



JUNIOR CERTIFICATE EXAMINATION 1999

TECHNICAL GRAPHICS

HIGHER LEVEL CHIEF EXAMINER'S REPORT

ORDINARY LEVEL CHIEF EXAMINER'S REPORT

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HIGHER LEVEL EXAMINATION

1.1 Overview.

- Three hour examination
- Two sections (Section A and Section B)
- Total marks 400

1.2 Commentary on individual sections.

SECTION A

Section A consists of 15 short answer questions of which candidates must attempt 12.
Section A - 120 marks out of the total 400 marks.

SECTION B

Section B consists of 6 longer type questions of which the candidate must attempt 4.
Section B - 280 marks out of the total 400 marks.

1.3 Commentary on individual questions

SECTION A

Q1. (To indicate the meaning of an obtuse angle and a sector of a circle)

Answered well in the majority of cases. A number of candidates produced a drawing of a segment rather than a sector.

Q2. (To inscribe an equilateral triangle in a given circle)

Generally well answered. In some cases an equilateral triangle was drawn smaller than its required size.

Q3. (To demonstrate an understanding of hardware devices used in a CAD facility)

Most candidates correctly listed the mouse but were less successful in selecting the plotter.

Q4. (Orthographic views on a square grid)

Well answered. In a number of cases the orthographic views were not arranged correctly.

Q5. (Perspective drawing using given vanishing points)

Reasonably well answered. A number of candidates had difficulty with the lines required for the seat of the armchair.

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Q6. (Isometric drawing on a grid)

Candidates scored well in this question.

Q7. (Loci)

Not a popular choice and poorly answered by a number of those attempting it. Very few candidates applied the required distance perpendicular to the line L. Guesswork was frequent.

Q8. (Development)

The standard of answering was varied. Some candidate had difficulty in establishing the developed length of the curved surface.

Q9. (Solids in Contact)

A common error was the use of guesswork to locate the centre of the sphere in elevation. Many candidates showed either the normal at point "P" or the bisector of the angle, but rarely both.

Q10. (Determining the minor axis length of an ellipse)

Standard of answering was good. Most attempts were based on the concentric circles method. Having constructed the major circle, many candidates concluded with guesswork.

Q11. (Sketching and Shading)

Answered poorly in most cases. Some candidates attempted to convey shadow rather than shading the sketch as required by the question.

Q12. (Completing the elevation of a cut solid)

Poorly answered, most candidates had difficulty in completing the elevation having projected the points from the plan.

Q13. (Area)

Approximately half the candidates attempting this question had difficulty establishing the necessary height of the triangle. In most cases however, the 55° base angle was correctly drawn.

Q14. (Axial symmetry)

This question was answered very well. A small number of candidates did not reflect points perpendicularly in the line L.

Q15. (Completion of elevation, given plan and end view of a cut solid)

Answered well by the majority of candidates. In some cases the hidden detail for the rear two edges of the solid was omitted.

SECTION B - HIGHER LEVEL

Question 1.

Orthographic Projection

Parts (a) and (b) (elevation and plan respectively) were very well answered. Difficulties with the auxiliary plan included an incorrect angle for the X1-Y1, not projecting at right angles to the surface "S" in elevation and omission of hidden detail. In some cases candidates only showed the surface "S" in the auxiliary plan. A small number of candidates projected an auxiliary elevation of the model aeroplane.

Question 2.

Mapping / Rotation

Part (a), which involved drawing the given views, as answered exceptionally well. Instead of the required plan, some candidates produced a view identical to the given elevation. Others, having set-up the required plan correctly, experienced difficulty with the semi-elliptical curves and drew semi-circles instead.

Question 3.

Isometric Projection

This question was well answered by the vast majority of candidates. Option (a), using the axonometric axes method, proved slightly more popular than option (b), using the isometric scale method. A small number of candidates lost marks for not showing the construction used to locate points on the curves.

Question 4.

Solids in Contact / Surface Development

This question was generally not well answered. While the given views were well drawn, a considerable number of candidates showed no construction for the tangential surfaces at 60° to the horizontal plane in the end view. Attempts at the plan were poor, with a number of lines omitted. The required points of contact were shown by very few candidates with most having neglected to locate them in the end view. The required surface development (of one of the hexagonal ends) was omitted or handled poorly by most candidates.

Question 5.

Transformation Geometry

Generally very well answered. Fixing the centre of rotation and locating all the image points correctly, following a 120° anti-clockwise rotation gave rise to errors in only a small number of cases.

Question 6.

Ellipse and Parabola

Generally very well answered, apart from the requirement to show clearly the construction required to determine the position of the vertex B of the parabola and the point of contact D between the ellipse and the base of the trophy. In the majority of cases the horizontal tangents to the ellipse were fitted without construction. Most candidates correctly drew both curves.

1.4 Popularity of Questions - Section B

- The majority of candidates attempted the required four questions in this section. Quite a small proportion (8%) attempted five questions while 1.6% attempted six questions.
- Certain questions are more popular than others. Question 1 on Orthographic Projection, which included an auxiliary plan, was the most popular choice followed by Question 2 which was based on a mapping / rotation. Question 4 on Solids in Contact / Development was the least popular.
- These findings are presented in Table 1 below and illustrated graphically in Figure 2.

Popularity of Questions (Section B - Higher Level)			
Order of Popularity	Question	Popularity %	Topics
1 st	Question 1	90%	Orthographic Projection
2 nd	Question 2	78%	Mapping / Rotation
3 rd	Question 5	75%	Transformation Geometry
4 th	Question 6	66%	Ellipse / Parabola
5 th	Question 3	62%	Isometric Projection
6 th	Question 4	27%	Solids in Contact / Development

Table 1. Popularity of Questions - Section B

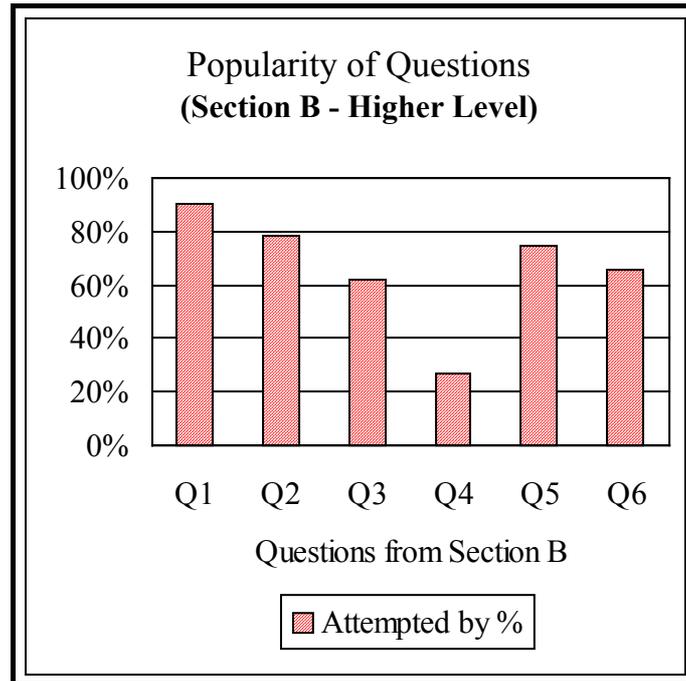


Figure 2. Graph showing popularity of questions - Section B.

1.5 Average marks awarded

- The average mark awarded for Section A was 85 out of a possible 120 marks, which is equivalent to 71%.
- The average mark awarded for Section B was 192 out of a possible 280 marks, which is equivalent to 69%.
- The average total mark awarded for the paper as a whole (Section A combined with Section B) was 277 out of a possible 400 marks. This is equivalent to 69%, a high grade 'C'.

An analysis of the average mark awarded for each question in Section B further highlights variations in marks awarded to candidates. Interestingly, the questions that attracted the highest average marks were not the most popular questions.

- Question 3 on Isometric Projection received the highest average marks.
- Question 4 on Solids in Contact / Development received the lowest average marks. (This question was also least popular).

The average marks awarded for each of the questions in Section B are set out in Table 3 below and illustrated graphically in Figure 4.

(Note: Each question in Section B carried a maximum of 70 marks.)

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Average Marks Awarded (SectionB – Higher Level)			
Rank Order	Question	Average Mark	Topics
1 st	Question 3	59	Isometric Projection
2 nd	Question 5	50	Transformation Geometry
3 rd	Question 6	49	Ellipse / Parabola
4 th	Question 1	48	Orthographic Projection
5 th	Question 2	47	Mapping / Rotation
6 th	Question 4	35	Solids in Contact / Development

Table 3. Average marks awarded per Question: Section B

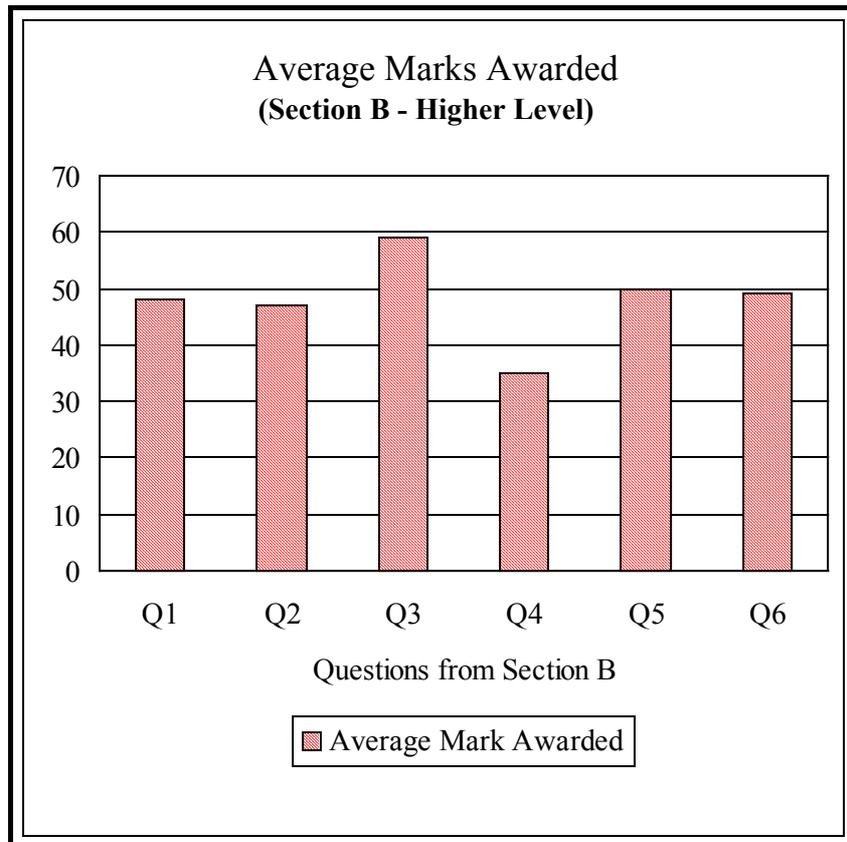


Figure 4. Graph showing average marks awarded per question in Section B.

TECHNICAL GRAPHICS

ORDINARY LEVEL EXAMINATION

2.1 Overview

- Two and a half hour Examination.
- Two sections (Section A and Section B)
- Total marks 400

2.2 Commentary on individual sections.

SECTION A

Section A consists of 15 short answer type questions of which candidates must attempt 10.
Section A - 120 marks out of the total 400 marks.

SECTION B

Section B consists of 6 longer type questions of which candidates must attempt 4.
Section B - 280 marks out of the total 400 marks.

2.3 Commentary on individual questions

SECTION A

Q1. (To complete an Orthographic)

Well answered. Some candidates omitted projection lines and hidden detail lines.

Q2. (CAD commands)

Poorly answered. Knowledge of CAD commands was poor.

Q3. (Computer Devices)

Well answered. Almost 100% correct in the answers provided.

Q4. (Convert to a Rectangle, twice the given area)

Well answered.

Q5. (Ellipse)

Poorly answered. No construction lines were shown in many solutions.

Q6. (Pentagon)

Poorly answered. Many candidates guessed the shape.

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Q7. (Isometric)

Very well answered. Dimensional inaccuracies were the main errors.

Q8. (Scale)

Very well answered. Popular question.

Q9. (Area)

Very well answered and a popular question with candidates.

Q10. (Auxiliary)

Poorly attempted. Many candidates exhibited a poor understanding of auxiliary projection.

Q11. (Isometric drawing on grid)

Very well answered. The standard of answering of this question is improving.

Q12. (Shadow)

Some candidates resorted to guesswork when determining the shadow on the vertical plane. Otherwise, well answered.

Q13. (External Tangent to two circles)

Poorly answered. Many candidates did not know the required constructions.

Q14. (Perspective)

Well answered. Some candidates omitted the projection lines to the Vanishing Points.

Q15. (Rotation)

A popular question, errors that did occur were in the orientation of the rotated figure.

SECTION B

Question 1.

Orthographic Projection – Oil Storage Tank

Very well answered. The placing of the end elevation on the incorrect side of the elevation, the omission of the hidden detail and dimension lines were the most common errors.

Question 2.

Ellipse -A Shop Display Sign

Very well answered. However, many candidates did not show clearly a method for obtaining points on an ellipse. Most candidates had little difficulty in completing the outline figure. However, the construction for the location of the centre of the three arcs was seldom shown.

Question 3.

Development - A Litter Box

Very well answered. The location of the end elevation on the incorrect side of the elevation and omission of the fold lines in the development were the main errors.

Question 4.

Pictorial Drawing using Oblique or Isometric - A Computer Game Show Award

Very well answered. Some candidates did not show the correct angle for the axes of projection.

Question 5.

Transformation Geometry

This question was not well answered. Candidates generally had a poor understanding of Axial Symmetry and Central Symmetry.

Question 6.

Plane Figures - A Child's Toy

This question was not well answered. Many candidates omitted the necessary constructions required to locate the points of contact to each of the circles and to the centres for each of the arcs. Points of contact were frequently omitted.

2.4. Popularity of Questions - Section B

- The vast majority of candidates attempted the required four questions in this section. Quite a small proportion (3.4%) attempted five questions while 0.5% attempted six questions.
- Some questions are more popular than others. Question 3 on Development, was the most popular choice followed by Question 2 which examined the Ellipse. Question 5 on Transformation Geometry was the least popular.

The results are presented in Table1 below and illustrated graphically in Figure 2.

Popularity of Questions (Section B - Ordinary Level)			
Order of Popularity	Question	Popularity %	Topics
1 st	Question 3	82%	Developments
2 nd	Question 2	76%	Ellipse
3 rd	Question 1	68%	Orthographic Projection
4 th	Question 4	54%	Pictorial Drawing
5 th	Question 6	53%	Plane Figures
6 th	Question 5	29%	Transformation Geometry

Table 1. Popularity of questions in Section B.

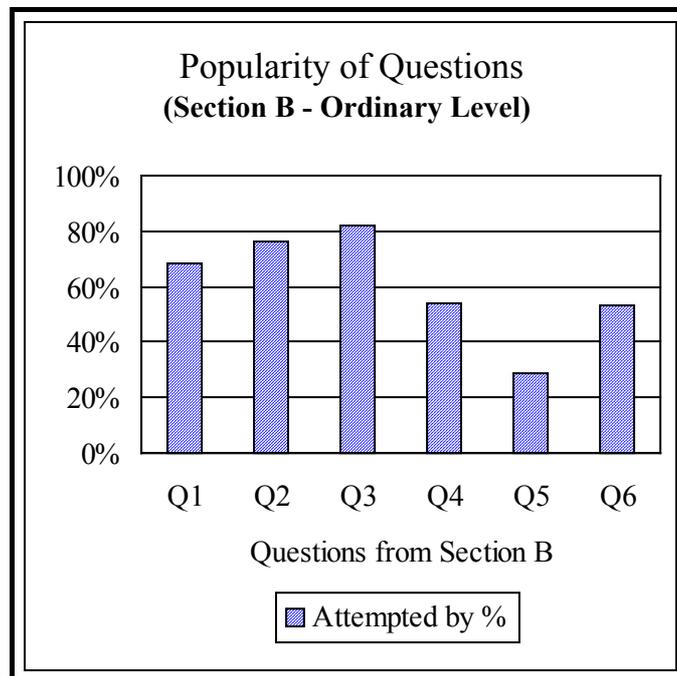


Figure 2: Graph showing popularity of Questions in Section B.

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2.5 Average marks awarded

- The average mark awarded for Section A was 83, which is equivalent to 69.2%.
- The average mark awarded for Section B was 188, which is equivalent to 67.4%.
- The average total mark awarded for the paper as a whole (Section A combined with Section B) was 271 out of a possible 400 marks. This is equivalent to 67.8%, a high grade 'C'.

An analysis of the average mark awarded for each question in Section B further highlights variations in performance of candidates. Interestingly, the questions that attracted the highest average marks were not the most popular questions.

- Question 4 on Pictorial Projection received the highest average mark, followed by Question 5 on Transformation Geometry.
- Question 3 on Development received the lowest average mark.

The average marks awarded for each question in Section B are set out in Table 3 below and illustrated graphically in Figure 4.

(Note: Each question in Section B carried a maximum of 70 marks.)

Average Marks Awarded (SectionB – Ordinary Level)			
Rank Order	Question	Average Mark	Topics
1 st	Question 3	50	Pictorial Drawing
2 nd	Question 5	48	Orthographic Projection
2 nd	Question 6	48	Ellipse
2 nd	Question 1	48	Transformation Geometry
3 rd	Question 2	45	Plane Figures
4 th	Question 4	44	Development

Table 3. Average marks awarded per question in Section B.

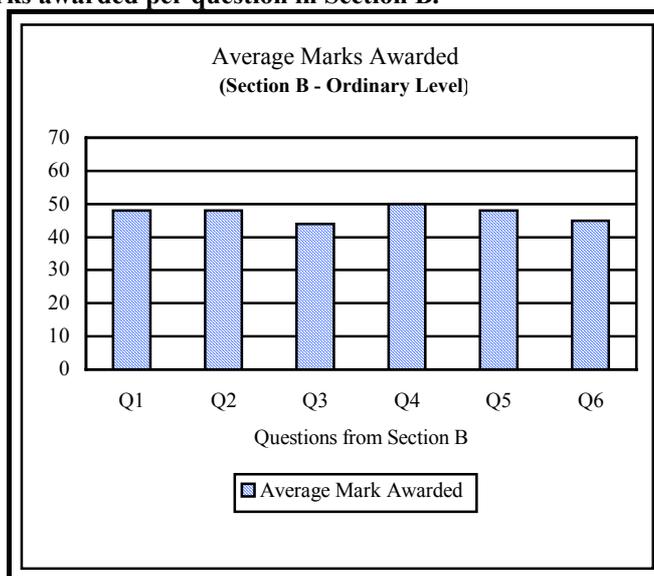


Figure 4. Graph showing average marks awarded per question in Section B.

3. EXAMINATION STATISTICS

3.1 Level at which candidates participated (uptake at each levels)

Table 1 below shows the uptake at each level since 1996.

Level at which Candidates Participated			
Year	Total Number of Technical Graphics Candidates	% Higher	% Ordinary
1996	18,765	47.4%	52.6%
1997	17,393	52.5%	47.5%
1998	16,972	53.0%	47.0%
1999	16,128	51.9%	48.1%

Table 1: Uptake of Technical Graphics.

3.2 Distribution of Grades – 1999.

Table 2 below sets out the grades awarded at Higher and Ordinary Levels for 1999. This data is illustrated graphically in Figure 3.

Distribution of Grades				
Grade	Higher		Ordinary	
	Number of Candidates	%	Number of Candidates	%
A	1,249	14.9%	943	12.1%
B	2,849	34.0%	2,489	32.0%
C	2,674	31.9%	1,877	24.2%
D	1,324	15.8%	1,434	18.5%
E	247	2.9 %	594	7.6%
F	34	0.4%	374	4.8%
N/G	5	0.1%	55	0.7%
Total	8,382	100%	7,766	100%

Table 2: Distribution of Grades

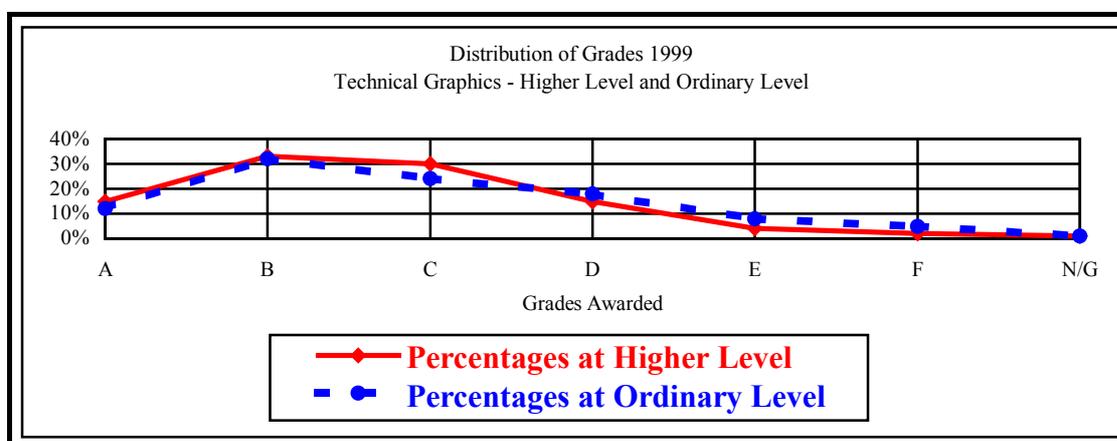


Figure 3. Graph showing distribution of grades at Ordinary and Higher Level.

3.3 Provision of Technical Graphics by school type

Schools by Sector taking Technical Graphics			
Secondary	Vocational	Community	Comprehensive
230	213	64	14

3.4 Commentary on Higher Level Statistics

When the Junior Certificate Technical Graphics syllabus was introduced into the schools it was envisaged that the ratio of Higher Level to Ordinary Level candidates would be approximately two-thirds to one-third. This year slightly under 52% of the candidates opted for Higher Level. A total of 80.6% of the Higher Level candidates achieved an A, B or C grade. Many candidates who could attempt the Higher Level are opting to sit the examination at Ordinary Level. A total of 3.9% of candidates did not achieve a D grade at Higher Level.

3.5 Commentary on Ordinary Level Statistics

A total of 13.0% of candidates did not achieve a D grade at Ordinary Level. Many of these candidates did not attempt the required number of questions and consequently were disadvantaged.

The number of questions attempted by candidates in Section B is as follows:

- 15.5% attempted 3 questions out of the 4 required in Section B.
- 6.1% attempted 2 questions.
- 3.4% attempted 1 question.
- 0.3% attempted 0 questions.

Conclusion

A total of 12.3% of candidates were awarded an A Grade at Ordinary Level. It would appear that a significant number of candidates, who take the examination at Ordinary Level, are capable of taking the examination at the Higher Level. It is hoped that candidates will give more consideration to the level at which they wish to present for examination and that teachers will encourage candidates to take the Higher Level where appropriate.