LEVEL 2 CERTIFICATE
FURTHER MATHEMATICS

8365/2 Paper 2 Calculator
Report on the Examination

8365
June 2022

Version: 1.0

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Summary

The first examination for this new specification was in November 2021 but that had a very small entry so care should be taken when making comparisons with June 2022.

This paper proved accessible to most students and many excellent responses were seen. Most students showed their working and followed the instructions given in the questions. Questions that ask students to show that a result is true were sometimes not answered clearly. Some handwriting was difficult to read and premature approximations sometimes led to an accuracy mark not being scored.

Topics where students excelled

- simple factorisation
- using midpoint
- matrices with algebra
- recognising an exponential graph
- cyclic quadrilateral
- expanding three brackets

Topics where students struggled

- right-angled trigonometry with an inequality
- differentiation of an algebraic fraction
- solving a trigonometric equation.

Individual questions

Question 1

This question was answered very well. A few students only partially factorised.

Question 2

Various approaches were seen and most were fully correct. Most errors were made when trying to use the equation of the line rather than the more straightforward midpoint formula.

Question 3(a)

Most students were able to correctly multiply a matrix by 3. Some struggled to multiply a pair of 2 by 2 matrices correctly with some conceptual errors seen. Overall there was a good response to the question.

Question 3(b)

Well answered by many students. A common error was to square root 64 after obtaining the equation $a^3 = 64$. The follow through for the value of b helped many students score 2 marks out of 3.

Question 4

The common error was to use a gradient of 4 or $\frac{1}{4}$ or $-\frac{1}{4}$ for line B.

Substituting $(2d, d)$ into their equation for B was also seen quite often. There were many fully correct solutions.

Question 5

Most students could write a simplified correct inequality. Many of these could then progress to the three correct integers but some gave $x < 4$ as their answer. Others included -4 in their list. Some gave an inequality alongside the three correct integers.

Question 6

Common errors were omitting the bracket after the subtraction or expanding their brackets incorrectly and not dealing with the minus sign. Some students misused the equals sign and showed rows of working that were not equal and this meant that full marks could not be awarded. Showing each step is important when asked to prove or show that something is true.

Question 7

This was a new topic compared to the previous version of this specification and the question was answered quite well. Many students gave a response that showed some understanding with 120, 360, 600 and 720 being seen quite often. A common error was to multiply all the given digits. Others worked out 240 but then did further work and gave a different answer.

Question 8(a)

Most students attempted differentiation and usually had at least one term correct. A common error was to rearrange incorrectly or to not give the answer in the required form.

Question 8(b)

Not giving both solutions to 3 significant figures was the most common error. Mistakes were made when substituting into the quadratic formula. Those who did not show their method scored 2 marks or zero marks. A significant number of students benefitted from the follow through from part (a).

Question 9(a)

This question was very well answered. Most who didn't score divided the correct expression and gave $5 + 2k$ as their answer.

Question 9(b)

Well answered although there were very few who gained part marks. The most common error was to use the 101st term rather than the 100th term.

Question 10

This multiple-choice question was very well answered. The most common incorrect choice was graph C.

Question 11

This novel question was not well answered. Many worked out 60° but never showed an inequality. Others substituted $a = 6$ and worked out 41.4°. The most common wrong answer was $x > 60$ with some of these scoring one mark by having $\cos x > \frac{1}{2}$ in the working lines.

Question 12

This question was not well answered with many students just differentiating the numerator and the denominator. Others only substituted into the given expression. Those who did simplify the fraction before differentiating were usually able to score some marks but fully correct solutions were not seen often. The term $\frac{3}{4x^2}$ was often processed incorrectly.

Question 13

Many students worked out the centre correctly but some used (3, 4). A significant number were unsure whether 5 was the radius or the diameter. Some used the diameter of 10 in their equation of the circle. Fully correct equations were seen in a small majority of responses.

Question 14

Different approaches were seen when forming an equation but most were correct. Some errors were made when eliminating brackets. A few thought the two angles were equal.

Question 15

This question was answered quite well. Most students simplified the brackets first and this was usually completed correctly. Most knew how to deal with division but there were quite a lot of errors made when simplifying the square root. Some squared everything but rarely took a square root at the end to recover this. Obtaining a single fraction but not simplifying fully was quite common.

Question 16

The angle included between the two given sides was often worked out correctly but a significant number of students thought that this was angle y. Those who worked out the perpendicular height usually worked this out correctly as 15 cm but often made no further progress. Most fully correct solutions started by using $\frac{1}{2}ab\sin C$ and then used base angles of an isosceles triangle.

Question 17

This was a new topic compared to the previous version of this specification and the question was answered quite well. Many students were able to work accurately although sometimes their working was hard to follow with equations all over the page and no logical order. Generally those who used elimination rather than substitution were more accurate and progressed further. Some

students eliminated terms too early and were left with incorrect equations. There was evidence of students using trial and improvement if their algebraic method had gone wrong.

Question 18

Many students were able to correctly work out *PG*, *PC* and *AC*. Most knew to use the cosine rule in triangle *APC* but some substituted incorrectly, often omitting brackets, and many rearranged the formula incorrectly or inadvertently used it to find one of the other angles.

Question 19

This question was well answered. Some students made sign errors or miscopied their working from one line to the next.

Question 20(a)

Most students knew to substitute $x = \frac{1}{2}$ and there were only a few who made calculation errors or forgot to show $= 0$. Most of those who did not score any marks used algebraic division, ignoring the instruction to use the factor theorem.

Question 20(b)

This question was answered quite well. Some students attempted algebraic division but worked out the coefficient of x incorrectly so made no further progress. Sometimes students factorised correctly but then used the incorrect signs for the solutions. Occasionally students made statements that confused factors with solutions. Those who started by differentiating often worked out the x-values of the turning points but thought these were the two solutions of the cubic equation. Some students had clearly solved the cubic on their calculator but then were unable to show the full factorisation.

Question 21

This question was not well answered. A significant number rearranged correctly but often forget to consider the negative square root. Most students who scored well on this question worked using $\tan x$ with those converting to $\sin x$ or $\cos x$ rarely scoring more than one mark.

Question 22

There were some very good responses with most students showing their working. Those who used powers of 2 often got as far as a quadratic equation but sometimes still had $= 1$ from their rearrangement, not realising that $2^0 = 1$. Some made a slip rearranging and factorising at the end. Those who worked with powers of 16 rarely made any significant progress.

Mark Ranges and Award of Grades

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