Questions matter

Level 2 Certificate
Further Mathematics

8365/1 Paper 1 Non-Calculator

Report on the Examination

8365
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Overall performance compared to last year

This is the third full edition of this specification (the November 2021 paper had a very small number of entries, so it is not valid to draw comparisons from that paper). The spread of marks would suggest this paper was slightly harder than last year's. The mean mark in 2023 was 52.5 and this year it was 49.6 (which is very similar to the 49.2 in 2022). Similarly at the top end only 14% of students secured 70 marks or over compared with 20% last year. The numbers at the lower end are very similar though with approximately 5% of students scoring 20 or less in both years.

There was a pleasing improvement in the performance of students for the indices question and as has usually been the case, students generally do better at topics that are also on 8300.

Topics where students excelled

- rationalising
- 3D Pythagoras
- cosine rule
- completing the square

Topics where students struggled

- using a linear graph and quadratic graph to solve a different quadratic
- expanding brackets (particularly when a negative is involved)
- matrix transformations
- trigonometrical manipulation

Individual questions

Question 1

Most students scored both marks. Some made errors in their working to score 1 and some were able to get a mark for values embedded in incorrect working (as this is question 1). On a non-calculator paper students should realise that much will cancel out to leave an easy calculation, but many get tangled in standard form or surd answers.

Question 2

A large number of students didn't spot the difference of 2 squares here.

Question 3

About 80% of students gained the mark. There was a mix of incorrect answers including a small number of students choosing more than one option.

Question 4

Some made errors in rearranging ($y = 3x - 5$ was common for the second equation). As the question says show that they are parallel, students must complete their working with the statement that the two lines are parallel. If they didn't mention that they were parallel they didn't score the A mark (this cost quite a few students). Very few students used Alt method 2.

Question 5

Lots of 3s and lots of 0s. Even after the comments from previous years, many students are still not splitting the fraction into 2 simplified terms before differentiating. Those that do usually score 3 marks.

Question 6

This question didn't perform as well as expected with too many students not working out the radius correctly. Mainly 3 marks or 1 mark awarded but a few 0s and 2s appeared as well.

Question 7

Some students write the left-hand side correctly but don't write the right-hand side. This could be recovered for M2 by writing the equations but didn't qualify for M1 on its own. A number of students wrote the matrices in the wrong order which once again could be recovered but in most cases wasn't. There were a number of special cases for this question. There was merit in multiplying the 2×2 matrix by $(-8,\ 7)$ and if this was done correctly it gained SC1.

Question 8

Too many students left the equation factorised in brackets without solving so lost the final mark. Similarly, quite a large group of students cancelled through by x without ever stating that it could be a solution and could only gain 1 mark.

Question 9

Most students are getting 3D Pythagoras correct, some of them very quickly. There were quite a few misreads of the diagram with SC1 being awarded in these cases. Some students left their answer as $\sqrt{169}$ so lost the final A mark.

Question 10

Lots of students managed to get to the two simultaneous equations but then made careless errors costing them one or both A marks. It is a concern how many students couldn't get the coordinates of point P.

Question 11a

Lots of correct answers. Most students use alt method 1. Some do long division but make an error and get $x^2 - x - 2$ and then don't score. $(-x+1)(-x-2)$ was also a possible pair of factors that wasn't stated on the MS, but it was seen very rarely. Quite a few students lost the final mark for putting numbers on the answer line rather than factors.

Question 11b

Students that followed alt method 1 virtually always continued on to gain full marks. Students trying to use other methods (possibly because they hadn't realised that it was a factor theorem question) rarely gained full marks but quite often gained the first M mark. It was interesting to see a number of students using a grid reduction method to solve this question with a small number gaining full marks (on the whole most using this method rarely scored more than 1 mark though).

Question 12

Done well by most students though some made the expected error of trying to use $\cos\frac{3}{4}$ and didn't score. The rest of the errors were down to carelessness. Some can't follow BODMAS and do 244 – 240 and then try to work out $\frac{3}{4}$ of it. A surprisingly large number couldn't do 244 – 180. There are also a small number who couldn't copy the cosine rule accurately from the formula sheet.

Question 13

This question gave a good spread of marks. Lots miss $3 < x$ which costs them the B mark. Some lose marks (between 1 and 3) for using T&I – evidence of working needs to be seen. There were some careless errors in calculations. Some use $=$ instead of $<$ but most of these recover it in the answer line (some don't though and then only score 1). $15(x - 2) < 30$ was seen a few times which is equivalent to M2.

Question 14a

A high number of misreads and slips on this question which usually involved changing signs in the middle of working or losing the square towards the end. Sometimes this could be awarded full marks if the correct answer had already been seen. A lot of correct answers though.

Question 14b

Surprisingly poorly done. Many students expand and then try to factorise or use the formula. Others solve incorrectly. Too many work it out correctly and then forget there are two answers so lose the mark. Some students found the turning point and should remember to read the question. Being only worth 1 mark would suggest it's a lot easier than many of the students gave it credit for.

Question 15

Parts a and b were marked together as some students drew diagrams that could overlap the space on the page. Part a was generally done well although some students put –1 instead of 0 and 0 instead of –1. Part b provided a range of answers. Many students just wrote down the correct answer whilst others preferred to find $\mathbf{N}^2$ first. A small number of students wrote down the transformation of $\mathbf{N}$ which was given the benefit of the doubt that this was the first part of their working rather than their final answer. Too many students lost the A mark for not stating the rotation or enlargement was about the origin or wrote it was round the centre.

Question 16

Most students followed the method in the mark scheme. There are other possibilities which were used by a small number that came up during marking (sometimes they followed it through for a fully correct answer and sometimes they didn't). It is worth noting for future papers that many students didn't state reasons (we didn't ask them to here, so it didn't matter for this paper) and those that did sometimes wrote incorrect versions such as delta theorem or line/angle theorem. It was disappointing to see how many students did the circle theorems correctly then made an error on $128 \div 8$ or even 16×5

Question 17

Too many students think that $7(3x + 4) = 21x + 4$. Alt method 1 is the most efficient method and most students who followed this method scored at least 2 marks. Fortunately, the vast majority followed our instruction to show that it simplified so there were very few cases of SC1 being awarded.

Question 18

It was possible to rationalise this expression by multiplying first by $\sqrt{3}$ or $\sqrt{5}$ which gets rid of a surd on the top and the bottom. They then rationalised this. It is more work but can be done for full marks (most trying to do it this way didn't manage to get to full marks though). A surprising number of students think that $18 \div 2$ is 6. Too many students still don't multiply by the correct surd combination to rationalise and so don't score anything. Lots of correct answers though on this question.

Question 19

A good spread of marks on this question. There is a very clear group of students who have been taught this who get all 5 marks in a clear manner testing the second differential to find the nature of the turning points. There are others who don't look as though they've seen this topic at all. In between there are students who find the values of x correctly and then don't test the nature of the turning points – just writing max and min or drawing a sketch is insufficient for a test which resulted in many students only being awarded 3 marks rather than the full 5 on this question. Errors in factorising or missing one of the values of x cost some students the first A mark but some of these went on to gain the third M mark for doing a correct second differential and then substituting in either $x = 0$ or $x = 2$ correctly to determine the nature of the point.

Question 20

Very poorly done. This is the first time that this type of question has come up on 8365 but it did appear a couple of times on the predecessor to this specification. Many students didn't attempt it. Those that did often tried to differentiate so didn't score. Some students gained full marks quickly and efficiently. The small amount of 3-mark answers came from errors in reading from their points of intersection (usually a sign error). 2 marks could be gained in a number of ways; some found $\frac{-x}{2} + 3$ correctly but then misread the axes and drew the line incorrectly, others made an error in their manipulation but still managed to get a B mark before then drawing their linear function correctly.

Question 21

Most errors on this question involved incorrect expanding of brackets with the majority of students at least getting the indices correct. Lots of $3(x - 1) = 3x - 1$ but also a few $(x + 3)(4x + 1) = 4x^2 + 7x + 3$
Some dropped a mark for not simplifying $-6 \div 4$

Question 22

Some excellent solutions here though not that many of them. Most of these follow our Alt 1 but a small number manipulate in different ways and still get to the correct answer using a valid method. Quite a few get to $\frac{\tan x}{4}$ with incorrect working via a range of errors. $\cos x + \sin x = 1$ appeared more than once.
There were quite a few non-attempts. Not enough students know how to use a CAST diagram or trigonometrical graphs and usually lost the final mark.

Question 23

The slightly unusual B scheme worked well on this question. Due to the AO2 nature of this question there were lots of different ways to solve it and often combinations of different methods were used. Careless arithmetic cost many students.

Mark Ranges and Award of Grades

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