



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate 2018

Marking Scheme

Design and Communication Graphics

Higher Level

Note to teachers and students on the use of published marking schemes

Marking schemes published by the State Examinations Commission are not intended to be standalone documents. They are an essential resource for examiners who receive training in the correct interpretation and application of the scheme. This training involves, among other things, marking samples of student work and discussing the marks awarded, so as to clarify the correct application of the scheme. The work of examiners is subsequently monitored by Advising Examiners to ensure consistent and accurate application of the marking scheme. This process is overseen by the Chief Examiner, usually assisted by a Chief Advising Examiner. The Chief Examiner is the final authority regarding whether or not the marking scheme has been correctly applied to any piece of candidate work.

Marking schemes are working documents. While a draft marking scheme is prepared in advance of the examination, the scheme is not finalised until examiners have applied it to candidates' work and the feedback from all examiners has been collated and considered in light of the full range of responses of candidates, the overall level of difficulty of the examination and the need to maintain consistency in standards from year to year. This published document contains the finalised scheme, as it was applied to all candidates' work.

In the case of marking schemes that include model solutions or answers, it should be noted that these are not intended to be exhaustive. Variations and alternatives may also be acceptable. Examiners must consider all answers on their merits, and will have consulted with their Advising Examiners when in doubt.

Future Marking Schemes

Assumptions about future marking schemes on the basis of past schemes should be avoided. While the underlying assessment principles remain the same, the details of the marking of a particular type of question may change in the context of the contribution of that question to the overall examination in a given year. The Chief Examiner in any given year has the responsibility to determine how best to ensure the fair and accurate assessment of candidates' work and to ensure consistency in the standard of the assessment from year to year. Accordingly, aspects of the structure, detail and application of the marking scheme for a particular examination are subject to change from one year to the next without notice.



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination 2018

Design and Communication Graphics Higher Level



Marking Scheme and Sample Solutions

(Other valid solutions are acceptable and are marked accordingly)

QUESTION A-1**MARKS****(a) Completion of axonometric of bicycle shelter (14)**

- (i) Location of four points on right hand end in axonometric view 4
- (ii) Complete right hand end ... (3 lines) 3
- (iii) Complete roof structure ... (3 lines) 3
- (iv) Determine Back, Front & Top lines on inner dividers ... (1, 2, 1) 4

(b) Determination of point of impact of ball with roof in axonometric view (6)

- (v) Join **YB** in elevation (XY plane) or axonometric view 2
- (vi) Join **YB** in end view (YZ plane) or axonometric view 2
- (vii) Location of required point of impact in axonometric view 2

Total = 20
QUESTION A-2**MARKS****(a) Shortest horizontal distance between skew lines (18)**

- (i) Draw line from **A** parallel to **CD** (or **C** parallel to **AB**) in elevation 2
- (ii) Draw line from **A** parallel to **CD** (or **C** parallel to **AB**) in plan 2
- (iii) Determine plan of horizontal line on either plane..... 3
- (iv) X_1Y_1 perpendicular to horizontal line (as located) 2
- (v) Projections of **AB** and **CD** on X_1Y_1 2
- (vi) X_2Y_2 perpendicular to X_1Y_1 line 2
- (vii) Projections of **AB** and **CD** on X_2Y_2 2
- (viii) Projection of required shortest horizontal distance to plan and elevation 3

(b) Distance between SHL and Horizontal Plane (2)

- (ix) Identify distance as required 2

Total = 20

QUESTION A-3**MARKS****(a) Draw Parabolic Curve (14)**

- (i) Draw horizontal lines dividing rectangle into a number of equal parts 4
- (ii) Draw corresponding dividing lines radiating from V 4
- (iii) Locate points on parabolic curve 3
- (iv) Draw parabolic curve (Any = 2) 3

(b) Draw Support Cables (6)

- (v) Draw support cable joining P to F 2
- (vi) Construction to determine tangent at P 2
- (vii) Draw required tangent at P 1
- (viii) Draw second support cable at 25° to correct tangent as required 1

Total = 20
QUESTION A-4**MARKS****(a) Dihedral angle between planes OAB and OAD (17)**

- (i) X_1Y_1 parallel to OA 3
- (ii) Projections of planes OAB and OAD on X_1Y_1 4
- (iii) X_2Y_2 perpendicular to OA (in auxiliary view) 4
- (iv) Projections of planes OAB and OAD (edge views) on X_2Y_2 4
- (v) Indicate required dihedral angle 2

(b) Angle between lines OA and OB (3)

- (vi) Required construction to determine True Shape of triangle BOA 2
- (vii) Identification of required true angle between cables OA and OB 1

Total = 20

QUESTION B-1**MARKS****(a) Required Plan (15)**

- (i) Draw outer portion of plan as given 6
- (ii) Draw inner portion of plan as given 3
- (iii) Plan of required Spectator Point, Picture Plane and Vanishing Points(2,2,2)..... 6

Perspective Drawing of Structure (27)

- (iv) Draw Ground Line and Horizon Line 2
- (v) Establish VP_1 and VP_2 in Perspective Drawing 2
- (vi) Draw perspective of vertical edge at **A** 2
- (vii) Draw rectangular 'Front Face' in Perspective Drawing 2
- (viii) Draw base edge and locate vertical edge of end in Perspective Drawing 3
- (ix) Use of AVP to complete sloping top of surface B 7
- (x) Complete perspective of upper rectangular face 4
- (xi) Complete perspective of upper end face 4
- (xii) Complete Perspective Drawing of structure(removal of inner detail)..... 1

(b) Perspective of Chimney Stack (2)

- (xiii) Project and use height to establish perspective of Chimney Stack 2

(c) Angle of Elevation (1)

- (xiv) Determine the required angle of elevation 1

Total = 45

QUESTION B-2**MARKS****(a) Development of surfaces 1, 2, 3, 4 and 5 (5)**

- (i) Draw five required surfaces attached as shown in 'Development View' 5

(b) Orthographic of Surfaces 1-5 (8)

- (ii) Elevation of required 'cuboid' in 'orthographic view' 2
- (iii) End View of required 'cuboid' (in correct relative position) 3
- (iv) Plan of required 'cuboid' (in correct relative position) 3

(c) Surfaces 6, 7, 8 and 9 in Development and Orthographic views (23)

- (v) Draw surfaces 6 and 7 in development view 4
- (vi) Draw surfaces 8 and 9 in development view 2
- (vii) Locate edge through 'e' in end view, elevation and plan (2,1,1) 4
- (viii) Use of length 'L' to locate point 'h' (and mirror image) in elevation 2
- (ix) Draw straight line sloping edges on surfaces 6 and 7 in end view and plan 3
- (x) Locate point 'h' in end view and plan 2
- (xi) Determine intermediate point on curves in end view and plan 3
- (xii) Draw curves in end view and plan (any = 2)..... 3

(d) Drawing 'handle surfaces' in elevation, end view and plan (9)

- (xiii) Draw top curve in elevation 1
- (xiv) Complete outline of surfaces 10 and 11 in development view 3
- (xv) Draw 'handle opening' in elevation and in development view ...(1,2) 3
- (xvi) Complete orthographic projection (incl. hidden detail) 1
- (xvii) Complete development view (incl. fold lines) 1

Total = 45

QUESTION B-3**MARKS****(a) Plan and Elevation of planes ABC and ABDE (10)**

- (i) Use given coordinates to draw projections of ABC 6
- (ii) Use given coordinates to draw projections of ABDE 4

(b) Dihedral Angle (16)

- (iii) X_1Y_1 parallel to line of intersection AB 3
- (iv) Projection of planes and line of intersection on new X_1Y_1 3
- (v) New X_2Y_2 perpendicular to line of intersection AB 5
- (vi) Projection of ABC and ABDE as lines and indicating dihedral angle 5

(c) Projections of AEFG and ACG (13)

- (vii) Locate point **G** in elevation and plan 2
- (viii) Construction to determine true length between **G** and **B** 4
- (ix) Draw projections of surface ACG (incl. hidden detail) 3
- (x) Use 'parallel information' to draw projections of surface AEFG 4

(d) Projections of 55mm Horizontal line from C and angle with VP (6)

- (xi) Draw (and use) horizontal section through C in elevation 2
- (xii) Draw plan of horizontal section (identified at (xi)) on **AEFG** 1
- (xiii) Drawing 55mm arc with centre C, to locate 'h' in plan 1
- (xiv) Draw line '**Ch**' in plan and elevation 1
- (xv) Drawing and indicating required angle 1

Total = 45

QUESTION C-1**MARKS****(a) Earthworks on Northern side of motorway (31)*****Earthworks between A and B (Level) - Embankment***

- (i) Draw parallel lines at 10mm intervals 3
- (ii) Identify intersections with contours and draw curve(4×1) 4

Earthworks between B and C (Level, Vertical Edge) - Cutting

- (iii) Draw parallel lines at 7.5mm intervals..... 2
- (iv) Identify intersections with contours and draw curve 2

Earthworks between B and C (Level, Horizontal Edge) - Cutting

- (v) Draw parallel lines at 7.5mm intervals..... 2
- (vi) Draw curve 2

Earthworks between B and C (Level, Sloping Edge) - Cutting

- (vii) Draw parallel lines at 7.5mm intervals..... 2
- (viii) Draw curve 2

Earthworks between C and D - Cutting

- (ix) Draw required 7.5mm arc at C and draw tangent 2
- (x) Draw parallel lines at 7.5mm intervals..... 2
- (xi) Identify endpoints and draw curve 2

Earthworks between C and D - Embankment

- (xii) Draw required 10mm arc at correct position between C & D and draw tangent 2
- (xiii) Draw parallel lines at 10mm intervals 2
- (xiv) Identify intersections with contours and draw curve 2

(b) Strike and Dip of stratum and Borehole from R (13)

- (xv) Establish points on top surface in elevation and draw required triangle 5
- (xvi) Draw required triangle in plan and establish Strike Line, S 3
- (xvii) Establish required Dip 3
- (xviii) Determine and indicate length of required shortest borehole from R 2

(c) Line of intersection between stratum and widened toll plaza (1)

- (xix) Draw required line of intersection (incl. req. construction) 1

Total = 45

QUESTION C-2**MARKS****(a) Plan and elevation of hyperbolic paraboloid ABCD and walkway (13)**

- (i) Draw **ABCD** in plan and elevation 6
- (ii) Draw straight line elements in plan and elevation (incl. correct divisions) 4
- (iii) Draw roadway edges in plan and elevation 3

(b) Elevation of Parabola (9)

- (iv) Establish required rectangular outline for curve ABC..... 2
- (v) Construction to locate points on required parabola..... 4
- (vi) Draw parabolic curve (Any = 1) 3

(c) Plan and End View of outline loop (16)

- (vii) Extend elements to parabola in elevation 2
- (viii) Determine points on curve in plan..... 4
- (ix) Draw outline loop in plan(Any = 1) 3
- (x) Determine points on curve (outline loop) in end view 3
- (xi) Draw curve in end view(Any = 1) 3
- (xii) Draw walkway in end view 1

(d) Determine focal point and directrix of parabola (7)

- (xiii) Draw 'normal' CE in elevation 2
- (xiv) Construction to determine required focal point..... 3
- (xv) Construction to determine required directrix..... 2

Total = 45

QUESTION C-3**MARKS****(a) Projections of left hand terrarium and dihedral angle between A and B (24)**

- (i) Draw plan as given 4
- (ii) Draw elevation as given 6
- (iii) X_1Y_1 parallel to line of intersection 3
- (iv) Projection of planes and line of intersection on new X_1Y_1 3
- (v) New X_2Y_2 perpendicular to line of intersection 4
- (vi) Projection of surfaces **A** and **B** as lines and indicating dihedral angle..... 4

(b) Development of Surface C (3)

- (vii) Construction to determine true shape 1
- (viii) Draw required development 2

(c) Projections of right hand terrarium (15)

- (ix) Draw outer hexagon and diagonals in plan 4
- (x) Draw equilateral triangular base to complete plan 3
- (xi) Use of semi-circle to determine orientation of cube in elevation 4
- (xii) Complete elevation of terrarium 4

(d) Inclination and True Shape of surface D (3)

- (xiii) X_1Y_1 inclined at 60° as shown 1
- (xiv) Edge view of surface D to determine inclination to HP 1
- (xv) Construction to determine true shape of surface D 1

Total = 45

QUESTION C-4**MARKS****(a) Locus of P (24)**

- | | |
|---|---|
| (i) Draw lines OA, CB and AB (incl. point P) as required..... | 5 |
| (ii) Division of circle (centre O) into equal parts (min. 12) | 3 |
| (iii) Draw circular arc about C (locus of B) | 2 |
| (iv) Determine link AB in all positions | 6 |
| (v) Locate midpoint of AB in all positions | 3 |
| (vi) Draw required locus ...(any = 1) | 3 |
| (vii) Construction to determine maximum rotation angle of link CB | 2 |

(b) Archimedean Spiral/helix (21)

- | | |
|--|---|
| (viii) Draw circular plan of inverted cone | 2 |
| (ix) Division into 12 equal parts..... | 2 |
| (x) Division of radius into corresponding parts | 3 |
| (xi) Locate points and draw spiral | 3 |
| (xii) Draw elevation of inverted cone..... | 2 |
| (xiii) Division into corresponding number of equal parts | 3 |
| (xiv) Locate points and draw helix | 3 |
| (xv) Development of quarter of cone between A and B | 1 |
| (xvi) Draw true shape of curve between A and B | 2 |

Total = 45

QUESTION C-5**MARKS****(a) Sectional Elevation (42)*****Assembly (6)***

(i) Relative positioning of components 6

Main Bracket (10)

(ii) Outline of bracket 3

(iii) Cylindrical details on top and bottom 4

(iv) Inner detail (fillets, shell and holes) 3

Glass Globe (3)

(v) Outline of globe 2

(vi) Inner detail 1

Globe Retaining Ring (2)

(vii) Retaining Ring 2

Top Swivel Mount (5)

(viii) Cylindrical portion 2

(ix) Rectangular portion (flanges) 2

(x) Cylindrical hole for pin 1

Swivel Arm (5)

(xi) Outline of Swivel Arm 3

(xii) Inner detail 2

Sliding Arm (3)

(xiii) Square portion 1

(xiv) Upper cylindrical portion and connecting 'bar' 2

Upper Camera Mount (4)

(xv) Upper rectangle in horizontal position 2

(xvi) Tangents and holes 2

Drawing Completion (4)

(xvii) Presentation, hatching and centrelines 4

(b) Distance between parts 7 and 2 (3)

(xviii) Determine and indicate required vertical distance 1

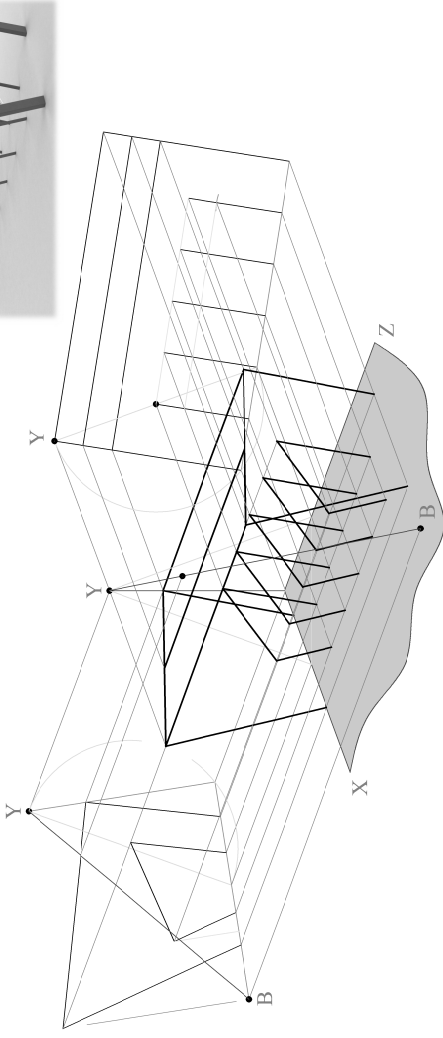
(xix) Adherence to drawing convention for dimensioning as required 2

Total = 45

SECTION A - Core - Answer any three of the questions on this A3 sheet.

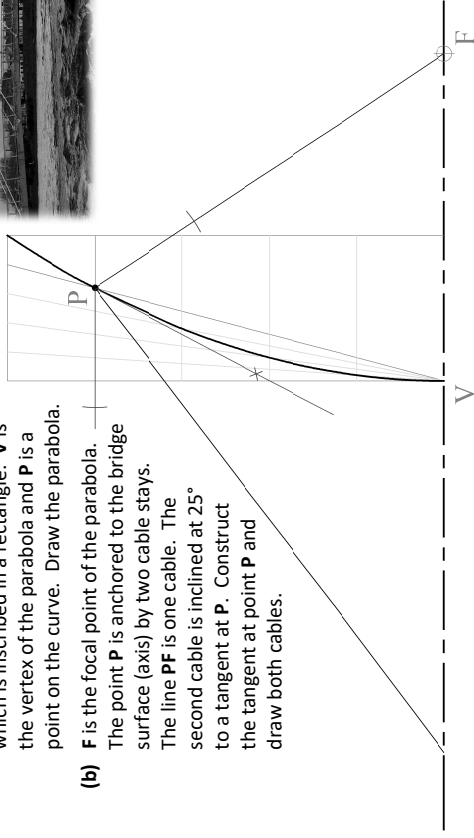
A-1. The 3D graphic shows a bicycle shelter. The drawing shows an incomplete dimetric projection of a similar shelter using the axonometric axes method. The horizontal plane is also included.

- Complete the axonometric projection of the bike shelter.
- A line joining **Y** to **B** represents the straight line path of a ball. Show the point of impact of the ball with the glass roof in the axonometric view.



A-3. The image on the right shows the *Salmon Weir Bridge* over the river Moy in Co. Mayo. The drawing below shows the incomplete elevation of the bridge.

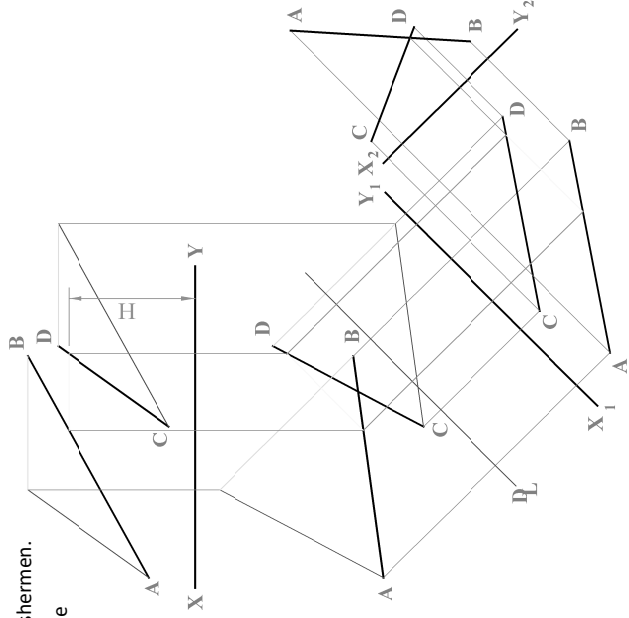
- The curved support pillar is based on a parabola which is inscribed in a rectangle. **V** is the vertex of the parabola and **P** is a point on the curve. Draw the parabola.
- F** is the focal point of the parabola. The point **P** is anchored to the bridge surface (axis) by two cable stays. The line **PF** is one cable. The second cable is inclined at 25° to a tangent at point **P**. Construct the tangent at point **P** and draw both cables.



A-2. The graphic below shows a group of fishermen.

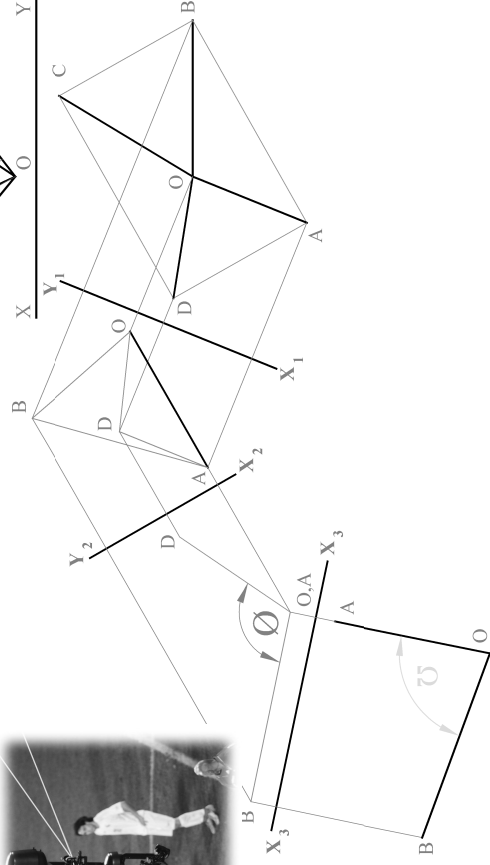
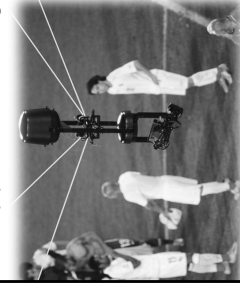
Two fishing rods are represented by the skew lines **AB** and **CD** on the right.

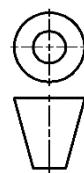
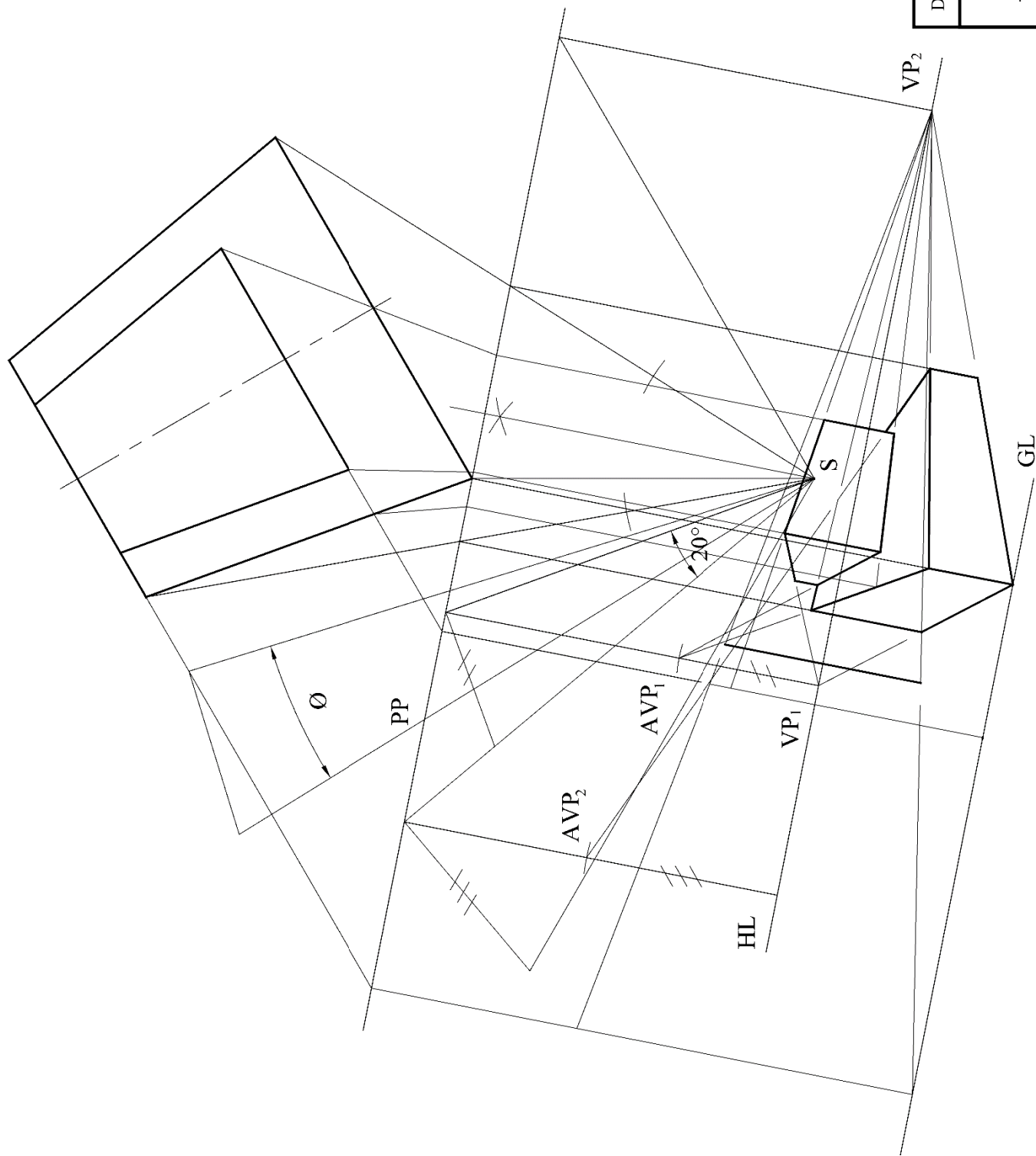
- Determine the projections of the shortest horizontal line between the two skew lines.
- Determine, and indicate the distance from this line to the horizontal plane.

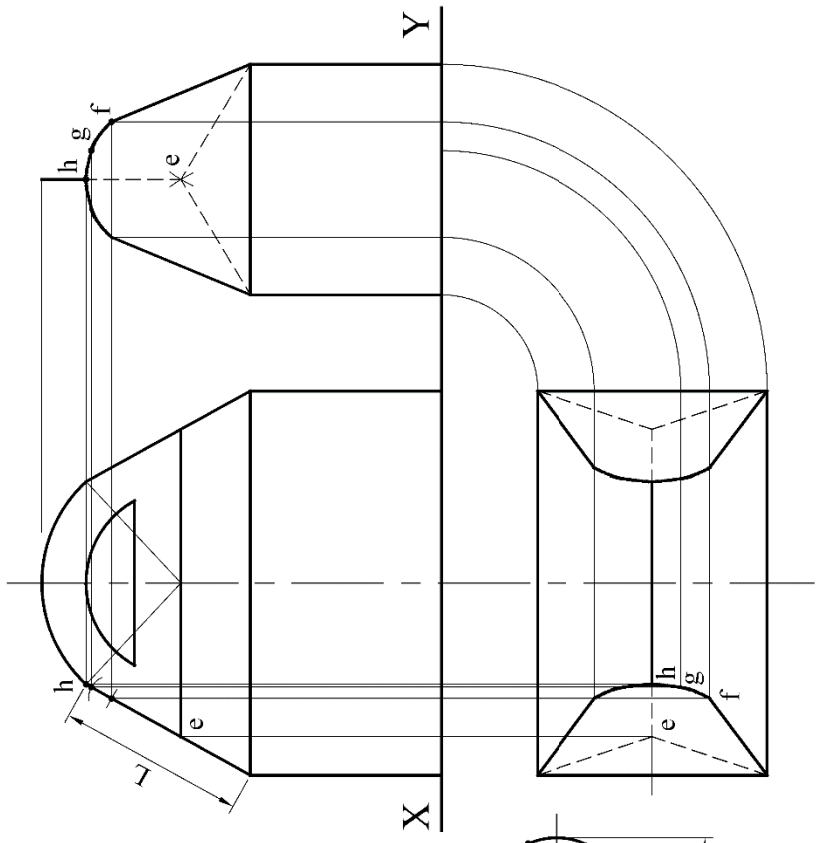
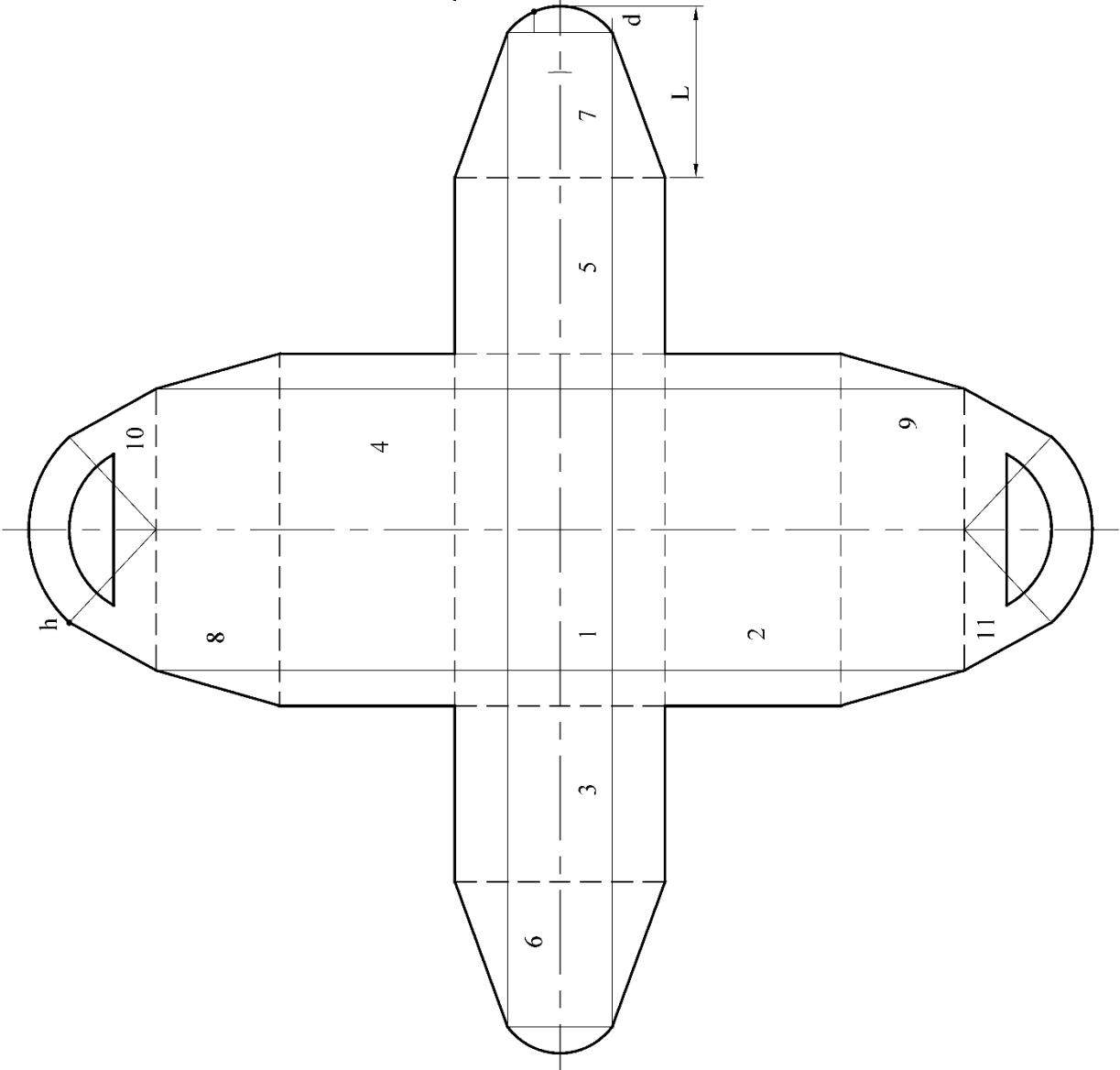


A-4. The graphic shows a 'spidercam' used for aerial coverage of sports events. It is supported by four cables. The drawing shows the projections of the cables.

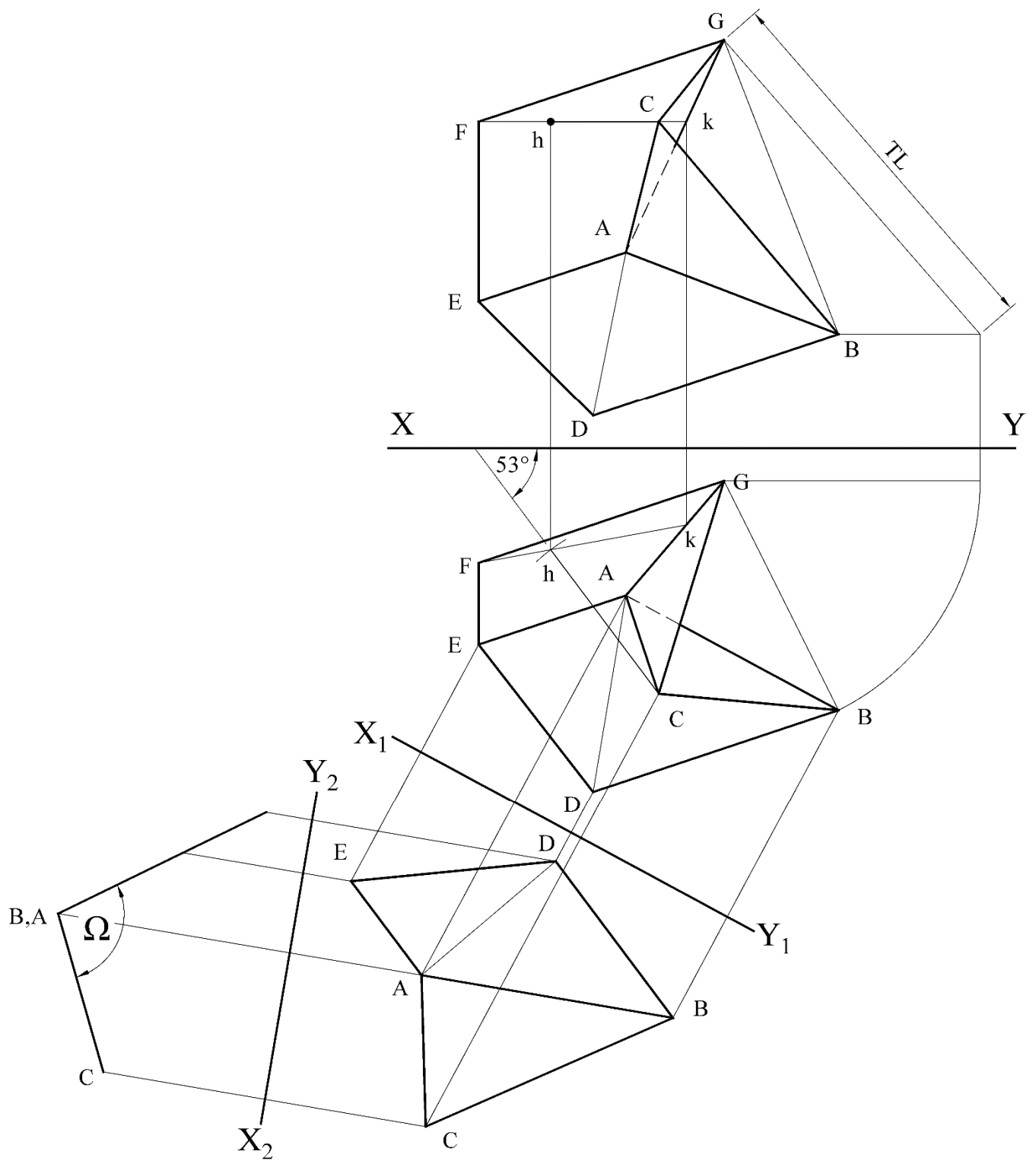
- Find the dihedral angle between the planes **OAB** and **OAD**.
- Determine the angle between the cables **OA** and **OB**.



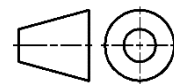




Design & Communication Graphics – Higher Level	
Marking Scheme	
Question B-2	
Scale: n/a	June 2018



Design & Communication Graphics – Higher Level

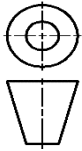


Marking Scheme

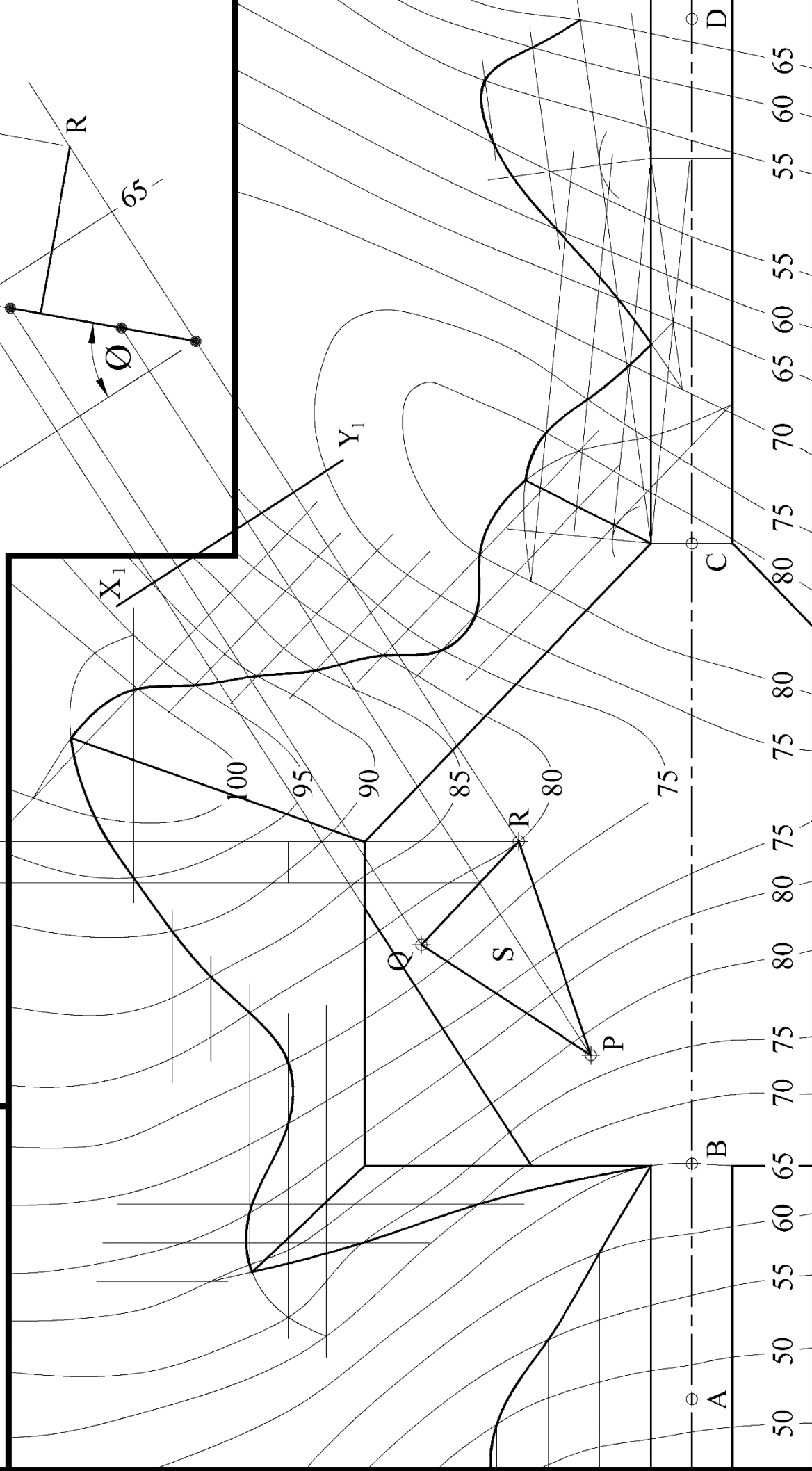
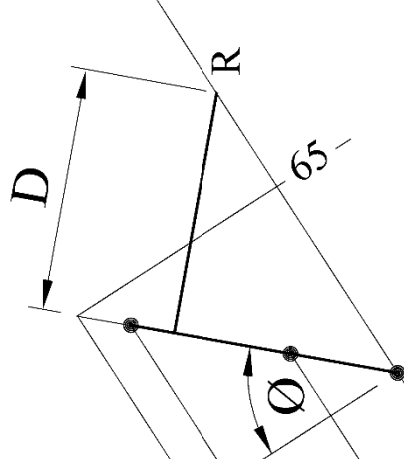
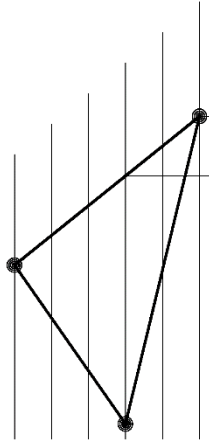
Question B-3

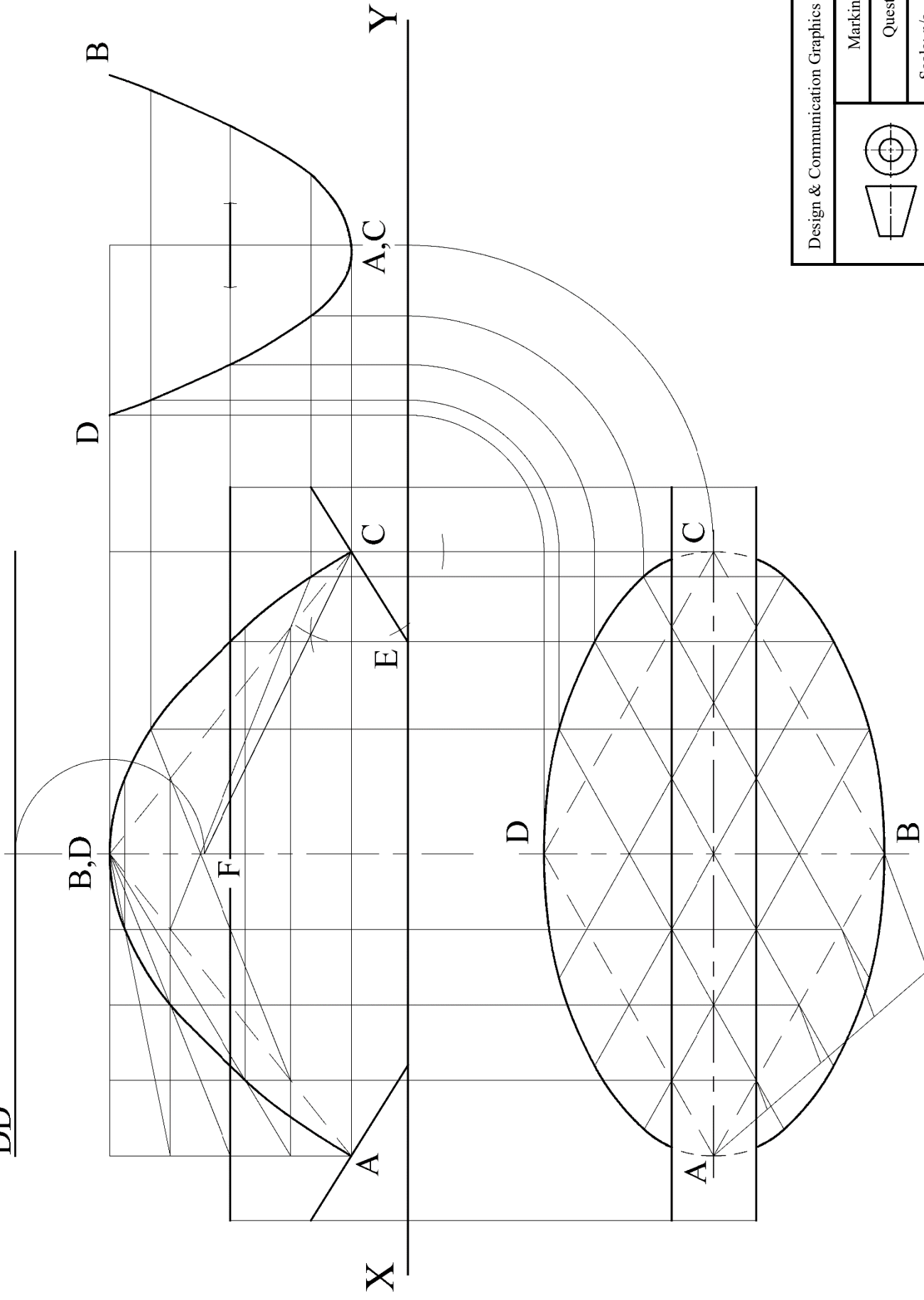
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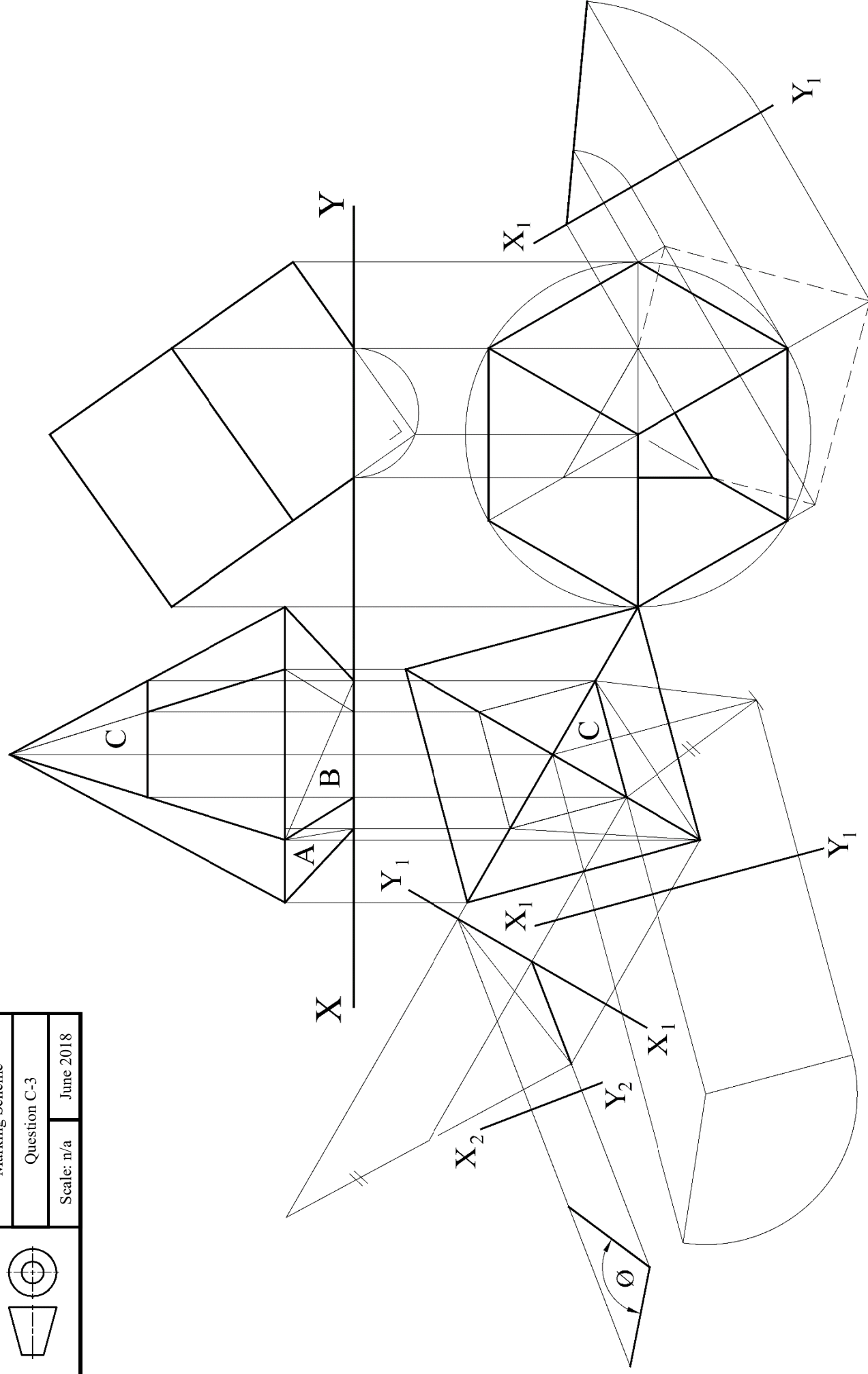
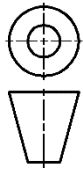
June 2018



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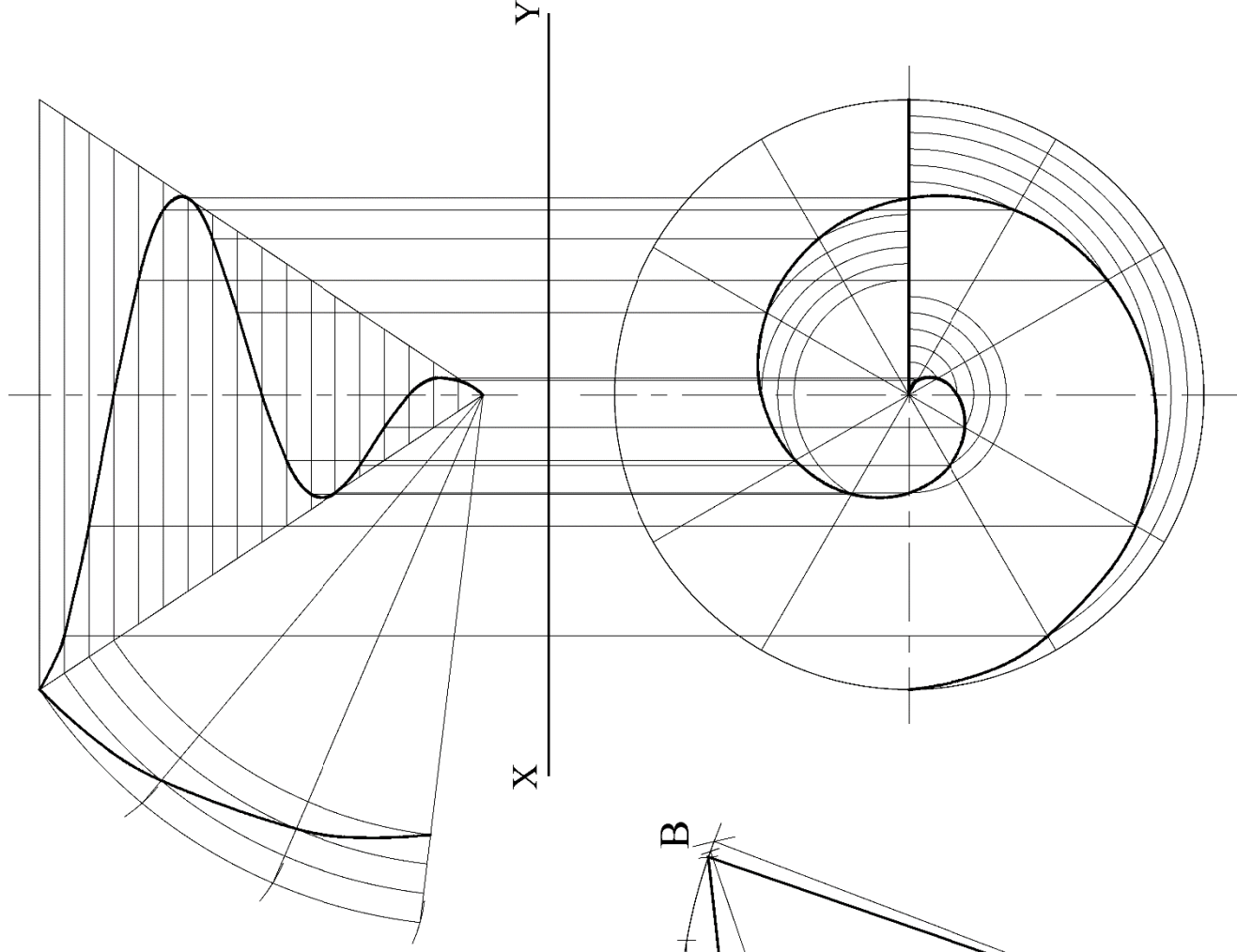
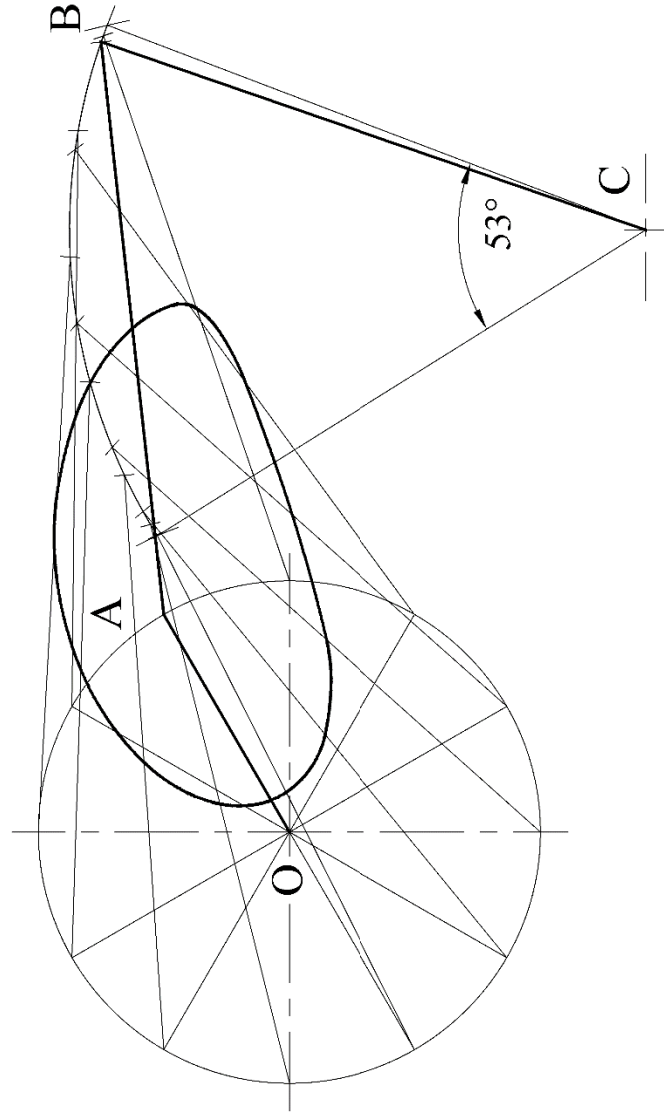


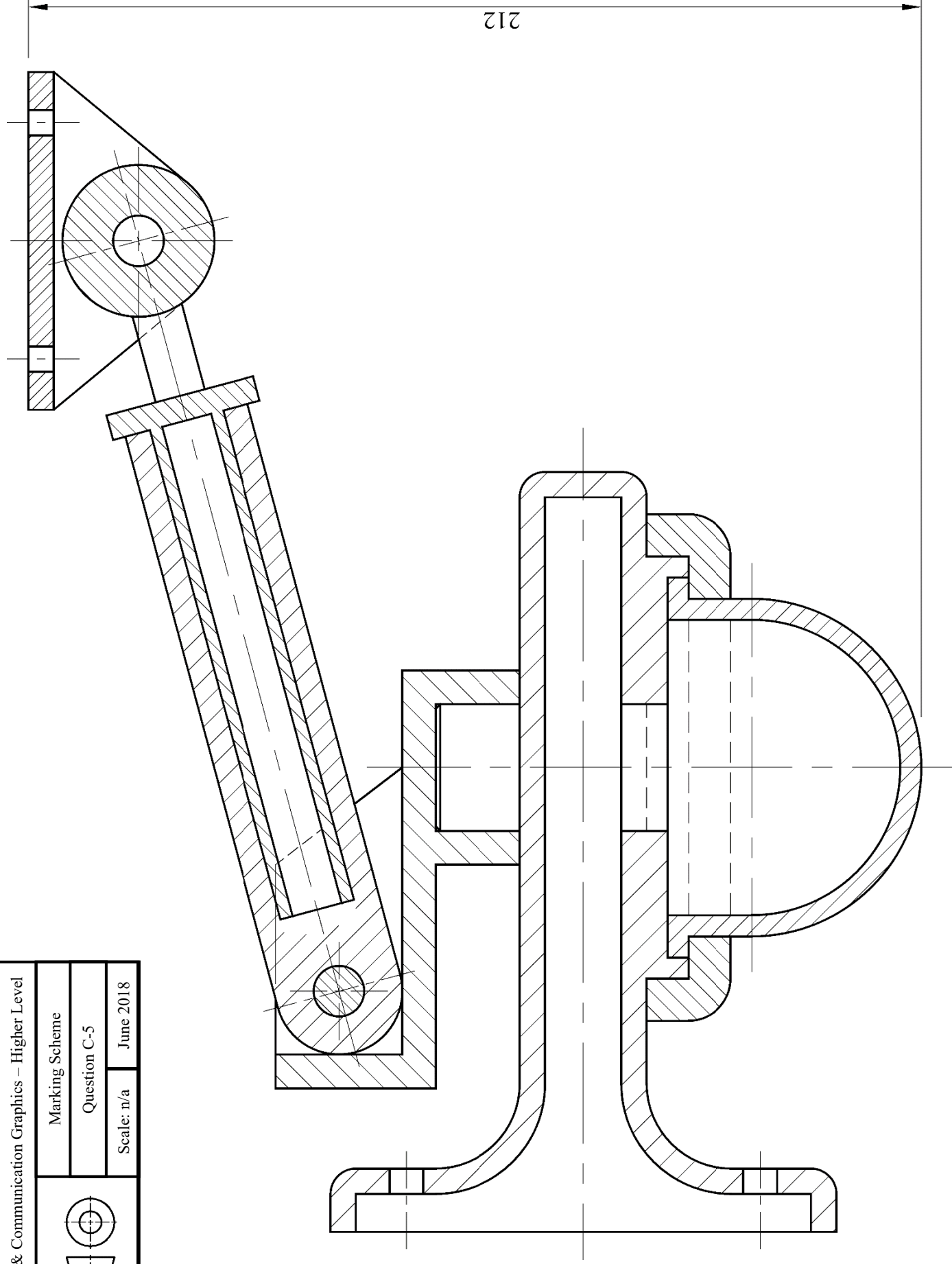
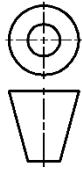


Marking Scheme

Question C-4

Scale: n/a June 2018





Design and Communication Graphics

Student Assignment - Higher Level

Assessment Sheet 2018

Candidate Exam No.

Output	Marking criteria	Marks
1	Design Research - Exploration of main design features using primary & secondary research; Selection of appropriate graphics; Effective layout and presentation of information combining images, sketches & annotations	
	a) Extensive range of relevant criteria considered - excellent presentation	13 - 15
	b) Most relevant criteria considered - very good presentation	10 - 12
	c) Some relevant criteria considered - good presentation	7 - 9
	d) Limited criteria considered - fair presentation	4 - 6
	e) At least one criterion considered - poor presentation	0 - 3
2	Design Feature Comparison - Selection of two appropriate images; Main dimensions inserted; Comparison of main design features; Contrasting of main design features; Effective layout and presentation of information combining images, sketches & annotations	
	a) Extensive range of relevant criteria considered - excellent presentation	13 - 15
	b) Most relevant criteria considered - very good presentation	10 - 12
	c) Some relevant criteria considered - good presentation	7 - 9
	d) Limited criteria considered - fair presentation	4 - 6
	e) At least one criterion considered - poor presentation	0 - 3
3	Freehand Graphical Representation – Proportion; Form/Volume; Use of Tone/Line for effective rendering; Detailed communication of main design features to include 3D presentation quality drawing; Layout & presentation	
	a) Extensive range of relevant criteria considered - excellent presentation	17 - 20
	b) Most relevant criteria considered - very good presentation	13 - 16
	c) Some relevant criteria considered - good presentation	9 - 12
	d) Limited criteria considered - fair presentation	5 - 8
	e) At least one criterion considered - poor presentation	0 - 4
4	SolidWorks Parts, Assembly, Drawing and eDrawing files	
	• Adherence to required filing structure	4
	• Creation of a minimum of 5 Part files	2
	• Part models – Proficiency in Parametric CAD, including economy of design and design intent; Selection of most appropriate profiles; Sketches fully defined; Features renamed; Appropriate type of extrusions/end conditions used	10
	• Assembly – Creation of Assembly environment; Accuracy of parts to facilitate correct assembly; Correct mating of parts; Application of appropriate appearances	5
	• Factor of difficulty	5
5	• eDrawing of CAD model	2
	Hardcopy outputs from SolidWorks - Detailed orthographic views of the selected artefact; Section/Detail views where appropriate; Rendered pictorial view of the Assembly; Exploded view of the CAD model; Inclusion of main dimensions, notes and symbols; Appropriate scaling, layout and presentation to be considered	
	a) Extensive range of relevant criteria considered - excellent presentation	13 - 15
	b) Most relevant criteria considered - very good presentation	10 - 12
	c) Some relevant criteria considered - good presentation	7 - 9
	d) Limited criteria considered - fair presentation	4 - 6
	e) At least one criterion considered - poor presentation	0 - 3
6	Photorealistic Representation	
	Produce photorealistic computer generated images of the artefact	7
7	Graphical exploration of design solutions - Exploration of theme/possible solution(s); Justification of chosen solution(s); Use of appropriate images/graphics; Effective layout and presentation of information combining images, sketches & annotations	
	a) Extensive range of relevant criteria considered - excellent presentation	21 - 25
	b) Most relevant criteria considered - very good presentation	16 - 20
	c) Some relevant criteria considered - good presentation	11 - 15
	d) Limited criteria considered - fair presentation	6 - 10
	e) At least one criterion considered - poor presentation	0 - 5
8	Presentation of Modification/Concept Design – Proportion; Form/Volume; Use of Tone/Line for effective rendering; Detailed communication of modified/concept design features; Layout and presentation	
	a) Extensive range of relevant criteria considered - excellent presentation	9 - 10
	b) Most relevant criteria considered - very good presentation	7 - 8
	c) Some relevant criteria considered - good presentation	5 - 6
	d) Limited criteria considered - fair presentation	3 - 4
	e) At least one criterion considered - poor presentation	0 - 2
9	Hardcopy outputs from SolidWorks – CAD Model; Detailed orthographic views of the proposed solution; Section/Detail views where appropriate; Rendered pictorial view of the CAD model; Photorealistic image; Inclusion of main dimensions, notes and symbols; Appropriate scaling, layout and presentation to be considered	
	• Application of CAD skills	5
	a) Extensive range of relevant criteria considered - excellent presentation	17 - 20
	b) Most relevant criteria considered - very good presentation	13 - 16
	c) Some relevant criteria considered - good presentation	9 - 12
	d) Limited criteria considered - fair presentation	5 - 8
	e) At least one criterion considered - poor presentation	0 - 4
Sub-total	Marks deducted for pages in excess of maximum	Total

5 marks Factor of Difficulty of Model
15 Marks Hardcopy Outputs

