Course report 2023

National 5 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: 38,297

Number of resulted entries in 2023: 37,558

Statistical information: performance of candidates

Distribution of course awards including minimum mark to achieve each grade

A	Number of candidates	10,636	Percentage	28.3	Cumulative percentage	28.3	Minimum mark required	62
B	Number of candidates	6,122	Percentage	16.3	Cumulative percentage	44.6	Minimum mark required	49
C	Number of candidates	6,669	Percentage	17.8	Cumulative percentage	62.4	Minimum mark required	36
D	Number of candidates	6,680	Percentage	17.8	Cumulative percentage	80.2	Minimum mark required	23
No award	Number of candidates	7,451	Percentage	19.8	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

Feedback suggests that the course assessment gave most candidates a good opportunity to demonstrate the spread and depth of their knowledge of National 5 Mathematics.

The question papers largely performed as expected, but the overall level of demand was higher than anticipated. The grade boundaries were adjusted to take account of this.

Question paper 1 (non-calculator)

Question paper 1 performed as expected, except for questions 4(a)(i), 4(b), 7(b), 9(b), 11, and 12, which proved more demanding than expected. Some candidates missed out on marks because they did not demonstrate the necessary basic number skills.

Question paper 2

Question paper 2 performed as expected, except for questions 7, 8, and 14(a), which proved more demanding than expected.

Section 2: comments on candidate performance

Question paper 1 (non-calculator)

Question 1 — dividing a mixed number by a fraction

Many candidates achieved full marks. However, some candidates did not simplify correctly, mostly those who did not 'cross cancel' a numerator and denominator before multiplying.

Question 2 — expanding brackets and simplifying

Many candidates achieved full marks. However, some candidates incorrectly expanded $(x+7)^2$ to give x^2+49, but were able to follow through correctly from this error.

Question 3 — simultaneous equations

Many candidates achieved full marks. Many candidates scaled the equations very well, but some candidates incorrectly carried out calculations involving a negative number when adding or subtracting the scaled equations.

Question 4(a)(i) and (b) — identifying features of a quadratic function

Many candidates did not gain any marks in these parts of this question. In 4(a)(i), many candidates incorrectly gave 3 as their answer.

Question 4(a)(ii) — identifying features of a quadratic function

Many candidates achieved full marks.

Question 5 — finding the discriminant

Some candidates attempted this question poorly this year. Most candidates found the discriminant, but some candidates made errors when carrying out the calculations. For example, $6^2-4\times4\times(-1)=36-(-16)=20$ was a common error.

Some candidates gave an incomplete description of the nature of the roots, omitting a key part of the statement (two, real, or distinct).

Question 6 — cosine rule

Many candidates achieved either 0 marks or 1 mark. Common errors included incorrectly substituting $\cos\frac{1}{5}$ into the cosine rule and/or carrying out the calculations in the wrong order.

For example, $5^2+6^2-2\times5\times6\times\frac{1}{5}=61-60\times\frac{1}{5}=1\times\frac{1}{5}=\frac{1}{5}$ was a common error.

Question 7 — equation of line of best fit

Some candidates attempted this question poorly this year. Some candidates carried out calculations incorrectly when finding the gradient or simplifying the equation of the line in 7(a), and when estimating the salary in 7(b).

A few candidates used incorrect coordinates, for example (20000, 5) and (50000, 25) and (1, 2) and (5, 5), to find the gradient. Some candidates did not express their final equation in terms of P and T.

Question 9(a) — median and interquartile range

Most candidates achieved 2 or 3 marks. Many candidates achieved full marks. A few candidates calculated the semi-interquartile range instead of the interquartile range.

Question 9(b) — comparing calculated statistics

A few candidates achieved full marks in this question. Some candidates achieved partial marks. Many candidate responses:

- did not refer to the ages of the newspaper readers and magazine readers, for example 'On average the newspaper reader was older, and the magazine reader was more consistent.'
- did not state 'on average' in the statement about the median, for example 'The newspaper readers were older.'
- simply stated that one median or interquartile range was higher or lower than the other

Question 10 — perpendicular bisector of a chord

Some candidates attempted this question poorly this year and did not demonstrate the necessary numeracy skills. Common calculation errors included
$50^2 - 30^2 = 250 - 90 \rightarrow \sqrt{160} = 40$ and $50^2 - 30^2 = 20^2 \rightarrow 20$.

Question 11 — sine of angles 0° to 360°

Very few candidates gave the correct answer. Most candidates answered with:
$330^\circ = 11 \times 30^\circ \rightarrow \sin 330^\circ = 11 \times \sin 30^\circ = 5.5$.

Question 12 — indices

Most candidates achieved the first mark for $\frac{5c^{-2}}{c^7}$. Some candidates achieved the second mark for $5c^{-9}$, but few achieved the final mark. Many candidates incorrectly gave the final step as $5c^{-9} = \frac{1}{5c^9}$.

Question 13 — interpreting a trigonometric graph

Very few candidates answered part (a) correctly, but many candidates answered part (b) correctly. Many candidates responded with a = 2 and b = 1.

Question 14 — inequation with fractional coefficients

Most candidates were unable to correctly eliminate the denominators. Some candidates achieved 1 or 2 marks for following through their working to obtain a consistent answer.

Question paper 2

Question 1 — depreciation

Many candidates achieved full marks, but overall candidate performance did not quite match previous years. This may have been because the question featured two percentages this year.

Most candidates used the correct method, but some candidates applied an incorrect percentage reduction for the final two years. The wording of the question may have contributed to this.

Common incorrect percentage reductions included $20000 \times 0.89 \times 0.83^2$ and $20000 \times 0.89 \times 0.83 \times 0.77$. Most candidates achieved the final 2 marks irrespective of the percentages they used.

Question 2 — scientific notation calculation

Most candidates carried out their chosen calculation correctly, but many candidates started with an incorrect method, for example $\left(6.64 \times 10^{-24}\right) \times 300$ and $\left(6.64 \times 10^{-24}\right) \div 300$.

Question 3 — length of an arc

Most candidates achieved full marks. A few candidates calculated the area of sector ABC and achieved partial marks.

Question 6 — reverse percentage

Many candidates achieved full marks. A few candidates calculated 108% or 92% of £94500.

Question 7 — change of subject

Many candidates achieved partial marks, but a few candidates dealt with the $\frac{1}{3}$ correctly.

Many candidates responded with $m = \frac{3P + r}{n}$.

Question 8 — converse of Pythagoras' theorem

Many candidates did not achieve full marks because they started with $4^2 + 7^2 = 8^2$ and/or did not mention a right angle or 90° in their conclusion. Candidates who used the cosine rule generally achieved full marks more often than those who used Pythagoras' theorem.

Question 9 — volume of composite solid

Most candidates used the correct volume formula. Some candidates incorrectly used 60 for the height of the large pyramid and/or used an incorrect value for the area of the base of each pyramid. For example, some candidates used the area of a triangle formula, while some used the length. Many candidates achieved partial marks for follow-through working.

Question 10 — subtracting algebraic fractions

Many candidates achieved partial marks for finding the correct denominator and/or numerator. Only some candidates correctly multiplied out the bracket in the numerator, obtaining $5x - 6$ instead of $5x + 6$. A few candidates did not achieve the final mark for subsequent incorrect working where they attempted to further simplify the fraction.

Question 11 — solving a trigonometric equation in context

A few candidates did not attempt this question. Some candidates started correctly and usually went on to achieve 3 or 4 marks.

Some candidates did not substitute h = 150 into the equation. A few candidates substituted values in the wrong place in the equation. When they rearranged their equation, they obtained values for $\cos x$ that were greater than 1 or less than -1 and could not find the two required angles.

Question 13 — trigonometric identity

A few candidates did not achieve any marks for this question. The number of candidates who achieved some marks was slightly higher than in previous years. Most candidates did not factorise first and did not lay out their proof in a structured way.

Question 14 — constructing and solving a quadratic equation

Many candidates achieved no marks in either part of this question. Many candidates answered part (b) in part (a) and vice versa. They received credit for correct working wherever it appeared. In part (a), some candidates achieved the first mark for finding a correct expression for the volume of the cuboid. Only a few candidates achieved the second mark for equating the expression to 45 and rearranging it into the required form.

Many candidates made errors in part (b), including:

- trying to solve the equation as if it were linear
- incorrectly calculating the roots of the quadratic equation
- obtaining a negative discriminant and still finding roots
- not rejecting the negative root as a solution to the problem

Question 15 — area of a triangle problem

Only a few candidates achieved more than 1 mark for this question. Many candidates used Pythagoras' theorem to calculate the length of the base of triangle ABC and progressed no further.

Some candidates achieved the first mark, mostly by using the sine rule to find the size of angle A. Very few candidates used right-angled triangle trigonometry to find angle A. Very few candidates made relevant progress by substituting angle A into the area formula and forming an equation.

Many candidates attempted to calculate lengths of other sides and sizes of other angles but did not always link their answers to the area of appropriate triangles. Some candidates used Pythagoras' theorem, the sine rule, or the cosine rule in shapes that were not triangles.

Most of the candidates who achieved full marks included many unnecessary steps of working.

Section 3: preparing candidates for future assessment

The following advice may help prepare future candidates for the National 5 course assessment:

- Candidates should maintain and practise number skills in preparation for the non-calculator question paper. This year, candidates lacking in number skills lost out on valuable marks in paper 1.
- Candidates should maintain and practise basic algebraic skills, for example rearranging, factorising, and simplifying. This year, in both question papers, candidates who could not demonstrate basic algebraic skills missed out on many marks.
- Centres should be aware that calculating the semi-interquartile range was replaced by calculating the interquartile range of a data set as a mandatory skill for the National 5 Mathematics course from session 2021–22 onwards. In this year's paper 1, question 9(a), some candidates calculated the semi-interquartile range instead of the interquartile range.
- When practising questions about determining the nature of the roots of a quadratic function, teachers and lecturers should remind candidates that the expected responses are:
  - $b^2 - 4ac > 0$: 'two real and distinct roots'
  - $b^2 - 4ac = 0$: 'one repeated real root' or 'two equal real roots'
  - $b^2 - 4ac < 0$: 'no real roots'
- Candidates should maintain and practise previously acquired skills. Many candidates this year did not find the size of an angle in a right-angled triangle using basic trigonometry in paper 2, question 15.
- Candidates should maintain and practise questions about the converse of Pythagoras' theorem. In this year's paper 2, question 8, many candidates incorrectly started by stating that $4^2 + 7^2 = 8^2$.
- Candidates should practise questions that require them to communicate a reason or an explanation. This year, many candidates did not make valid comments when comparing data sets in paper 1, question 9(b).
- Candidates should practise the problem-solving skills they need to answer questions that assess reasoning.

Teachers and lecturers delivering the National 5 Mathematics course, and candidates studying the course, should consult the detailed marking instructions for the 2023 question papers on SQA's website. 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.