Course report 2023

Higher Mathematics

This report provides information on candidates' performance. Teachers, lecturers and assessors may find it useful when preparing candidates for future assessment. The report is intended to be constructive and informative, and to promote better understanding. You should read the report in conjunction with the published assessment documents and marking instructions.

The statistics in the report were compiled before any appeals were completed.

Grade boundary and statistical information

Statistical information: update on courses

Number of resulted entries in 2022: 18,052

Number of resulted entries in 2023: 18,745

Statistical information: performance of candidates

Distribution of course awards including minimum mark to achieve each grade

A	Number of candidates	7,290	Percentage	38.9	Cumulative percentage	38.9	Minimum mark required	84
B	Number of candidates	3,756	Percentage	20	Cumulative percentage	58.9	Minimum mark required	70
C	Number of candidates	2,683	Percentage	14.3	Cumulative percentage	73.2	Minimum mark required	57
D	Number of candidates	2,100	Percentage	11.2	Cumulative percentage	84.4	Minimum mark required	43
No award	Number of candidates	2,916	Percentage	15.6	Cumulative percentage	100	Minimum mark required	N/A

Please note that rounding has not been applied to these statistics.

You can read the general commentary on grade boundaries in the appendix.

In this report:

- ‘most’ means greater than 70%
- ‘many’ means 50% to 69%
- ‘some’ means 25% to 49%
- ‘a few’ means less than 25%

You can find more statistical reports on the statistics and information page of SQA’s website.

Section 1: comments on the assessment

The course assessment performed largely as expected and proved accessible to most candidates. Feedback from the marking team and teachers and lecturers indicated it was positively received by centres and was fair and accessible. Candidates had good opportunities to demonstrate their knowledge and understanding of the course.

Question paper 1 (non-calculator)

Question paper 1 performed as anticipated. Most candidates made a good attempt at all questions.

Many candidates missed out on marks because their responses contained numerical inaccuracies.

Question paper 2

Question paper 2 performed as anticipated. Most candidates made a good attempt at all questions.

The assessment as a whole was slightly more demanding than expected at the C grade. This was taken into account when setting the grade boundary.

Section 2: comments on candidate performance

Question paper 1 (non-calculator)

Question 1 — differentiation

Most candidates gained full marks for this question.

Question 2 — determining the equation of a perpendicular bisector

Most candidates were able to identify the steps required to find a perpendicular bisector.

Question 3 — solving a logarithmic equation

Many candidates gained full marks for this question; however, some were unable to convert from logarithmic form into exponential form.

Question 4 — applying the addition formulae

Most candidates attempted this question well. Some candidates missed out on marks because they used Pythagoras' theorem inaccurately and incorrectly identified the opposite and adjacent sides of the right-angled triangles.

Question 5 — using the discriminant

Most candidates identified the strategy required in this question; however, many candidates were unable to factorise the non-unitary quadratic equation.

Question 6 — integration

Most candidates demonstrated knowledge of integration, but some candidates were disadvantaged by their poor numerical skills. For example, they were unable to simplify $\frac{6x^{\frac{3}{2}}}{\frac{3}{2}}$ to $4x^{\frac{3}{2}}$.

Question 7(b) — finding the range

Few candidates responded correctly to this question. Where candidates made the link between a logarithmic graph and the expression in the question, they were more successful.

Question 8 — finding stationary points

Most candidates used the strategy required and were able to find the x-coordinates of the stationary points; however, some did not find the y-coordinates or communicate the nature of the stationary points clearly.

Question 10(a) — showing that a linear expression is a factor of a quartic

Most candidates gained full marks for this part of the question; however, a few candidates did not interpret their results clearly. A few candidates did not communicate that the remainder was 0 and a few did not link that remainder to the conclusion.

Question 10(b) — solving a cubic equation

Most candidates identified the correct approach for finding further factors of the equation; however, a few candidates used a guess-and-check approach (choosing four factors and multiplying them together to try to reach the stated quartic). This was not an appropriate strategy. Many candidates were unable to deal with the irreducible quadratic appropriately.

Question 11 — definite integral of a trigonometric function

Many candidates did not integrate both terms in the integrand or were unable to process the exact values to evaluate the definite integral.

Only a few candidates were able to identify the area represented by the integral on the sketch provided.

Question 12 — completing the square

Most candidates attempted this question although some did not demonstrate the rigour required throughout their solution.

Question paper 2

Question 1 — altitude of a triangle and applying $m = \tan\theta$

Most candidates were able to determine the altitude of a triangle and use the formula $m = \tan\theta$ to find the angle required.

Question 2 — determining the equation of a tangent to a curve

Many candidates gained full marks for this question; however, some candidates did not correctly calculate the gradient of the tangent line from the derivative.

Question 4 — transforming the graph of a cubic function

Many candidates were unable to carry out the two transformations required. Some candidates transformed the points given but did not consider the overall shape of the graph.

Question 5 — calculating the rate of change of a function

Most candidates identified the strategy required and made a good attempt at this question.

Question 6 — determining an inverse function

Many candidates had a valid strategy for finding the inverse of a function. Many candidates missed out on marks in method 2 because they were not able to make x the subject of $y - 3 = \frac{2}{x}$.

Some candidates missed out on marks because they wrote conflicting expressions for y, for example $y = \frac{2}{x} + 3$ and $y = \frac{2}{x-3}$.

Question 8 — calculating the area between two curves

Many candidates gained 4 or 5 out of 5 for this question. Some candidates made errors because of missing brackets and inefficient use of a calculator.

Question 9(b) — determining the maximum of a trigonometric function

Many candidates did not make the link between parts (a) and (b) of this question.

Question 10 — determining when a function is decreasing

Many candidates did not consider an inequality at any stage in this question. If candidates did not state an inequality, it was not possible to determine whether their final answers were solutions to the intended inequality.

Question 11(a) — finding the centre of a circle

Most candidates were able to identify the centre of the circles.

Question 12 — solving a differential equation

Many candidates identified the strategy required to solve the differential equation; however, a few candidates did not include the '$+c$' when they integrated.

Question 13(b) — applying composite functions and the double angle formulae

Many candidates were unable to rearrange $2\sin p = \frac{1}{3}$ into $\sin p = \frac{1}{6}$ and few were able to apply the double angle formula to $2\sin 2p$.

Question14(a) — determining expressions for area and volume

Some candidates made little progress with part (a) of this question. Some candidates scored 3 or 4 out of 4 in part (b) but made no realistic attempt at part (a).

Section 3: preparing candidates for future assessment

Question papers 1 and 2 — non-calculator and calculator

The comments in the previous sections and those below will help teachers and lecturers to prepare future candidates for Higher question papers.

- Maintain and practise basic numerical skills regularly, particularly fractions and negative numbers.
- Encourage candidates to check their final answers carefully and to simplify final answers, where appropriate.
- Encourage candidates to write down their working in a structured and logical manner. Each line of working should follow logically from the line above. This is particularly important when differentiating and integrating, and when working with logarithms and exponentials.
- Encourage candidates to use notation and symbols accurately throughout the course, for example integral notation.
- Encourage candidates to use brackets appropriately throughout the course, particularly when completing the square, finding the area between curves, and when substituting negative numbers into formulae.
- Consider how best to practise using radian measure and the exact values of trigonometric ratios.
- When teaching algorithms, emphasise the intervening steps. For example, when factorising a quadratic expression, statements such as $9p^2-20p+4=p^2-20p+36$ $=(p-18)(p-2)=(p-2)(9p-2)$ are not consistent from line to line and would not gain full marks.
- Encourage candidates to use a calculator efficiently in preparation for paper 2.
- Encourage candidates to score out working that does not form part of their final response.
- Remind candidates to lay out their working and solutions in a clear and concise manner. Solutions that are not well-structured and poorly set-out can be difficult for markers to interpret.
- Consider how best to practise sketching graphs of functions on provided axes.

Teachers and lecturers delivering the Higher Mathematics course, and candidates studying the course, should consult the detailed marking instructions for the 2023 question papers on SQA's website. These illustrate the requirements for questions on, for example, integration, nature tables, inverse functions, evaluating the area between two curves, the wave function, and demonstrating that no further factors or solutions occur. The website also contains the marking instructions from previous years.

Appendix: general commentary on grade boundaries

SQA's main aim when setting grade boundaries is to be fair to candidates across all subjects and levels and maintain comparable standards across the years, even as arrangements evolve and change.

For most National Courses, SQA aims to set examinations and other external assessments and create marking instructions that allow:

- a competent candidate to score a minimum of 50% of the available marks (the notional grade C boundary)
- a well-prepared, very competent candidate to score at least 70% of the available marks (the notional grade A boundary)

It is very challenging to get the standard on target every year, in every subject at every level. Therefore, SQA holds a grade boundary meeting for each course to bring together all the information available (statistical and qualitative) and to make final decisions on grade boundaries based on this information. Members of SQA's Executive Management Team normally chair these meetings.

Principal assessors utilise their subject expertise to evaluate the performance of the assessment and propose suitable grade boundaries based on the full range of evidence. SQA can adjust the grade boundaries as a result of the discussion at these meetings. This allows the pass rate to be unaffected in circumstances where there is evidence that the question paper or other assessment has been more, or less, difficult than usual.

- The grade boundaries can be adjusted downwards if there is evidence that the question paper or other assessment has been more difficult than usual.
- The grade boundaries can be adjusted upwards if there is evidence that the question paper or other assessment has been less difficult than usual.
- Where levels of difficulty are comparable to previous years, similar grade boundaries are maintained.

Grade boundaries from question papers in the same subject at the same level tend to be marginally different year on year. This is because the specific questions, and the mix of questions, are different and this has an impact on candidate performance.

This year, a package of support measures was developed to support learners and centres. This included modifications to course assessment, retained from the 2021–22 session. This support was designed to address the ongoing disruption to learning and teaching that young people have experienced as a result of the COVID-19 pandemic while recognising a lessening of the impact of disruption to learning and teaching as a result of the pandemic. The revision support that was available for the 2021–22 session was not offered to learners in 2022–23.

In addition, SQA adopted a sensitive approach to grading for National 5, Higher and Advanced Higher courses, to help ensure fairness for candidates while maintaining standards. This is in recognition of the fact that those preparing for and sitting exams continue to do so in different circumstances from those who sat exams in 2019 and 2022.

The key difference this year is that decisions about where the grade boundaries have been set have also been influenced, where necessary and where appropriate, by the unique circumstances in 2023 and the ongoing impact the disruption from the pandemic has had on learners. On a course-by-course basis, SQA has determined grade boundaries in a way that is fair to candidates, taking into account how the assessment (exams and coursework) has functioned and the impact of assessment modifications and the removal of revision support.

The grade boundaries used in 2023 relate to the specific experience of this year's cohort and should not be used by centres if these assessments are used in the future for exam preparation.

For full details of the approach please refer to the National Qualifications 2023 Awarding — Methodology Report.