LEVEL 2 CERTIFICATE
FURTHER MATHEMATICS

8365/1: Paper 1 (Non-calculator)
Report on the Examination

8365
June 2023

Version: 1.0

Summary

Overall performance compared to last year

There have only been two papers of 8365 so far. The November 2021 paper had a very small number of entries so it is not sensible to draw comparisons from this paper. There has been an improvement in scoring compared to the June 2022 paper with the mean mark increasing by over 3 marks and the cumulative percentage of students with over 70 marks and over 60 marks significantly increasing. There has been a similar pattern in which questions scored well and which ones poorly to the June 2022 paper however there has been a clear improvement in the understanding of angles outside the first quadrant with Q12b scoring better than previous questions on this topic. There was also improvement in the matrices questions from previous years.

Topics where students excelled

- surd manipulation and rationalising
- algebraic proof
- matrices
- second differentials

Topics where students struggled

- non-linear simultaneous equations
- solving equations with indices
- re-arranging equations for spatial problems

Individual questions

Question 1a

Far too many candidates substituted $x = -5$ into the function rather than realising the function itself equalled –5. This resulted in 0 marks. A number of candidates think that –5 – 1 is –4 unfortunately. There were a small number of SC1s from a likely miscopy.

Question 1b

Done well. There were a number of careless errors: particularly $3^2 = 6$. Those candidates that followed Alt 1 usually gained 2 marks. There were more errors on Alt 2. A small number of candidates gained B0B1ft from Alt2 but B0B1ft was very rare from Alt 1. There were instances of SC1.

Question 2

This question was done well by most candidates. Some did not factorise fully or made an error but could still gain B1. Quite a few candidates missed the final bracket off which was condoned. (3xy)(2x+7) was condoned for B2. There were instances of all three SC1s seen.

Question 3a

This was automarked with about three quarters of candidates gaining the mark. There was a mix of incorrect answers including a small number of candidates choosing more than one option.

Question 3b

There are clearly some centres still not teaching the matrices topics judging by the number of non-attempts to this question. Those that did attempt the question usually made a good job of it. Some candidates lost the second mark due to not stating the identity matrix.

Question 4

Part (a) and part (b) were marked together in case a sketch had been drawn containing information for both parts. Both parts were answered well by most candidates. Errors in part (a) came from numerical errors mainly. A few candidates had change in x at the top and change in y at the bottom. $\frac{3}{1}$ was not awarded the A mark as it was not complete. Most of the errors in part (b) came from not being able to simplify root 40. There were very few examples of candidates using the incorrect values from part (a) and gaining the ft mark in part (b).

Question 5

Alternative method one was the most elegant proof but not many candidates tried to use this method. This question was done well by most candidates however. It was also pleasing to see how many of them completed their proof with a closing statement (although we didn't require one with this being so early in the paper). Too many candidates are dropping brackets though. Some of these managed to recover them by reaching 3n+3 but some didn't. Being a proof it was necessary to show each stage of the process and some candidates lost marks by going straight from expanding the brackets to 3n+3 without showing any evidence of subtraction taking place.

Question 6
Most candidates differentiated but then some didn't know how to get the gradient when $x = 1$. We were generous about what we allowed to be used as a gradient for the third mark as we were examining them knowing how to find the equation of a straight line for this mark. A surprisingly high number of candidates found the equation of the normal rather than the tangent (and for the most part did it correctly gaining 3 marks).

Question 7
Many correct solutions. Some candidates don't know how to find the area of a triangle sadly which limited them to a maximum of 1 mark. Too many candidates were expanding $4(\frac{1}{2}y^2x)$ as $4 \times \frac{1}{2}y^2$ + or x $4x$. A small number of candidates found the correct answer but then rationalised the root pi in the denominator. As long as this was done correctly we didn't penalise this.

Question 8
Too many candidates think that $\sqrt{x^2 - 25}$ is $x - 5$. A number of candidates ignored the guidance to not use trial and improvement and tried to draw a graph. This was not accepted as a valid method due to the lack of accuracy involved. Some candidates went for guesswork and managed to get the correct answers but without working this was worth no marks (although some of them still gained the first mark). Sadly a small number of candidates worked it all out correctly and then put the coordinates in the wrong order (so lost the last A mark).

Question 9
A large majority of candidates can do these very neatly and quickly and once again it regularly scored highly. The A mark was sometimes lost due to not writing $y =$ on the answer line or for not rooting the term. Most candidates gained at least one mark.

Question 10
Most candidates completed this correctly. A common error was getting 9+5 in the denominator. Some candidates lost the final mark as they simplified incorrectly. There are still some candidates who don't know what to multiply by to begin the method. $2 \pm \sqrt{5}$ was condoned.

Question 11
Lots of full marks awarded on this question. 2 marks came from writing ±7 or from 55-6 not getting 49. Too many candidates made an error in their differentiation and couldn't get more than 1 mark. $\sqrt{49}$ wasn't enough to gain the A mark.

Question 12a
Quite a few candidates used a trigonometrical graph to work it out the answer. Very few CAST diagrams seen though. This question was answered well.

Question 12b
$\frac{\sin y}{\cos y} = \frac{\sqrt{3}}{3}$ was considered enough for M1. Some candidates used other identities to reach $\sin y = 0.5$ which gave 30° which gained M2 but this didn't help them to get 210° so the final mark was lost. There was an unusually high number of non-attempts for a question this early in the paper. Quite a few candidates manipulated incorrectly to get $\tan y = \sqrt{3}$ and so went for y = 60° for 0 marks. Those candidates using CAST diagrams usually gained 3 marks. Those using the tan graph less so and those not using any diagram usually left it at 30°.

Question 13
A number of candidates tried to split the question into two parts. This method can work well but too many candidates forgot about the 1 and either didn't deal with it all or just added it to the numerator without considering the common denominator (resulting in 0 marks). Some candidates gained the answer but then did further working (many getting $3 - \frac{10}{3x}$) so lost the A mark.

Question 14
The majority of candidates managed to form one of the quadratics (but those not realising they needed to multiply by x gained 0 marks). Unfortunately, far too many then factorise incorrectly or try to complete the square (or use the formula). Too few candidates checked their inequality at the end and a substantial number of them lost the A mark because of this.

Question 15
This question was very poorly done and proved to be the hardest question on the paper. Most candidates tried to expand the brackets with just 2 terms and forgot about the middle terms of the expansion. Those that did expand properly usually worked it through for full marks. Most of the solutions that were awarded 1 mark were for either factorising an incorrect cubic equation or the SC1 for writing $x = 0$ which may have come from observation, incorrect working or a lucky guess. Some candidates chose to change the indices into surd form but this was rarely successful.

Question 16
There are still some candidates adding within terms for the expansion rather than multiplying ie. $6(1^2) + 12x^2$ which didn't gain any marks. There were a large number of non-attempts on this question which would suggest that some centres are not teaching this topic. Some candidates attempted to expand the brackets rather than using the Binomial expansion which usually used up a lot of time and rarely delivered results.

Question 17

Far too many candidates didn't realise that they needed to differentiate. They did not pick out the words 'stationary point'. Some knew to differentiate but then forgot that $\frac{dy}{dx} = 0$ at a stationary point. A number of candidates appeared to guess the values of a and b from $-2a + b = 1$ without doing any differentiation. This had to be awarded full marks as the answers were not from incorrect working (only partial working).

Question 18

Too many candidates do not check their answers and write solutions that don't work in all three equations. Many candidates worked this question through efficiently to gain full marks. Candidates gaining the correct answers from either incorrect working or with no working didn't score on this question. There were not many 0 marks awarded and most candidates could eliminate one unknown from two equations.

Question 19

The B scheme worked very well for this question. Candidates not gaining two of the values could still gain a mark by completing the square or by showing an understanding of equating identities. Although the numbers used in this question were not easy ones to manipulate the question in general was done quite well.

Question 20

The first 4 marks were straight forward to mark. However there are numerous ways to gain the last 2 marks. The most popular methods included dividing the Isosceles triangle in half or using the sine rule however students could also use the cosine rule to get:

$21 = r^2 + r^2 - 2 \times r \times r \times \cos 120$ leading to $21 = 3r^2$

An unusual method that was seen but which is equally correct is to combine the area of a triangle formula with the sine rule to get $\frac{abc}{4r}$ where r is the radius of the circumcircle. This then leads to:

Area of QPR = $\frac{1}{2} \times 4 \times 5 \times \sin 60 = 4 \times 5 \times \frac{\sqrt{21}}{4r}$ which can be solved for r.

A small number of students used the fact that it was a 30, 60, 90 triangle and used ratios. A small number of students wrote the answer without working and this had to be given the benefit of the doubt for all 6 marks.

Mark Ranges and Award of Grades

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