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Examiners' Report/ Principal Examiner Feedback

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GCE O Level

Mathematics Syllabus B (7361/01)
Paper 1

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Mathematics Syllabus B

Specification 7361

Paper 1

Introduction

There was no evidence that candidates did not have enough time for this paper. However, some questions proved to be quite challenging to a significant number of candidates and, as a consequence, many scripts showed no attempt at a number of questions. The questions where this was evident were: Q14, Q19, Q22 and Q29.

Centres would be well advised, for future examinations, to focus their candidates' attention on the following topics:

- The meaning of a determinant of a matrix
- Symmetry of figures
- Probability – the difference between *with* and *without replacement*
- The correct evaluation of fractional indices
- Correct usage of column vectors in determining coordinates
- Percentages when applied in an algebraic context
- Finding angles **and giving textual reasons** in geometrical drawings
- The application of Pythagoras **only** to right-angled triangles
- Working to the required degree of accuracy
- Volumes of geometrical solids
- Determining rates of flow

It should be pointed out that the methods identified within this report may not be the only legitimate methods for correctly solving the questions. Alternative methods, whilst not explicitly identified, earn the equivalent marks. Some candidates use methods which are beyond the scope of the syllabus and, where used correctly, the corresponding marks are given.

Report on Individual Questions

Question 1

The majority of candidates correctly substituted the values into the expression (M1) and many correct answers of 73.8 (A1) were seen. However, a minority of candidates gave the incorrect answer of -23.8 which followed from -48 - 0.8 +25 or the incorrect answer of 72.2 which followed from 48 – 0.8 + 25.

Question 2

A significant number of candidates gave the answer of $\{-1 \leq x \leq 8\}$ rather than the required answer of { -1, 0, 3, 8 } (B2). If at least three of the four required values were not shown in the working area, both marks were lost here.

Question 3

Better candidates achieved x = -3 (M1, A1) by solving the equation $8 - 3x = 17$ but $\frac{1}{3x-8} = 17$ or $3x + 8 = 17$ were common wrong equations used which led to no marks being awarded.

Question 4

This was generally well done with many candidates correctly identifying that there are three numbers which are divisible by 3 from the given list (B1) and many correct answers of $\frac{3}{10}$ (B1) were seen. The most common incorrect answer seen, which earned no marks, was $\frac{2}{10}$.

Question 5

There was a requirement in this question to convert all three values to the same units (M1). Unfortunately for a significant number of candidates, the conversions were not carried out correctly. In particular, the correct conversion of km to cm proved elusive to many as there were either too many or too few zeros in the conversion. For those candidates who did convert correctly, some of the subsequent attempts at cancelling were incorrect and consequently the last mark was lost. The required answer of 2000 : 1600 : 1 (A1) was, as a consequence, not seen as often as was expected.

Question 6

This was a well-answered question with the majority of candidates recognising that Pythagoras was required to work out the modulus (or length) (M1). Except for the few candidates who evaluated $\sqrt{-8^2+6^2}$ or $\sqrt{(-8)^2-6^2}$, many arrived at the required answer of 10 (A1).

Question 7

A surprising number of candidates simply solved the equation $x+4+x-2+2x-1=0$ to arrive at an incorrect answer of $-\frac{1}{4}$. Others subtracted $x-2$ rather than added. Some candidates seemed to think that quadratic equations were involved and wrote $(x+4)(x-2) = (2x-1)(x-2)$ leading to much working and no marks. Correctly adding $x-2$ to both $x+4$ and $2x-1$ (M1) was seen on a significant number of scripts resulting in the required answer of 5 (A1). Some astute candidates realised that they could shortcut the process by simply solving $x+4=2x-1$.

Question 8

This was a well attempted question with many correct answers of 2.05×10^{-4} seen (B1, B1). Common errors seen were 2.05^{-04} or 7×10^{-10}.

Question 9

Despite being a straightforward question on symmetry, the marks for both parts of the question proved to be elusive to a third of candidates and the answers (a) 2 (B1) (b) 2 (B1) were not seen as often as was expected.

Question 10

This question was generally well answered with many correct matrices seen. Except for the odd arithmetic slip or sign slip, many answers of $\begin{pmatrix} 4 & -6 \\ -4 & -2 \end{pmatrix}$ (B1) were seen in part (a). For those candidates who could multiply two matrices together, the required answer of $\begin{pmatrix} -23 & 18 \\ -26 & 17 \end{pmatrix}$ (B2) was frequently seen in part (b).

Question 11

Probability still proves to be a difficult concept for many candidates and many attempts were seen where *without replacement* was used. Such candidates earned no marks. For those candidates who realised that they needed $\frac{3}{5}\times\frac{2}{5}=\frac{6}{25}$(M1), many simply stopped here and earned no more marks. Doubling or adding $\frac{6}{25}$(M1 dep) invariably led to the required answer of $\frac{12}{25}$(A1). About half the candidates earned no more than the first mark in this question.

Question 12

This question was reasonably well attempted with about 70% of candidates writing down the required answers of (a) 3, 8 (B1), (b) 4, 7, 9 (B1), (c) 1, 5, 6 (B1).

Question 13

There were some very good attempts at this question often resulting in the correct answer of $\frac{65}{32}$ (B1, B1, B1). Weaker candidates, however, seemed to think that $64^{0.5}$ was 32 or $64^{1/3}$ was 21. A sizeable majority left their answer as $\frac{8.125}{4}$ not realising how to express the answer in integer form. These candidates only achieved two of the three marks available for the question.

Question 14

Many candidates did not seem to know where to begin with part (a) and very few scripts showed the column vector $\begin{pmatrix} 0 \\ 4 \end{pmatrix}$ (B1) which was a necessary step to arrive at the answer of (5, 3) (B1). Candidates who left their answer as the column vector $\begin{pmatrix} 5 \\ 3 \end{pmatrix}$ did not earn this second mark. As a consequence of many incorrect answers to part (a), there were very few correct answers of $x = 5$ (B1) in part (b).

Question 15

It was pleasing to see much correct algebra in this question and many candidates were able to arrive at the inequality x < 4.33 (M1, A1). The difficult step seemed to be identifying the largest possible integer and many incorrect statements such as $x = 4.33$ or $x = 5$ were seen. Such answers did not earn the last mark which was for $x = 4$ (A1).

$x < 4$ was seen on some scripts. This did not earn the last mark.

Question 16

Again, much good working in this question with many candidates using $\sqrt{8}$ or 19.5° (B1). A successful substitution into the given expression (M1) led many of those candidates who used $\sqrt{8}$ to the required answer of $\frac{73}{72}$ (A1). The candidates who used 19.5° earned no more than method here. The most common error seen was $\frac{65}{24}$ from candidates believing that $\left(\frac{\sqrt{8}}{3}\right)^2 = \frac{8}{3}$ rather than $\frac{8}{9}$. Some candidates insisted on using $\sqrt{8}$ = 2.8 or 2.82 and, as a consequence, earned no more than two marks.

Question 17

Many candidates did well with this question; successfully using either 4 cm (radius) or 8 cm (diameter) (B1) in a correct Pythagorean statement (M1).

Despite some candidates losing the final mark through rounding errors, a significant number of candidates arrived at the required answer of 5.66 cm (A1). Somewhat of a concern, however, was the number of candidates who, on seeing a circle, used either πr^2 or $2\pi r$. These candidates earned no marks for this question.

Question 18

Many candidates realised that the numerators needed to be balanced and many correct first steps of the form $3m + n - 3(m - n)$ (M1) were seen. Correctly removing the brackets and placing over the required denominator (M1 dep) however proved to be more problematic with $\frac{3m + n - 3m - 3n}{12}$ often seen leading to an incorrect answer of $-\frac{2n}{12}$ (or equivalent). One arithmetical slip was allowed for the second mark which enabled most candidates to obtain two of the three marks for this question. A significant number of candidates failed to simplify a final answer of $\frac{4n}{12}$ to the required answer of $\frac{n}{3}$ (A1). Such candidates lost this last mark.

Question 19

The mean mark for this question was under one as a significant number of candidates did not seem to know where to begin. Indeed, many scripts showed no working at all.

Of those candidates who did make an attempt, many tried to avoid using any algebra and a number of these candidates were successful in at least reaching a value of 75% which was one step away from the required answer.

Candidates who did not use any algebra at all were penalised once only in the question. Of those candidates who made a start, many simply wrote down $\frac{a-0.1}{b\pm 0.2}$ or even $G = \frac{-\mathbf{10}}{\mathbf{20}}$ = -0.5% thus earning no marks.

Only on a very small minority of scripts were the expressions $0.9\times a$ or $1.2\times b$ (M1) seen. Indeed, of these candidates, some lost the remaining marks because they treated a 20% increase in *b* as a decrease and used $0.8\times b$ instead. As a consequence, few expressions of the form $\frac{0.9a}{1.2b}$ (M1) were seen and the required answer of 25% (M1, A1) proved to be elusive to many candidates.

Question 20

This type of question has usually been attempted well in previous examinations. Indeed, many candidates here were able to correctly identify the constant, *k*, as $k=\frac{V}{d^3}$ (M1, M1dep). A significant number of candidates however seemed unable to handle the third stem of the question and many used *D* instead of D^3. Such candidates lost the final two marks.

Of those candidates who did correctly used D^3 and wrote down $3V=\frac{V}{d^3}D^3$ (M1 dep), not all produced the required answer of $\sqrt[3]{3d}$ (A1) as many either left expressions which still involved *V* or gave answers of the form $D = 3d$ or $D=\sqrt{\mathbf{3}d}$ thus losing the last mark.

Question 21

In part (a), many candidates did not seem to understand the concept of the median and many incorrect answers, rather than the required answer of 4 (B1), were seen.

Indeed, a popular incorrect answer was 2.5. Presumably this answer was arrived at by calculating $\frac{0+5}{2}$.

Whilst many candidates achieved a correct mean of 3.225 or 3.23 (M1, A1, A1) in part (b), there were many instances of 3.22 seen. Such candidates lost the last mark.

Other incorrect solutions seen included $\frac{\mathbf{40}}{\mathbf{5}}$ = 8; $\frac{\mathbf{15}}{\mathbf{6}}$ =2.5; $\frac{\mathbf{15}}{\mathbf{40}}$ = 0.375 and $\frac{\mathbf{40}}{\mathbf{6}}$ = 6.7.

Question 22

With a mean mark just above one, this question was very poorly attempted indeed with many candidates not even attempting the question. Of those candidates that did attempt the question, some arrived at the required answer but many either gave no reasons at all or reasons which did not justify giving a mark. Of those candidates who started the question, many seemed to be confused between the angles of a hexagon and angles of a pentagon and 108° was a common incorrect angle given. The minority of candidates who did start the question successfully, arrived at $\angle AFE = 120°$ or $\angle XFY = 60°$ (B1). A suitable geometrical reason in words (B1), however, often proved elusive. The required answer of 30° (B1) was seen on very few scripts and this answer was often not supported by a further suitable geometric reason in words (B1).

Question 23

Many correct answers of £ 127 500 (M1, A1) were seen in part (a) as candidates appreciated that they needed to determine 85% of the money loaned by the bank. Some candidates spoilt their good work by then subtracting this value from £ 150 000 to arrive at £ 22 500 thus losing the last mark. Part (b) proved to be a little more elusive to candidates as many started with the value of £150 000 rather than their answer to part (a). As a consequence, not as many candidates as expected calculated $\frac{127500}{2.5} - 30000$ (M1) to arrive at the required answer of £ 21 000 (A1).

Question 24

Many candidates constructed the perpendicular bisector correctly (M1, A1) and were able to accurately locate the position of *C* (B1). The demand in part (c), *shade the region ΔABC containing the points which are more than 3 cm from B*, proved to be too difficult a concept for many and only a minority of candidates were able to construct a 3cm arc at *B* (B1) and complete the required shading outside of the arc but inside the triangle (B1).

Question 25

Some rather strange looking graphs were seen in this question. The first line needed to be drawn from (1,0) to (2.3, 84) (B1) but on many scripts this line was drawn to the point with coordinate (2.3,80). Many candidates recovered with the second part of the journey correctly drawing a horizontal line of length 1 hour (B1 ft). The calculation of the time in part (c) (M1) often led to 1.5 or 1.55 or 1.56 instead of the correct 1.6 hours (A1). The third part of the journey was not always drawn accurately (B1 ft). Indeed, a significant number of graphs terminated at 4hours 36 minutes even when 1.6 had been achieved in part (c). On a minority of scripts the final line was drawn back to the starting point on the grid.

Question 26

Apart from the few candidates who used the incorrect trigonometrical ratio, part (a) was answered well with many correct answers of 6.93 (M1, A1) seen. Occasionally, candidates reduced their answer to 6.92 and this was penalised. Determining *BC* (M1) and *AC* (M1) correctly and then using Pythagoras (M1 dep) led a surprising number of candidates to the answer of 21.3 cm rather than the required answer of 21.4 cm (A1).

The accuracy mark was lost by these candidates who did all their working to 3 significant figures. Centres are advised to ensure that their candidates work to a greater degree of accuracy than that which is required. A significant number of candidates determined the lengths of *BE* and *AE* and then incorrectly applied Pythagoras to Δ*ABE*. These candidates earned, at most one mark. Where the cosine formula was used, there were mixed responses with as many correct substitutions as incorrect substitutions seen. Equivalent marks were awarded for correct working, involving a correct use of the cosine rule.

Question 27

There were many incorrect responses in part (a) with $\frac{100}{360}$ x 480 = £133.33 being seen instead of the correct $\frac{480}{120}$ x 100 =£400. (M1, A1). Candidates who used the same incorrect method in part (b) to arrive at an answer of £188.67 were not penalised twice for method and were award one mark here. Candidates with the correct answer to part (a) invariably produced the required answer of £560 (M1, A1) for this part of the question.

Despite much wrong working in the first two parts of the question, many candidates were able to accurately draw the required pie chart (M1, A1). Some candidates, however, lost a mark here because they used their protractor incorrectly, measuring the furniture sector as 80^0 rather than 100^0.

Question 28

Many correct evaluations of $2 \otimes 1$ (B1) followed by the required answer of -2 (B1) were seen in part (a) but some candidates seemed to think that $\frac{3}{3} - 3 = 0$ instead of -2 and even $\frac{2+1}{1} = 2$ instead of 3.

In part (b), many candidates started with a correct statement, $6 \otimes \left(\frac{x}{5} - 5\right)$ (M1) and a significant number continued by writing down the correct equation, $\frac{6 + \left(\frac{x}{5} - 5\right)}{\frac{x}{5} - 5} = -4$ (M1). Having reached this point, many candidates did not score more marks as the complexity of the algebra proved too difficult and it was rare to see a final answer of 19 (M1, A1).

Question 29

This question was not attempted well at all and very few complete and correct answers were seen. Many candidates either did not attempt the question at all or simply misquoted the formula for a cone. Of those candidates who could quote the formula for a cone correctly in part (a), many incorrectly subtracted $\frac{1}{3}\pi \times 9^3$ from $\frac{1}{3}\pi \times 10^3$ rather than subtracting $\frac{1}{3}\pi \times 1^3$ (M1). Of those few candidates who achieved the method mark, a significant number left their answer to either 2 decimal places or gave the answer as 333π. Whilst both answers are correct, an answer of 1046 cm^3 (A1) was required. Many of the candidates who arrived at any answer in part (a) were unable to show a complete method in part (b).

The majority of candidates who achieved any marks at all in part (b) were able to divide their answer to part (a) by 3 x 60 (M1, M1). However, dividing 9 by 180 (where 9 is the height of the remaining frustrum) earned no marks whatsoever. A very small minority of candidates did realise that they also needed to divide by the cross-sectional area, $\pi \times 1^2$ (M1, M1), of the bottom of the frustrum but the required answer of 1.85 (A1) was very rarely seen.

Statistics

Overall Subject Grade Boundaries

Grade	Max. Mark	A	B	C	D	E	U
Overall subject grade boundaries	100	71	55	40	35	26	0

Paper 1

Grade	Max. Mark	A	B	C	D	E	U
Paper 1 grade boundaries	100	72	58	45	36	27	0

Paper 2

Grade	Max. Mark	A	B	C	D	E	U
Paper 2 grade boundaries	100	71	54	37	31	25	0

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