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Examiners' Report January 2008

GCE

GCE O Level Mathematics B (7361)

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Mathematics B

Specification 7361

Paper 1

Introduction

There was no general indication that the examination paper was too long, with most candidates making reasonable attempts at nearly all of the questions and with a number of these scoring high marks. Overall, the standard of presentation and clarity of work was high. However, it should be emphasized that candidates should be encouraged include their working on the paper to show how they obtained their answers since if an incorrect answer was given without any working shown, all of the associated marks were lost. It would also be prudent of Centres to encourage their candidates to answer the questions within the examination paper booklet and not, if at all possible, on any extra sheets of paper. Also, Centres should emphasize to candidates who do need to use extra sheets of paper, to clearly indicate this in the answer area of the relevant question in the examination booklet.

Once again, it was pleasing to observe that some candidates showed that they have a good understanding of the basic techniques of arithmetic, algebra and trigonometry and were able to apply them competently. However, despite the latter comment, the question paper did nonetheless highlight the following problem areas, followed by their corresponding question numbers, which should receive attention by Centres:

- Sequences (Q1)
- Venn diagrams (Q3)
- Differentiation (Q4)
- Expressing numbers to various types of accuracy (Q5 and Q14)
- Trigonometry (Q7 and Q29)
- Algebraic manipulation (Q11)
- Providing geometrical reasons (Q18)
- Variation (Q20)
- Similar figures and solids (Q23b)
- Distance-time graphs (Q25)
- Graphical inequalities (Q26)
- Centres would also be well advised to stress the importance of reading the demands of a question carefully before attempting to answer it (Q16, Q17, Q26 and Q29).

Report on Individual Questions

Question 1

Essentially, the candidates fell into two categories, those who knew how to do this question and those who did not. However, there were many candidates who did not even attempt an answer for this question. Incorrect answers of 21, -26 were seen rather often.

Question 2

Whilst many candidates were able to achieve the correct answer of 1674 for the LCM, there were also many who were out by a factor of 31, giving their answer as 51894. Equally some were out by a factor of 9 too small and gave 186 as the answer. Most knew how to arrive at the prime factors of 27, 186 and 558 – it was the subsequent processing after this stage that let them down.

Question 3

The question on the Venn diagram was poorly answered with candidates either offering no response or believing that sketches of an octagon, rectangle and any peculiarly shaped quadrilateral was all that was required. Where some attempt was made at a Venn diagram, it was not uncommon to see $Q \subset R$, rather than $R \subset Q$. Too many candidates simply drew 3 intersecting circles.

Question 4

This question proved to be a barren wasteland for many candidates. It was rare to see a fully correct expression for $\frac{dy}{dx}$, many preferring to leave their answer as $\frac{2x}{2}$ or $\frac{12x^4}{3}$ where some success had been achieved. Many had non-sensible answers such as $\frac{2x}{0}$ or $36x^{-4}$. Some candidates decided to take a common denominator (often resulting in errors) and then tried to apply the quotient rule, resulting in even more errors.

Question 5

Many were able to give the answer to part (a) as 0.0213 but 0.02 and 0.021 were equally prevalent. Attempts at putting the answer from part (a) into standard form caused confusion for a substantial number of candidates. It was upsetting to observe that a number of able candidates were unable to provide their answers in the forms required by the question.

Question 6

Many misread this question as 'the probability of a prime number' rather than 'the probability of *not* a prime number'. Consequently an answer of $\frac{3}{10}$ was very popular instead of the correct $\frac{7}{10}$. It was surprising how many candidates believed that 49 was a prime number. Some had no idea what the question was about and decided to find the mean of the ten numbers in some desperate hope.

Question 7

This question was poorly answered with many non-responses or completely erroneous work. The most common response was $\cos 30^0 = 0.866$, which whilst true, did not answer the question. Sometimes 150^0 was seen followed by 179 or 179.34 from 180 – 0.866. Those that nearly made it were guilty of writing $\cos 150^0$ as -0.87 or -0.86, ignoring the request for 3 significant figure accuracy.

Question 8

As with question (1), the candidates fell into two categories, those who knew how to do this question and those who did not. An incorrect answer of $\sqrt{2.25}$ was seen often.

Question 9

Most candidates collected the mark in part (a) but many candidates had difficulty in drawing the rotated kite in part (b) or drew it inaccurately.

Question 10

The majority of candidates were able to achieve the correct answer of 12.2 cm^2 but there were many cases of 12.217cm^2 or 12.219cm^2 or 12.22cm^2 . Some tried to find the arc length or even the total perimeter of the sector. It was disturbing to see quite a number of candidates believing that the area of a circle was $2\pi r^2$.

Question 11

Many candidates achieved full marks, however, there were a number of candidates, including some of the ablest, who expanded the brackets and did not continue to simplify their expression as required by the question.

Question 12

The responses of many candidates indicated that more practice is needed generally in using a protractor.

Question 13

Many candidates handled the inequalities more successfully than in previous papers. A number of candidates, however, lost marks for not stating $x \geq -2$.

Question 14

This question was generally answered well with many getting all 3 marks. Most candidates got the first part, but some just went on to convert this to a decimal, and so losing out on the second 2 marks. The others just giving 64/125, and not converting it, but at least they got 1 mark for this part. As noted in question (5), a number of the abler candidates were unable to provide their answers in the required form.

Question 15

Most candidates collected at least 2 marks for this question, losing out when they did on either the mark for accuracy or the mark for shading in part (b).

Question 16

Judging by the absence of 260 in many cases, it would appear that such candidates did not read the question with sufficient attention. However, many candidates gained all 4 marks here. Of the others the most common error was to use the 100, and divide that by 10 and go on from there, or to a lesser extent use the 360 in the same way. A few used 180 which at least got them 1 mark if they then divided it by 10 (B1 ft).

Question 17

As in the previous question, it would appear that many candidates again did not read the question with sufficient care, however, many candidates obtained full marks, whilst others obtained at least 2 marks for getting as far as 10773. Of those scoring less than 2 marks, the main error was finding 10% of 12600 as 1260, and then finding 5% of that 1260.

Question 18

Many candidates obtained the correct answers of 40 and 60, but several did not state their reasons, or in the case of part (a) just gave "angles of a triangle = 180". In part (b) the use of alternate segment theorem was seen significantly often. Use of cyclic quadrilaterals was seen quite a few times. This question did show, however, that most candidates had a clear understanding of angle geometry but were unable to state their reasons for their work as required by the question.

Question 19

There were very many candidates gaining all 4 marks here. Of those that did not, the most commonly seen error was an answer of 5.29 in part (b) showing that such candidates thought that $(-6)^2 = -36$.

Question 20

This was the most poorly answered question on the paper. Many candidates got to $V = kr^3$, and not much further than that. Of those who did get further, usually fell by using R instead of R^3 in $R^3 = \frac{64Vr^3}{V}$, but many candidates simply had no idea of what to do. One suspects that if this question had been numerical, a lot more candidates would have collected a lot more marks.

Question 21

Most candidates collected at least 2 marks here, showing a correct reflection from either a correct Q or an incorrect Q, indicating that reflections are better understood than centres of enlargement. Only a small minority used an incorrect line for $y = x$.

Question 22

This question was answered well with many candidates gaining all 4 marks. Of the others, many got 2 marks by collecting both the method marks. A few lost out altogether for not balancing correctly, mainly for omission of minus signs.

Question 23

Most candidates coped with part (a) . However, part b) not so well answered. It should be noted by Centres that it was clear from the answers of many candidates that the concept and properties of similar figures or solids are not well understood. The most common error was to mix up 15 with 5, thus obtaining 36.3 from $\sqrt{(36^2 + 5^2)}$ and then obtaining $\frac{181\pi}{2}$, thus losing both marks for part (b).

Question 24

This question was generally answered well, with a significant number of candidates collecting full marks, thus showing a clear understanding of the content of the question. Only on a few occasions was the expression factorised incorrectly $(x - 4)(x + 2)$, but such candidates collected the method mark here, but losing the accuracy marks. Answers for *C* were usually correct. A small number differentiated $y = x^2 + 2x - 8$.

Question 25

John's journey, more often than not, was plotted correctly. If not, then the candidates usually picked up 1 mark for the 2cm horizontal line. Michael's journey was often not plotted correctly. When it was not correct, it was usually plotted from (10 00, 11) to (11 00, 0) and an answer of 10.29 was given.

Question 26

There was evidence of a very poor understanding of this question. Full marks were rarely collected. The first mark for the straight line was usually collected but many candidates went downhill rapidly after that. On many occasions, crosses placed in all incorrect places were seen and common answers of 0 and 6, or 3 and 6 were given as answers for part (c).

In addition, it was evident from the attempts of many candidates that they failed to read "positive integers" for part (b) and this proved to be the downfall of many.

Question 27

Most candidates collected the mark for part (b). Common answers for part (c) was 1, and then 1 for part (d) Such candidates thus achieving 2 marks for parts (c) and (d). Rarely was 3 given on its own in part (c), with 1 and 3 seen more often seen.

Question 28

This question was fairly well attempted, with candidates showing a clearer understanding of part (a) than part (b). In part (b), the most common error was to obtain 1/5 x 1/5 x 4/5 on its own and then not realize that more had to be done to obtain the correct answer. However, it was pleasing to note that there many fully correct answers to this question.

Question 29

Many candidates made the incorrect assumption that *ABED* and *ABCE* were parallelograms because they looked that way in the figure. Centres should instruct their students that they should not make such assumptions just because of the appearance of a figure. If *ABED* and *ABCE* were in fact parallelograms then this would have been stated in the question or would have been something that the question would have required the candidates to show.

In part (a), the most common error was sin 55 = *AF* / 6 leading to an answer of 4.91. Most candidates managed to collect the method in part (b) for sin 55 = "*AF*" / *AD*. In part (c), problems occurred when many candidates found the length *DF* and then incorrectly assumed that *DF* was equal to *FE*, and then carrying on to multiply this by 4 to get the length *DC*. The more able candidates did manage to calculate correctly the area of triangle *ABE* by the correct method. There were, however, a number of candidates who failed to realize that $\angle AED = 65^o$ and thus were unable to start to answer the question.

Paper 2

Introduction

There was no general indication that the examination paper was too long, with many candidates attempting most of the questions. Overall, the standard of presentation and clarity of work was high. A few candidates did not use the graph paper in the examination paper booklet and instead choose to use loose graph paper leaving the page with graph paper in the booklet blank. This practice should be avoided in future if possible.

Once again, it was pleasing to observe that many of the candidates have a good understanding of the basic techniques of arithmetic, algebra and two dimensional trigonometry and were able to apply them correctly. The major discriminating questions were Q6(a) (drawing histograms), Q5(ai) and Q7(ci) and (cii) (the use of the ratios of the sides of similar triangles), Q10(a) and (e), and 11(f) (three dimensional trigonometry), whilst minor discriminating questions were Q3(b) (using the inverse matrix to solve simultaneous equations given in matrix form), Q6(b) (medians), Q8(e) (describing transformations) Q9(b) and (c) (probability). These will be discussed below.

Report on Individual Questions

Question 1

Many correct attempts were seen at this question. Part (a) was usually fully correct although a few candidates struggled to square out the brackets correctly. In part (b), a common error was to write $(x - 4)^2 = x - 16$, otherwise most candidates earned the M1 for the correct follow through method.

Question 2

Many candidates completed this question correctly. A few candidates used synthetic division in part (a). In part (b), the main difficulty was the division of the cubic by x - 1.

Question 3

Most candidates found the inverse matrix correctly and produced the correct simultaneous equations, but then they often made slips in their algebra. It was surprising to observe that few candidates made use of the inverse matrix that they obtained in part (a) to solve the simultaneous equations even though they were given in matrix form in the question.

Question 4

Most candidates answered parts (a) and (b) well, but there were many who misread the demand in part (a) and gave the sum of the interior angles as their answer. Few candidates collected full marks for part (c) as they failed to state their reasons. This failure has been emphasized in previous reports when discussing similar qeometrical questions . Those that did not state their reasons but arrived at $\angle AEB = \angle CED = \angle BEC = 36^o$ collected one B mark only.

Question 5

Candidates who successfully did part (a) used the similar triangles method using ratio of sides. A common error seen was to set $\frac{AD}{DB} = \frac{DE}{BC}$ which lead to AD = 1.2 and then to AB = 4.2. Because this first step was a major error, these candidates collected no marks for part (a). Many of these, though, did carry on and collected one or both the two method marks in part (b) as they used their values of AD and AB correctly in their method. A common error seen though in part (b) was to calculate the volume of the solid S as $\frac{1}{3} \times \pi \times 5^2 \times 3$.

Question 6

As remarked in previous reports, candidates have little understanding of how to produce histograms correctly and this proved to be the case in this examination paper with very few candidates producing a correct histogram. Thus part (a) was one of the discriminators of the paper. Quite a lot of the candidates managed to get the correct interval containing the median in part (b). Some candidates had difficulty in identifying the midpoints of the intervals in part (c), although many could and usually arrived at the correct answer of 36.4 years but then many failed to correctly translate this into years and months giving an incorrect answer of 36 years 4 months.

Question 7

This question was poorly done by many candidates. A common incorrect answer seen for part (a) was $\overrightarrow{QC} = \frac{1}{3}\overrightarrow{BC} = \frac{4}{3}\mathbf{a}$. Very few candidates gave a complete set of reasons in part (b), usually omitting to state why the triangles were similar. Many instances of attempts at vector division were seen in part (ci) and were not condoned. Part (d) of this question was relatively well answered with most candidates achieving full marks if they obtained the correct scale factor. However, a common error was to set an area of 4x4 = 16 for triangle APO followed by 16 - 4 = 12 for the area of $ACQO$, gaining no marks.

Question 8

There were a considerable number of accurate calculations and plots for parts (a) to (d). However, complete correct descriptions of the transformations were rare. Of those who did collect marks in part (e), the marks were those for 90^o clockwise which collected 2 B marks.

Question 9

Part (a) was nearly always correct, but in part (b) the sum $15x$ = 1 was obtained by few candidates. The most common errors were $15x$ = 360 or $15x$ = 15 or $15x$ = 3. Part (c) was rarely done correctly and was thus another discriminator in the paper. A popular incorrect solution for P(score = 3) was $\frac{2}{20}$ and for P(score = 6) was $\frac{4}{20}$ ie the candidates had basically used their table from part (a).

Question 10

Part (a) was one of the main discriminators of the paper with many candidates not understanding what was required here, or simply omitted this part or 'fudged' a proof. However, a number of candidates did produce clear solutions. It was a pity to observe that many candidates lost marks in part (b) for incorrect rounding. The curve was usually well done with many candidates picking up both marks in part (d) although many instances of '2.5 to 4.5' were seen and these collected no marks. Parts (e) and thus (f) proved elusive to all except the ablest candidates. A common error seen in part (e) was $(2r)^2 = 25r\left(1-\frac{r}{7}\right)$. Part (e) was thus another one of the discriminators of the examination.

Question 11

Parts (a) to(c) were usually well done thus demonstrating that most candidates have a good understanding of two dimensional trigonometry. The commonest errors seen here were rounding errors. Parts (d) and (e) were understood and attempted correctly by a significant number of candidates. A common error in part (d) was to use $\angle BPD$ as 25^o. Also seen on numerous occasions was the use of the inverse of the correct trigonometrical expressions in parts (d) and (e). Many candidates, though, were very confused in part (f) and failed to interpret the three dimensional aspect of the problem. Many failed to recognize that $\angle BCP$ was a right angle. Part (f) was thus another discriminator of the paper and indicated that many candidates still do not understand three dimensional trigonometry.

Statistics

Overall Subject Grade Boundaries

Grade	Max. Mark	A	B	C	D	E	U
Overall subject grade boundaries	100	69	54	39	34	27	0

Paper 1

Grade	Max. Mark	A	B	C	D	E	U
Paper 1 grade boundaries	100	69	54	40	32	25	0

Paper 2

Grade	Max. Mark	A	B	C	D	E	U
Paper 2 grade boundaries	100	70	54	39	33	28	0

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