Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate 2020

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 2020

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 Dimetric Projection ***(16)***

(i) Determination of required vertical surfaces of square prism **4**

(ii) Location of points **'e'** and **'f'** **2**

(iii) Complete surface 'abfe' **3**

(iv) Location of points **'g'** and **'h'** **2**

(v) Complete surface 'bchgf' **3**

(vi) Complete top surface of square prism **2**

(b) Determination of true angle between surface 'abcd' and the H.P. ***(4)***

(vii) Determination and indication of required angle.....**4**

Total = 20

QUESTION A-2

MARKS

(a) Completion of elevation of drawing board and set squares ***(16)***

(i) Projection of points to elevation **2**

(ii) Completion of elevation of drawing board **2**

(iii) Location of 3 remaining lines of 30°/60° set square in elevation **4**

(iv) Location of 3 lines of 'outer triangle' of 45° set square in elevation **4**

(v) Location of 3 lines of 'inner triangle' of 45° set square in elevation **4**

(b) Determination of projections of required line ***(4)***

(vi) Draw projections of line inclined at 45° to bottom edge of board.....**2**

(vii) Draw correct required line in elevation and plan **2**

Total = 20

QUESTION A-3

MARKS

(a) Construction of Parabola *(16)*

(i) Location of axis **2**

(ii) Location of vertex **3**

(iii) Locate points below latus rectum **6**

(iv) Locate points above latus rectum **2**

(v) Draw curve **3**

(b) Normal *(4)*

(vi) Required construction and draw normal ... (2, 2) **4**

Total = ***20***

QUESTION A-4

MARKS

(a) Shortest horizontal distance between skew lines *(17)*

(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 **2**

(v) Projections of AB and CD on X_1Y_1 ..... **2**

(vi) X_2Y_2 perpendicular to X_1Y_1 line **1**

(vii) Projections of AB and CD on X_2Y_2 ..... **2**

(viii) Projections of required shortest horizontal distance to plan and elevation **3**

(b) True Length of AC *(3)*

(ix) Construction to determine true length of line AC **3**

Total = ***20***

QUESTION B-1

MARKS

(a) End View, Plan and Elevation *(20)*

(i) Draw required end view **5**

(ii) Draw required plan **7**

(iii) Draw required elevation **8**

(b) Plan and Elevation of Triangular Logo *(14)*

(iv) Draw plan as given **3**

(v) Determine the elevation of points r, s and t **3**

(vi) Determine the elevation of the 4 required 'cross-over' points **4**

(vii) Completion of elevation of triangular logo (incl. hidden detail) **4**

(c) Surface Development of Prism *(11)*

(viii) Draw development of surfaces **A**, **B** and **C** **3**

(ix) Draw development of the remaining rectangular surfaces **3**

(x) Draw development of pentagonal sides **2**

(xi) Draw development of label **3**

Total = 45

QUESTION B-2

MARKS

(a) Elevation and Plan of intersecting planes ABC and ABD *(8)*

(i) Use given coordinates to draw elevation (connecting 4 correct points) **3**

(ii) Draw the plan of planes ABC and ABD **5**

(b) Dihedral Angle *(12)*

(iii) New 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) Additional X_2Y_2 perpendicular to line of intersection AB **3**

(vi) Projection of ABC and ABD as lines and indicating dihedral angle.....**3**

(c) Inclination of ABC to horizontal plane and True Shape of ABC *(14)*

(vii) Projections of required horizontal line on ABC … (2,1,2).....**5**

(viii) X_1Y_1 perpendicular to plan of correct horizontal line **2**

(ix) Projection of plane ABC to auxiliary view and indication of true inclination **3**

(x) Determine true shape of ABC **4**

(d) Plan of point E and completion of projections *(11)*

(xi) Draw elevation of plane ADE **3**

(xii) New X_1Y_1 parallel to line of intersection AD **2**

(xiii) Projection of plane ABD on new X_1Y_1 .....**2**

(xiv) Additional X_2Y_2 perpendicular to line of intersection AD **1**

(xv) Projection of ABD as edge view and drawing of dihedral angle at 165° **2**

(xvi) Completion of plan **1**

Total = 45

QUESTION B-3

MARKS

(a) Perspective of Structure (40)

(i) Draw the given plan of structure **8**

(ii) Position spectator and plan of picture plane (1, 2) **3**

(iii) Plan of vanishing points **2**

(iv) Ground line, horizon line, vanishing points in elevation (1, 1, 2) **4**

(v) Projection lines from plan to spectator **2**

(vi) Perspective of base lines of structure .... (2x2) **4**

(vii) Measure and apply height of top vertex of pyramid **4**

(viii) Complete outline of pyramid **3**

(ix) Perspective of inclined lines on pyramid **4**

(x) Perspective of horizontal lines on pyramid **6**

(b) Perspective of Flag (5)

(xi) Draw plan of vertical pole of flag in required position..... **1**

(xii) Perspective of vertical pole of flag **2**

(xiii) Perspective of inclined sides of flag **2**

Total = 45

QUESTION C-1

MARKS

(a) Earthworks for Putting Green and Fairway *(21)*

Earthworks for Putting Green (Level) - Embankment

(i) Draw parallel arcs at 7.5mm intervals **3**

(ii) Identify intersections with contours and draw curves **2**

Earthworks between A and B (Level) - Cutting

(iii) Draw parallel lines at 10mm intervals **3**

(iv) Identify intersections with contours and draw curves **4**

Earthworks between B and C (rising embankment)

(v) Draw required 7.5mm arc at correct position and draw tangent **4**

(vi) Draw parallel lines at 7.5mm intervals **2**

(vii) Identify intersections with contours and draw curve **3**

(b) Parabolic Fight Path *(12)*

(viii) Establish highest point of ball on flight path **2**

(ix) Construction to determine points on parabola **5**

(x) Draw parabola **3**

(xi) Determine impact point **2**

(c) Strike, dip and thickness of stratum *(12)*

(xii) Determine strike of stratum **3**

(xiii) X_1Y_1 line perpendicular to 'strike' **2**

(xiv) Establish required dip and thickness **7**

Total = 45

QUESTION C-2

MARKS

(a) Draw required projections of hyperboloid of revolution structure *(29)*

(i) Draw elevation and plan of 'bottom' cone **4**

(ii) Location of 'throat' circle in plan and elevation **4**

(iii) Location of asymptotes **2**

(iv) Construction to determine points on one branch of hyperbola in elevation **8**

(v) Determination of points on second branch in elevation **4**

(vi) Draw hyperbolic curves …. (Any = 1) **3**

(vii) Draw elevation and plan of two 'top' cones **4**

(b) Focal Points and Directrices *(6)*

(viii) Construction to determine required focal points **3**

(ix) Construction to determine required directrices **3**

(c) Projections of shortest line from S to PQ *(10)*

(x) Elevation and plan of line PQ **4**

(xi) Construction to determine the length of the required shortest distance **4**

(xii) Determine required shortest distance **2**

Total = 45

QUESTION C-3

MARKS

(a) End View, Plan and Elevation *(18)*

(i) Draw end view as given **4**

(ii) Draw plan as given **8**

(iii) Draw elevation as given **6**

(b) Dihedral angle between surfaces A and B *(12)*

(iv) X_1Y_1 parallel to line of intersection **3**

(v) Projection of surfaces A and B and line of intersection on new X_1Y_1 ..... **3**

(vi) New X_2Y_2 perpendicular to line of intersection **3**

(vii) Projection of surfaces as lines and indicating dihedral angle **3**

(c) Development of Surfaces A, B and C *(7)*

(viii) Correct construction to determine true shape of surface **C** **2**

(ix) Correct construction to determine true shape of oblique surface **B** **3**

(x) Correct construction to determine true shape of oblique surface **A** **2**

(d) Determine the projections of the hands of the watch on surface C *(8)*

(xi) Correct projections of hands on surface **C** **2**

(xii) Elevation of hands **3**

(xiii) Plan of hands **3**

Total = 45

QUESTION C-4

MARKS

(a) Can Profile and Displacement Diagram *(23)*

(i) Draw camshaft and two circular arcs **3**

(ii) Divide circle into 12 equal parts **2**

(iii) Horizontal divisions at 12mm as required on displacement diagram **2**

(iv) Transfer of heights to displacement diagram **2**

(v) Establish height at 90° interval and draw 'Rise' curve **3**

(vi) Draw correct horizontal 'Dwell' line **1**

(vii) Construction to determine S.H.M. (min. 7 incl. end points) **5**

(viii) Draw SHM curve … (any = 1) **2**

(ix) Complete cam profile **3**

(b) Locus of point T *(22)*

(x) Draw given outline of digger and line AB **8**

(xi) Divide wheel into 30° intervals **2**

(xii) Corresponding divisions stepped horizontally **3**

(xiii) Locate points on locus **6**

(xiv) Draw required locus … (any = 1) **3**

Total = 45

QUESTION C-5

MARKS

(a) Sectional Elevation ***(45)***

Assembly (7)

(i) Relative positioning of components.....**7**

Lower Bracket (6)

(ii) Outline **4**

(iii) Tangential portion.....**2**

Top Bracket (6)

(iv) Outline.....**3**

(v) Curves **2**

(vi) Cylindrical bar **1**

Swivel Mount (6)

(vii) Outline of Swivel Mount **4**

(viii) Inner Detail **2**

Swivel Arm and Swivel Arm Spindle (6)

(ix) Draw required outline of Swivel Arm **3**

(x) Inner Detail of Swivel Arm.....**2**

(xi) Swivel Arm Spindle.....**1**

Phone Holder Body (6)

(xii) Outline of Phone Holder Body **4**

(xiii) Inner Detail **2**

Cam Lever Lock and Cam Lever Spindle (4)

(xiv) Draw required outline of Cam Lever Lock **2**

(xv) Inner Detail of Cam Level Lock **1**

(xvi) Cam Level Spindle **1**

Completion of drawing (4)

(xvii) Presentation, hatching and centrelines ***4***

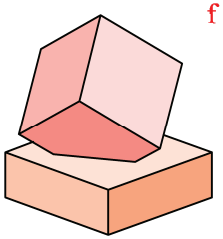
Total = 45

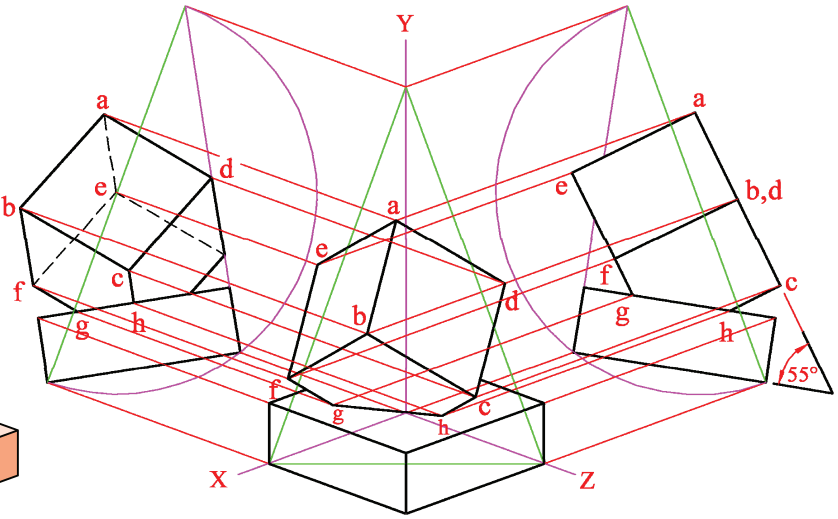
SECTION A - Core - Answer **any three** of the questions on this A3 sheet.

A-1. The image below shows a paper weight. It consists of a cube and a square prism which intersect each other. The drawing shows an incomplete dimetric projection of the paper weight. A pictorial view is also shown.

(a) Complete the dimetric projection of the paper weight.

(b) Determine, and indicate in degrees, the true angle between the surface abcd and the horizontal plane.



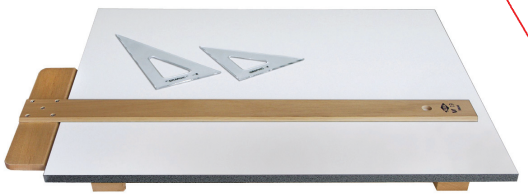


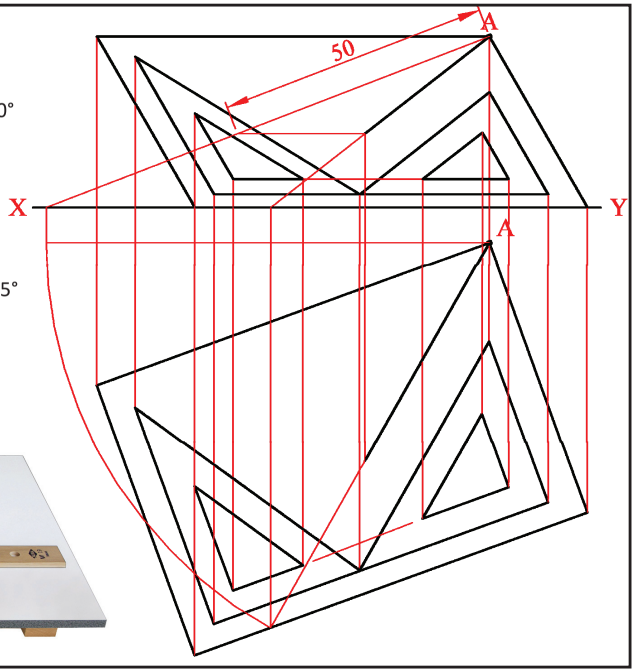
A-2. The image below shows a drawing board and two set squares. The drawing on the right shows the plan and incomplete elevation of a similar board with a 30°/60° set square and a 45° set square.

(a) Complete the elevation of the board and set squares.

(b) A line is drawn on the surface of the board from the point **A**. The line is 50mm long and makes an angle of 45° with the bottom edge of the board.

Draw the projections of the line.

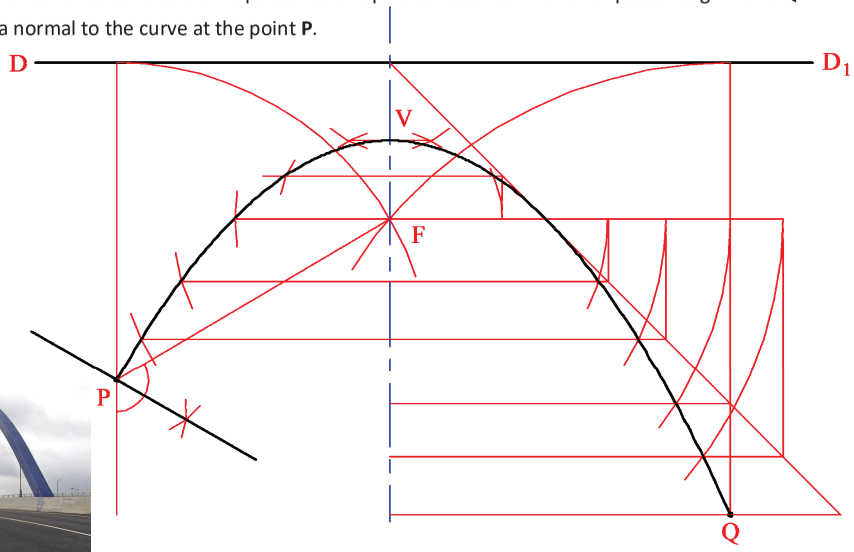




A-3. The graphic below shows a parabolic bridge at the M50 interchange in Dublin. The drawing shows the directrix DD_1 the focus **F** and two points **P** and **Q** on a similar parabola.

(a) Locate the axis and vertex and draw a portion of the parabolic curve which shall pass though **P** and **Q**.

(b) Construct a normal to the curve at the point **P**.

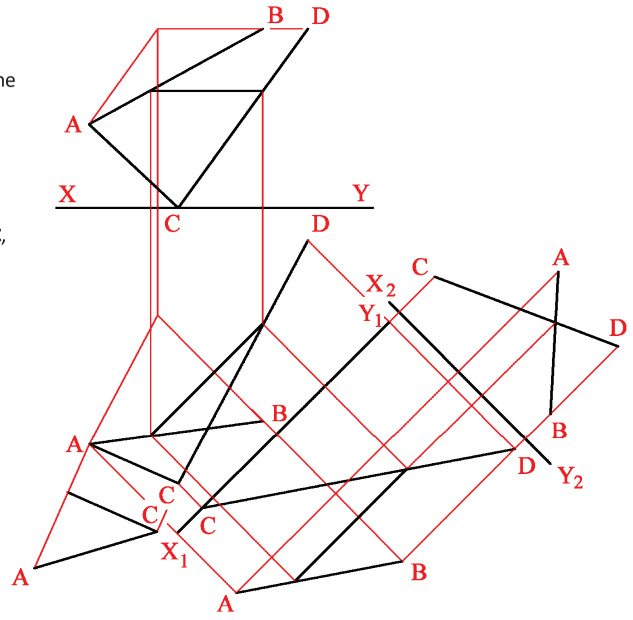


A-4. The graphic below shows a fragrance diffuser bottle and reeds.

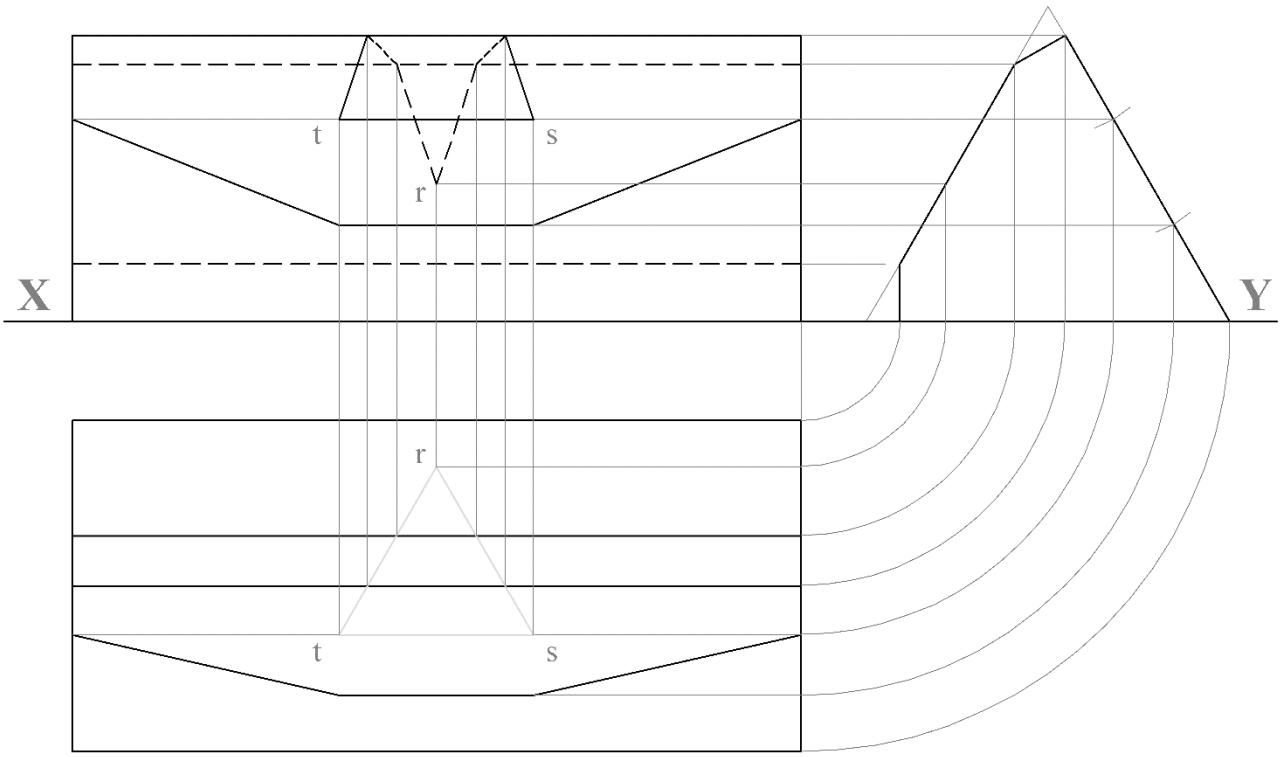
Two of the reeds are represented by the skew lines **AB** and **CD** on the right.

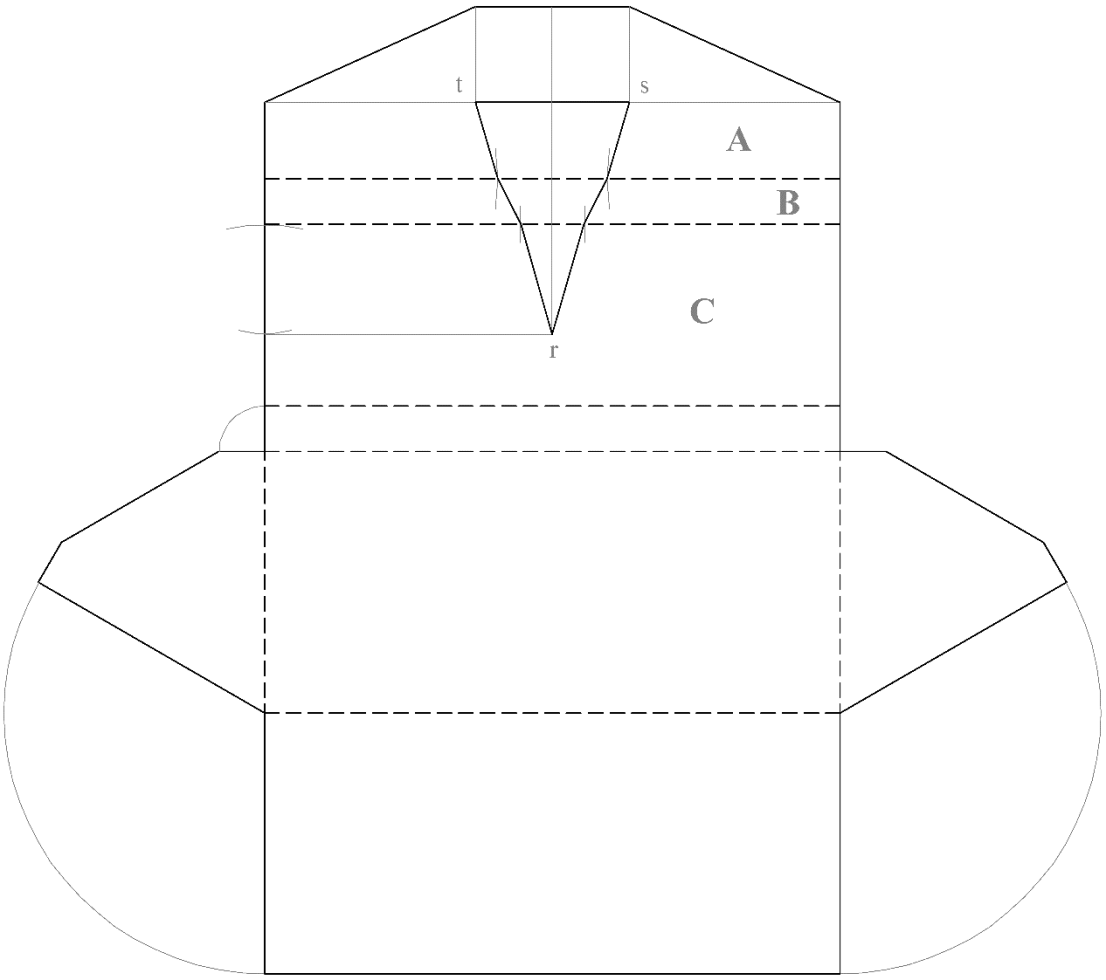
(a) Determine the projections of the shortest horizontal line between the two skew lines.

(b) Draw a line, joining points **A** and **C**, and determine the true length of that line.

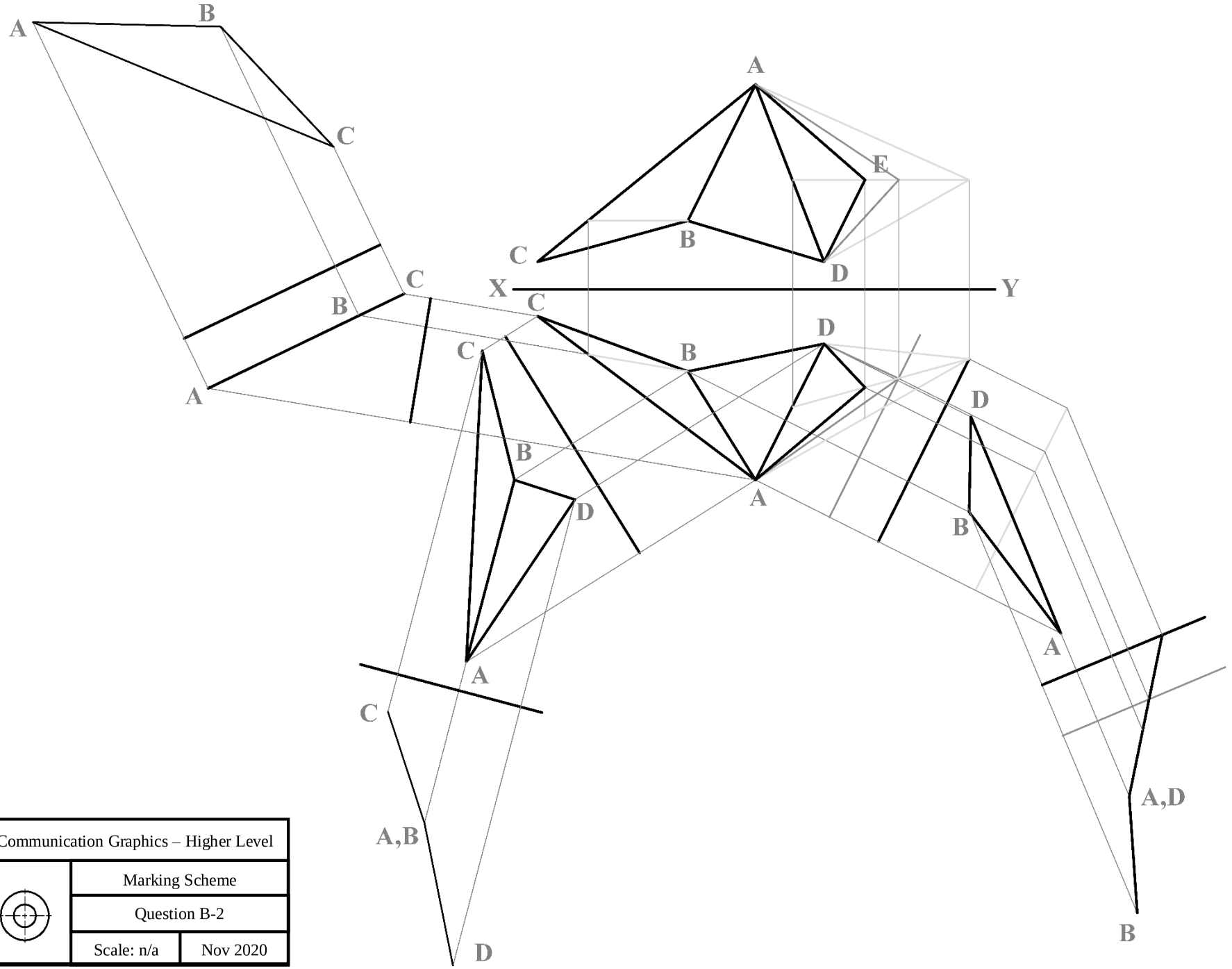


This examination paper must be returned at the end of the examination – You must include your Examination Number on the front cover.





Design & Communication Graphics – Higher Level		
	Marking Scheme	
	Question B-1	
	Scale: n/a	Nov. 2020



Design & Communication Graphics – Higher Level		
	Marking Scheme	
	Question B-2	
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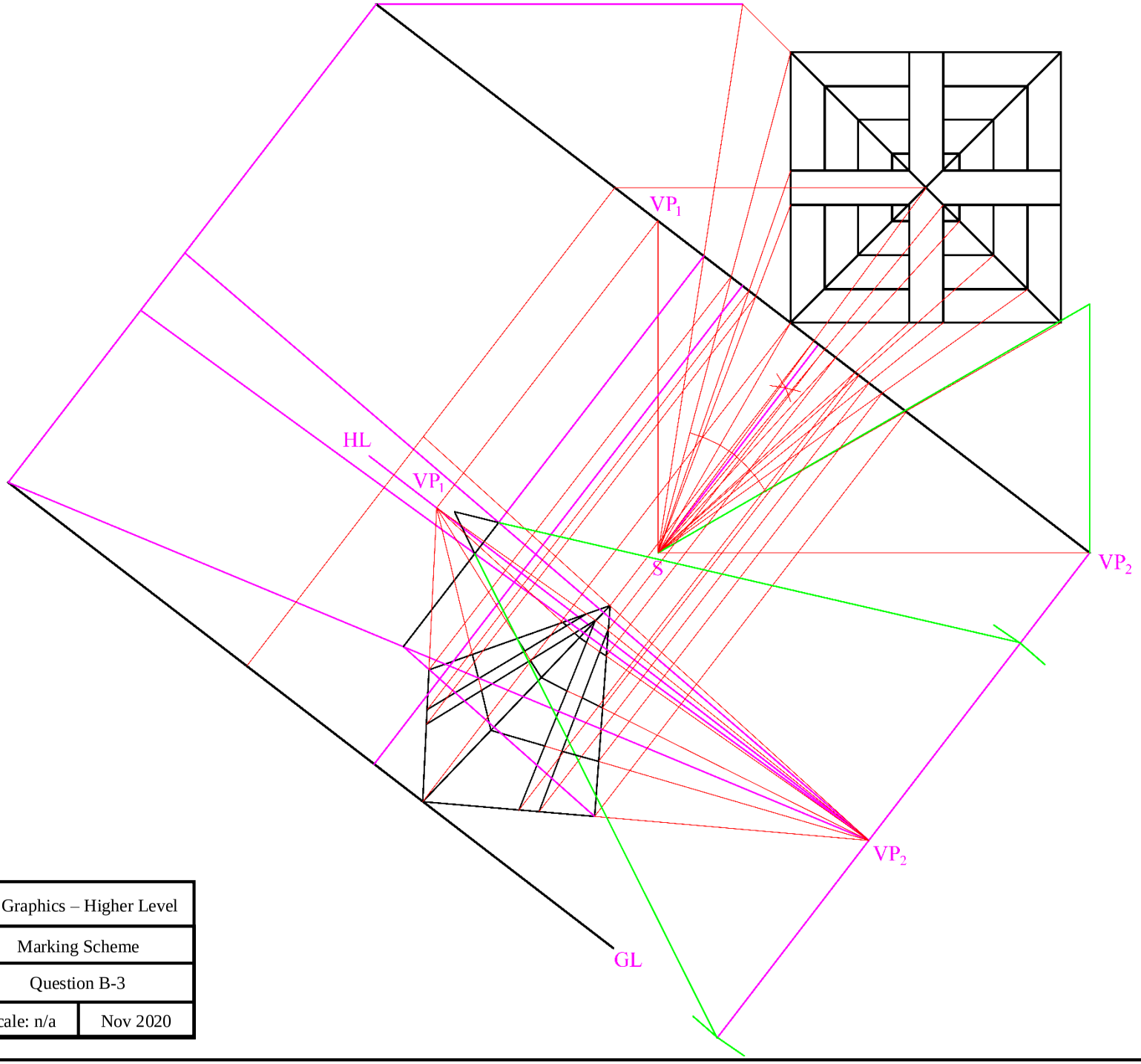

Design & Communication Graphics – Higher Level		
	Marking Scheme	
	Question B-3	
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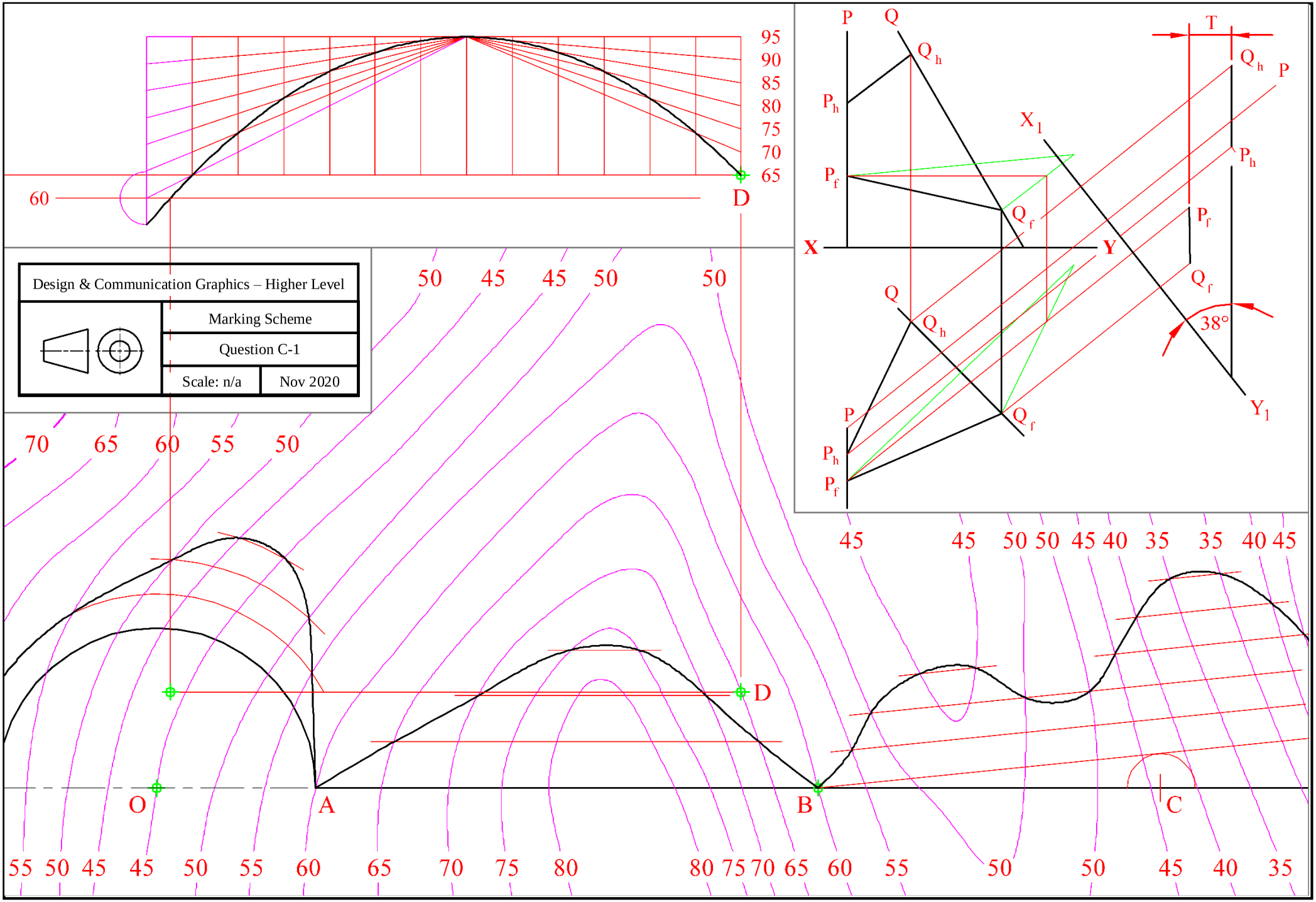
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Design & Communication Graphics – Higher Level
Marking Scheme
Question C-1
Scale: n/a
Nov 2020
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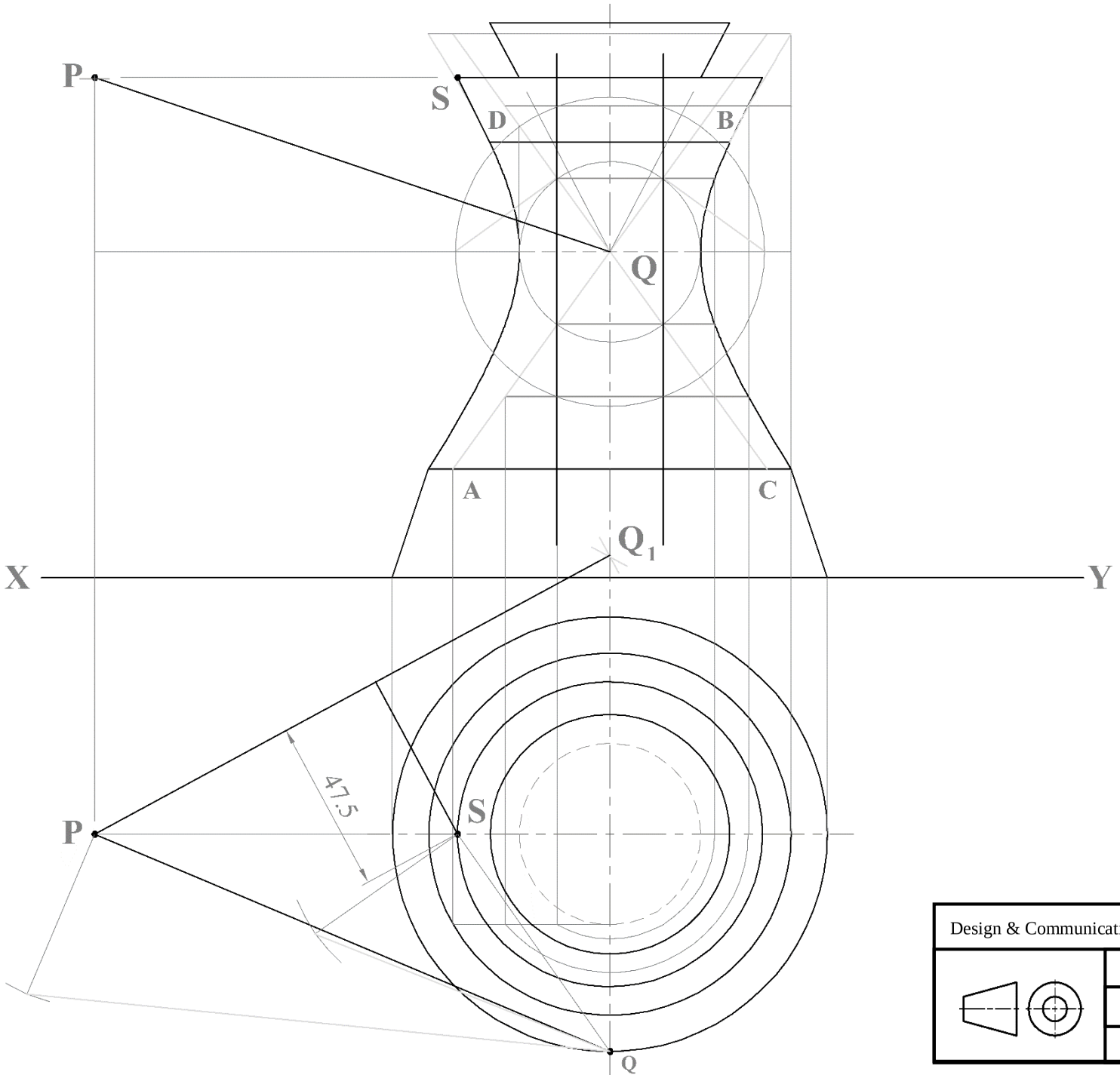
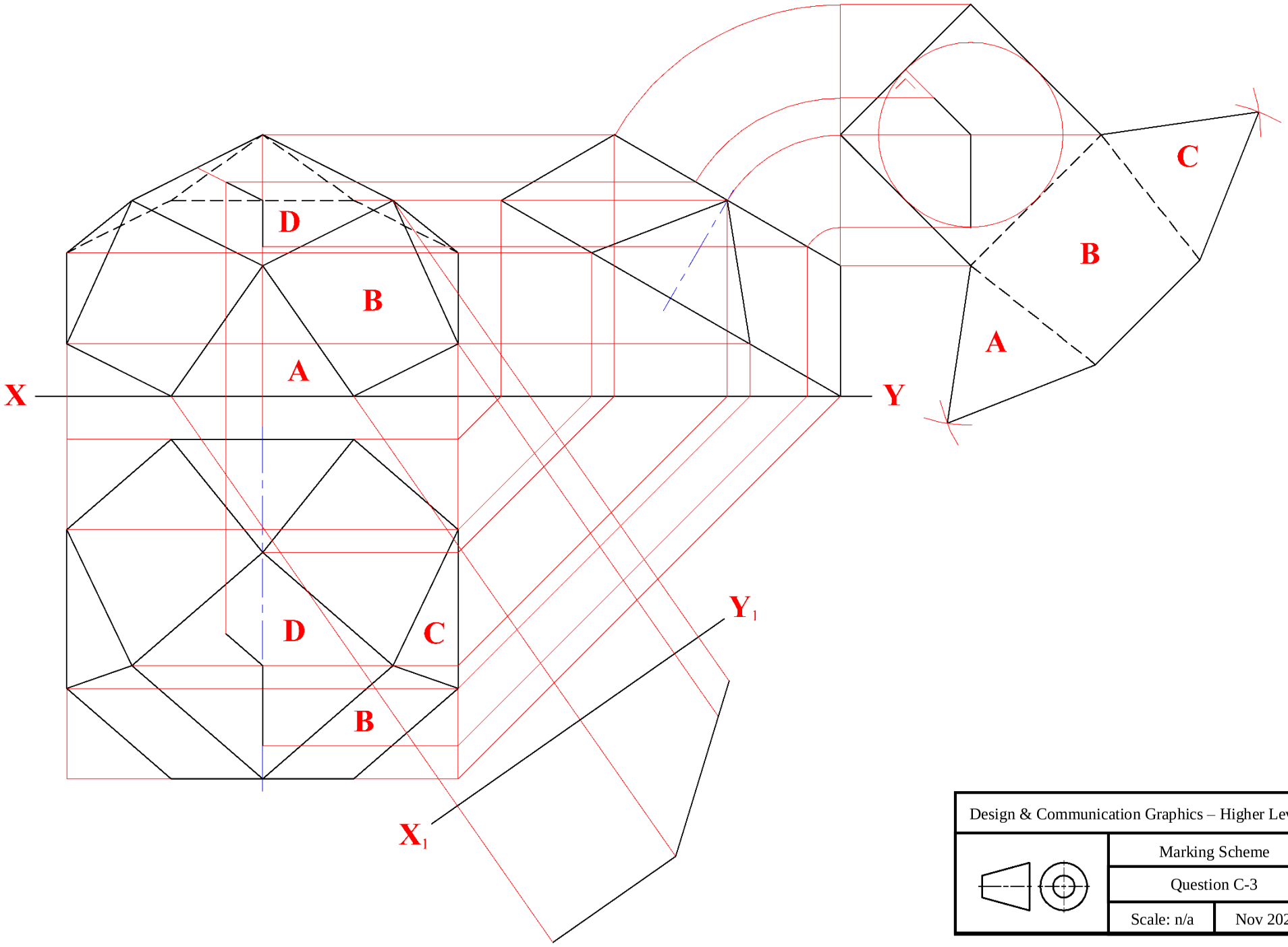
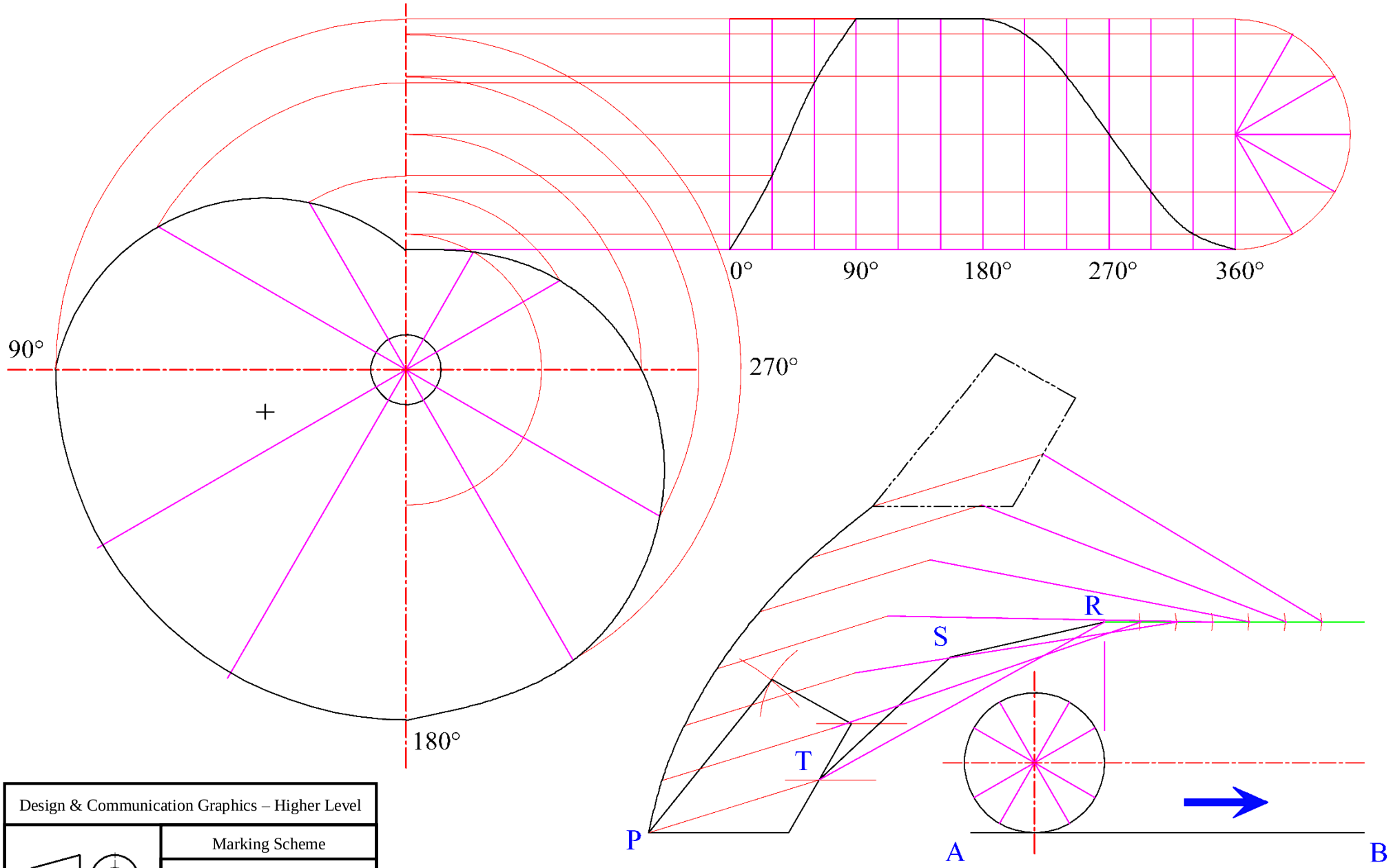


Design & Communication Graphics – Higher Level	
	Marking Scheme
	Question C-2
	Scale: n/a | Nov 2020



Design & Communication Graphics – Higher Level	
	Marking Scheme
	Question C-3
	Scale: n/a | Nov 2020



Design & Communication Graphics – Higher Level		
	Marking Scheme	
	Question C-4	
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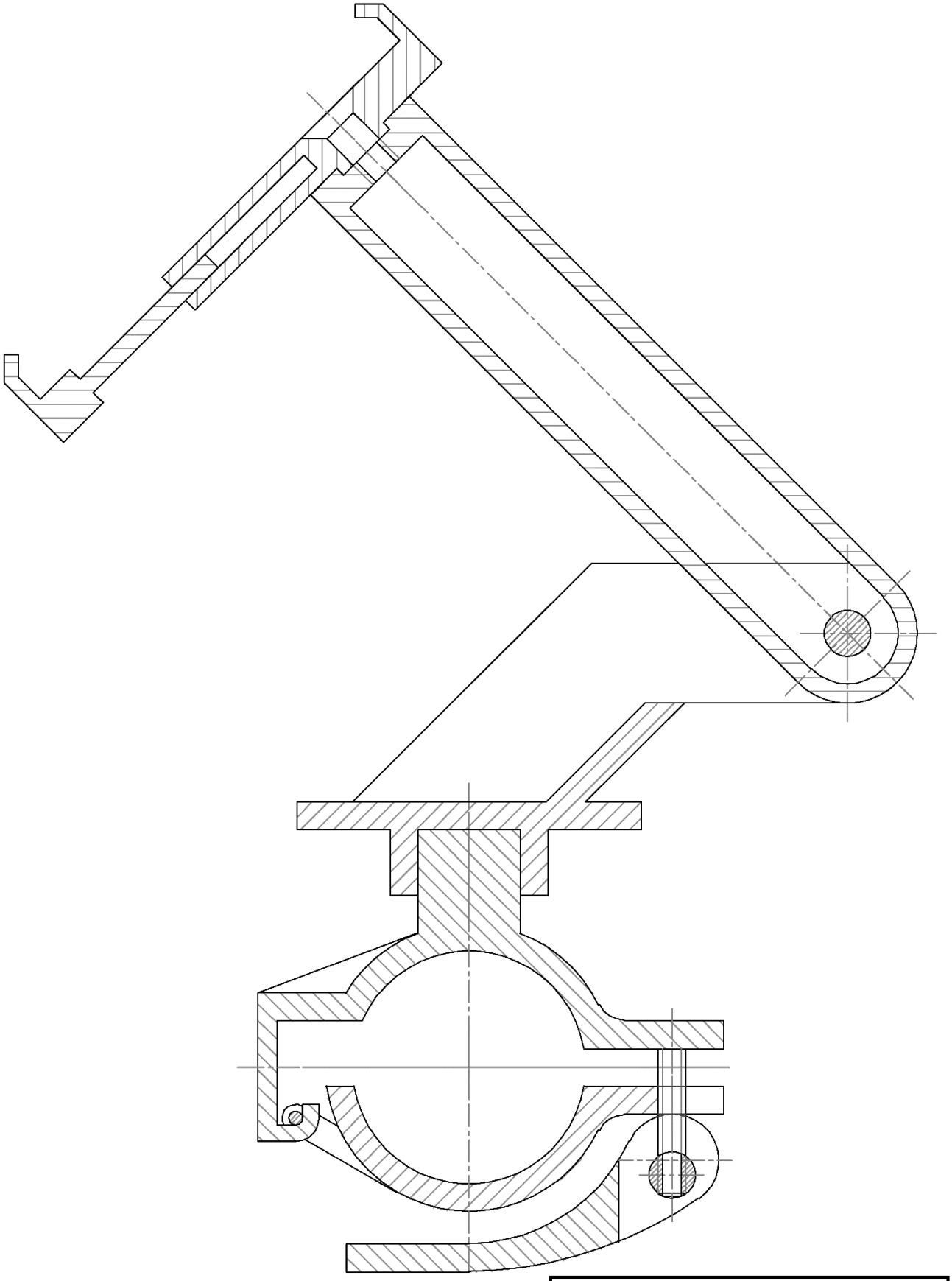

Design & Communication Graphics – Higher Level		
	Marking Scheme	
	Question C-5	
	Scale: n/a	Nov 2020

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Design and Communication Graphics
Student Assignment - Higher Level
Assessment Sheet 2020

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**		
	• **eDrawing of CAD model**	**2**		
5	**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**	**5**	
	b) Most relevant criteria considered - very good presentation	**13 - 16**		
	c) Some relevant criteria considered - good presentation	**9 - 12**	**15**	
	d) Limited criteria considered - fair presentation	**5 - 8**		
	e) At least one criterion considered - poor presentation	**0 - 4**		

5 marks Factor of Difficulty of Model
15 Marks Hardcopy Outputs

Sub-total		Marks deducted for pages in excess of maximum		Total	