LEVEL 2 CERTIFICATE
FURTHER MATHEMATICS

8365/1 Paper 1 Non-Calculator
Report on the Examination

8365
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Summary

Overall performance compared to last year

The previous paper took place in November 2021 and was the first sitting of this new specification. The November 2021 paper had a very small number of entries so care should be taken when making comparisons to this paper. Illegible hand writing may have led to students losing marks that could have otherwise been awarded.

Topics where students excelled

- quadratic nth terms
- rationalising surds
- rearranging equations
- finding the length of a line using Pythagoras

Topics where students struggled

- differentiation where the expression needs to be simplified first
- trigonometrical identities and exact values of angles outside the first quadrant
- matrix transformations
- quadratic inequalities
- circle theorem proofs
- non-linear simultaneous equations

Individual questions

Question 1

Not surprisingly this question was answered well. Quite a few students worked out the difference using our SC1 method but went on to get full marks. Most students using an algebraic method followed Alternative method 1 and did the method well but some dropped careless marks when expanding the brackets. A common error came from incorrectly working out $6 - 1.2$. Only a small number of students followed Alt 2.

Question 2

Most students followed Alt 1 and most of these gained both marks. Most of the lost marks on this question came from arithmetic errors. Quite a few students found c then continued with further incorrect working so didn't score both marks. A small number of students gained both marks by looking at steps but about half of these confused x and y and found the point at (0 , 0) scoring no marks.

Question 3a

Where it was clear that a ruler had not been used to draw one or both of the straight lines one mark was lost. Students who clearly used a ruler for the quadratic part of the line and had straight lines between (1 , 3), (2 , 4) and (3 , 3) lost the mark for the quadratic however it was much harder to see between (3 , 3) and (4 , 0).

Question 3b

Most students that worked this question through were putting $g^{-1}(x) =$ on the answer line which is pleasing. Some careless mistakes (usually when dividing by a negative) cost marks. The answer, as expected, comes in various forms. A small number of students used a flow chart to get to the answer.

Question 4a
This question was multiple choice and was answered well by the majority of students.

Question 4b
Marks were awarded for intention in this sketch. Sketches with a clear vertex at (180 , –1) or lines that were straight lost the A mark. Some level of curvature needed to be seen at key points.

Question 5
This question was answered well and most students expanded the brackets and then equated coefficients. A small number of students tried to use substitutions which works but they ended up with simultaneous equations to solve if they didn't choose to use $x = 0$. A common error was $2 \times -4 = 8$.

Question 6
A very common error on this question was not expanding the brackets before differentiating. It was common to see the part on the outside of the brackets differentiated and then the part on the inside and at that point students attempted to multiply. For those that did expand the brackets first there were quite a few who were multiplying the powers rather than adding them. If they didn't gain the M mark they couldn't gain any A marks so whilst there were a few students who managed to gain the middle term in the answer this merited no marks. Students attempting the product rule were few and far between but those that did use this method usually gained full marks.

Question 7
The question is written in fractions. The candidates that did it using fractions usually went on to get all 3 marks. The ones who changed everything to decimals ended up doing lots of long multiplication and rarely managed to get to the correct answer. A small number of candidates spotted that it was a 3, 4, 5 triangle and quickly gained all 3 marks. Some candidates worked out the gradient or the midpoint (so didn't read the question). A small number of candidates wrote $\pm \frac{5}{4}$ which was condoned.

Question 8
Most of the answers that gained 2 marks came from SC2. The first mark was intentionally generous. A small number of students managed to show the transformations correctly using a unit square but there were also quite a few that tried to just use one point for the transformations. These students could still gain full marks by showing the matrix multiplication but in the majority of cases they only scored 1 mark.

Question 9a
This question was answered very well for the most part. A growing number of students are using Alternative method 3. They simply find the first and second differences then memorise expressions with a, b and c that match up to the terms. Marks were often lost through arithmetic errors.

Question 9b
A large number of students do not use inequalities and try to work through the problem as an equation. If this was recovered in the answer (and many did) then full marks could still be awarded but if they wrote an answer of 40 then it is clear they had not understood in the nature of the question and the best they could score was 1 mark for the factorising. Not enough students are looking to factorise into double brackets and trying to use the quadratic formula (which in this case made the question harder).

Question 10
This question was answered well by many candidates who wrote the answer in a neat form. A common error was $3 \div 6 = \frac{1}{3}$. A number of candidates multiply by $3 + \sqrt{3}$. There were also a few candidates who didn't simplify fully so lost the last mark.

Question 11
Those students that chose to expand the brackets rarely went on to gain full marks but managed to fill the working lines and often needed to use additional sheets. Quite a few students using the Binomial expansion didn't put brackets round 2x and then failed to recover it. A small number of students used ${}_nC_r$ terminology. If they calculated the correct results the first mark could be inferred, but if not, it was either M2 or M1.

Question 12a
Some candidates lost a mark for writing ± 8. Otherwise it was done well.

Question 12b
This question was answered well. We condoned answers such as 3 tending to infinity or 3 tending to n or n tending to 3 etc.

Question 13
This question was answered poorly. Most students gained the 2 and 3. Many also managed the x terms. The y terms however were not done well. Some students were penalised for further incorrect working (quite often adding the terms together to get $5x^n y^m$).

Question 14
This question was done really well. We condoned missing $e =$ on the answer line as long as they had written the complete answer correctly on the last line of their working. Very few students dropped a mark by losing the e too early.

Question 15
The best way to get the first 3 B marks was to put them on the diagram. Flexibility was allowed in how reasons were stated. Unless it was clear which working applied to which angle the marks couldn't be awarded (they could have been on the diagram). Some students ended with the correct answer but from incorrect methods which included double errors with negative signs. Three out of four reasons were needed for the final mark (the first 3 B marks and then the 4th mark when forming an equation). A number of students stated that ABPC was a cyclic quadrilateral (which it is). If they showed that ABP and ACP were right angles it was fine just to write that BAC + BPC = 180. Without stating ABP and ACP were right angles they have no evidence to support ABPC being a cyclic quadrilateral so this wasn't accepted. A few wrote that it was a kite and opposite angles sum to 180 which is an incorrect statement and wasn't accepted.

Question 16
Some students tried to factorise or use the formula without getting the quadratic into an integer form. If they managed this successfully the M marks had been recovered and it was possible to still be awarded all 6 marks. Most didn't manage to recover though and, in most cases, only gained the first M mark.

Question 17a
Some students gained 1 mark in more than one way but didn't get 2 marks on any method. It was common to use trigonometry to get one coordinate and then use Pythagoras to get the other one.

Question 17b
Most students managed to find the gradient and the gradient of the tangent then put it in to one of the formulae. Not many managed to manipulate the surds into the correct format though. We were very specific as to the form we wanted to see it written in.

Question 18
Most candidates spotted it was the sine rule (a few tried the cosine rule). Only a small number knew that sin135 = sin45 = $\frac{\sqrt{2}}{2}$. Common errors were sin135 = sin90 + sin45 and sin135 = 3sin45.

Question 19
Quite a few students were using $b = 2$ and following through from that. This was sometimes continued with other incorrect attempts but usually they just left it at that and didn't get any marks. Very few students were using Alternative method 2 but those that did usually gained full marks.

Question 20
Some students were differentiating twice and then putting the second differential = 0. Some students missed out the working required for the first Mdep mark but recovered it later. We condoned maxima, maximal, max, minima, minimal and min.

Question 21
Proofs were, for the most part, poorly constructed. Some students treated it as an equation and cross-multiplied ending with 1 = 1 (as soon as this happened we stopped marking so it was usually either 1 or 0 marks). Others try to work from both sides which makes it confusing to mark (examiners needed to look at which side gained the most marks). Substitutions are sometimes used without saying which or how. This can mean students didn't gain the first M mark and hence usually ended up with 0. We condoned splitting the numerator from the denominator for the M marks as long as it was recovered for the A mark.

Mark Ranges and Award of Grades

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