Level 2 Certificate
Further Mathematics

83602 Paper 2

Report on the Examination

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General
Most students completed the paper in the time allowed. There were a small number of questions with a high number of non-attempts and this was most likely due to the difficulty of the topics rather than a lack of time. Work was usually well presented. Some students need to take more care with their use of brackets in algebra questions. The transposing of coordinates is another error that appears quite often.

Topics that were well done included:

- *n*th term of a sequence
- integers problem
- solving an equation involving a cube root
- trigonometry in triangles
- change of subject.

Topics which students found difficult included:

- matrix equation
- simplifying algebraic fractions
- trigonometry using a graph
- trigonometric identities.

Question 1

Part (a) was well answered. Part (b) was often incorrect with $\frac{3}{2}$ a common wrong answer.

Answers in terms of n were also quite common.

Question 2
Many fully correct responses were seen in part (a) but there were also frequent slips resulting in at least one element being incorrect. Some thought that each element in **A** should be squared.
Part (b) was not well answered. Many incorrect equations were seen with k often being omitted from the expansion of $k\mathbf{B}$. Part (c) was also not well answered.

Question 3
Part (a) was well answered. In part (b) nearly all students factorised correctly. Fully correct responses often followed but quite a lot of answers had b as 36 when this had to be the value for a.

Question 4
This question was well answered. The common error was to take the cube root of 14.

Question 5
There were many fully correct solutions with most of these coming from setting up a simple linear equation. Others attempted to use Pythagoras' theorem and this approach rarely led to a correct answer, usually because of using $2PM^2 = PQ^2$.

Question 6
Nearly all students applied correct trigonometry to their right-angle triangle but it was quite common to have angle *VAC* labelled as 38°.

Question 7
Many different methods were used in this question. Errors in working out the coordinates of *A* and *B* were quite common, including transposing a point's coordinates and transposing the points *A* and B. Similarly, the coordinates of *P* were often transposed or even when correctly worked out they were often used incorrectly in an area calculation. Some worked out the area of triangle *OAP* but did not subtract this from the area of triangle *OAB*. Those who worked out the length *AB* and the length *BP* and the size of angle *OBP* only occasionally gave a fully correct response.

Question 8
This question was well answered.

Question 9
This question was quite well answered and was a good discriminator at the target grade. Many students correctly worked out the range of values of x for each inequality. Some then gave either 2 or 1 as the only integer value. Others used substitution and some of these attempts were not communicated very well.

Question 10
Many fully correct responses were seen. Most students used the correct formula but a common error was to halve 231.04 when they should have taken the square root. Others made errors when rearranging, particularly with sin 150°. Another error was to work with one of the 15° angles. Some obtained the correct answer but continued to work out *BC*.

Question 11
Both parts were good discriminators. In part (a) many students drew the two straight lines correctly although the line between $x = 4$ and $x = 5$ was sometimes curved. Most plotted the correct points for the curve although these were sometimes joined by straight lines or by a poor quality curve. Only a few students drew a graph for an incorrect domain. In part (b) a common error was to repeat the domain. Others made a notation error but did select –5 and 7 as the relevant values. Statistical ranges were sometimes seen.

Question 12
Part (a) was answered quite well but many stopped after taking out a factor of 3. Part (b) was well answered with most expanding both brackets before collecting the terms. Errors with brackets were quite common.

Question 13
Very few students factorised at the outset or attempted to cancel before multiplying out numerators and denominators. This led to fractions that were subsequently quite difficult to simplify and many answers were left in an unsimplified form. Errors were often made in expanding, leading to incorrect powers of a.

Question 14
There were many fully correct responses. Common errors were to have an incorrect gradient for $x + 4y = 74$ and to not use the correct relationship between the gradients of perpendicular lines. Some students did not show what their gradient was for $x + 4y = 74$.

Question 15
This question was well answered.

Question 16
Part (a) was well answered. Part (b) was not well answered with most students choosing 125^x
In part (c) the correct answer was selected most often but the part was not very well answered.

Question 17
In part (a) most students attempted differentiation and had at least one correct term. Many progressed to complete a fully correct response but often also included work on the second derivative. Others ignored their first derivative and equated the second derivative to zero.
There were many correct responses to part (b) although some did not use brackets when working out $6 \times (-1)^2$ and made arithmetic errors. Different methods were used to factorise the cubic expression in part (c). Errors were quite often made when using the quadratic formula, sometimes due to not using brackets for $(-7)^2$. Some tried to use the quadratic formula on the cubic equation.

Question 18
Many students omitted brackets when applying Pythagoras' theorem. Often, their equation was manipulated to the form $ax^2 = by^2$ and this was used to obtain an expression for the area.

Question 19
None of the three parts were well answered. Very few students knew how to answer part (c).

Question 20
In part (a), referring to the angle in a semicircle was not a common response. A few explained correctly using the angle at the centre being half the angle at the circumference. For the proof in part (b) it was necessary to make clear statements in a particular order. Many students started off correctly but then made an incorrect statement. Others started by assuming that angle *DCE* was $2x$ which was not acceptable. Some excellent responses were seen that included explanations of the angle properties being used; but there were also quite a lot of non-attempts.

Question 21
Part (a) was well answered. Working for part (b) was often shown on the previous page and this part was answered quite well. Some used incorrect notation, for example, labelling the gradient function as y. Part (c) was a good discriminator. There were many non-attempts but also a significant number of fully correct, well presented responses.

Question 22
This question was a good discriminator with some excellent algebraic work being seen. Common errors include omission of brackets and expansion errors. Some students did not eliminate a letter and just expanded one bracket to obtain a quadratic equation in one variable. Most of those who obtained the correct quadratic equation used factorisation to solve it.

Question 23
A significant number of students replaced $\tan^2 x$ with $\dfrac{\sin^2 x}{\cos^2 x}$ but then could not make any further progress. Many scored zero including a large number who made no attempt.

Question 24

Most students attempted this question and quite often made a correct start. Subsequent working was often incorrect, sometimes because a second set of brackets was required. It was common to see several attempts being made.

Use of statistics

Statistics used in this report may be taken from incomplete processing data. However, this data still gives a true account on how students have performed for each question.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.