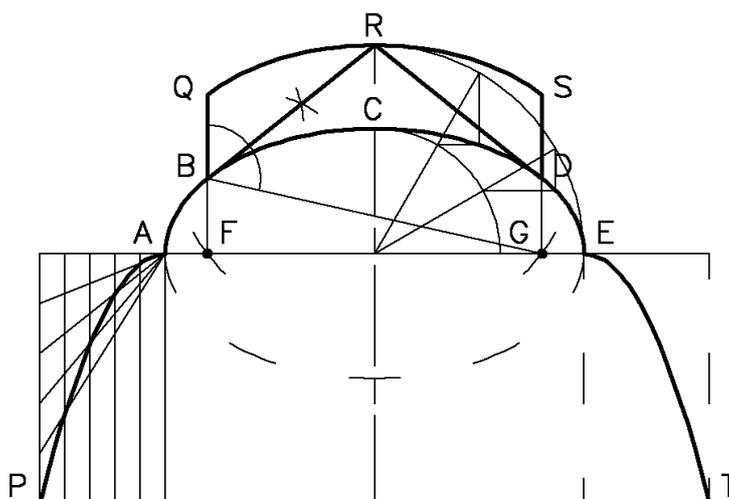
**Q.5 Section B — Transformation Geometry**



<b>Setting up (10)</b>	
6	Drawing the given figure.
4	Fixing the line L-L1 and the points R, S and T.
<b>Axial Symmetry (12)</b>	
4	Projecting perpendicular to line L-L1. (Deduct 2 marks if not perpendicular)
4	Locating key image points.
4	Drawing the image figure accurately.
<b>Central Symmetry (12)</b>	
4	Lines projected through point S.
4	Locating key image points.
4	Drawing the image figure accurately.
<b>Translation (12)</b>	
4	Lines projected parallel to ST.
4	Locating key image points.
4	Drawing the image figure accurately.
<b>Rotation (16)</b>	
4	Arcs, centre R. (Deduct 1 mark if centre R is not used).
4	Apply 35° angle of rotation. (Deduct 1 mark for an incorrect angle).
4	Locating key image points.
4	Drawing the image figure accurately.
<b>8</b>	<b>Draughtsmanship</b>

**Total marks = 70**

**Q.6 Section B — Ellipse and Parabola**



<b>Setting-up (6)</b>	
6	Setting-out five measurements and centre line position as given.
<b>Ellipse (16)</b>	
10	Locating points on the ellipse. (2,2,2,2,2 if concentric circles method is used).
6	Drawing the elliptical curve ABCDE (smooth, accurate curve required).
<b>Semi-Parabolas (14)</b>	
8	Construction to determine points on the parabola. (2,2,2,2).
6	Drawing of the semi-parabolas AP and ET. (3 marks each).
<b>Tangents BR and DR (16)</b>	
4	Location of focal point(s).
8	Construction of tangent at P.O.C. (4 marks for angle, 4 marks for bisecting).
4	Drawing of tangents BR and DR.
<b>Curve QRS (10)</b>	
6	Translation of curve BCD or similar construction.
4	Drawing of curve QRS. (smooth, accurate curve required).
8	<b>Draughtsmanship</b>

**Total marks = 70**