Course Report 2018

Subject	Mathematics
Level	National 5

This report provides information on the performance of candidates. 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. It would be helpful to read this report in conjunction with the published assessment documents and marking instructions.

The statistics used in this report have been compiled before the completion of any Post Results Services.

Section 1: comments on the assessment

Summary of the course assessment

The course assessment was accessible to the majority of candidates. Feedback suggested that it gave candidates a good opportunity to demonstrate the spread and depth of their knowledge of the subject at this level.

The course assessment largely performed as expected, but the overall level of demand was less than expected for the stronger candidates. The grade boundary was adjusted to take account of this.

Component 1: question paper — paper 1 (non-calculator)

This question paper performed as expected except for question 14, which candidates found less demanding than expected, and question 19(a)(ii), which candidates found more demanding than expected. The majority of candidates made a good attempt at all questions apart from questions 12, 16, 18 and 19(b). Poor basic number skills resulted in some candidates dropping marks in some questions.

Component 2: question paper — paper 2

This question paper performed as expected except for question 17, which candidates found less demanding than expected. The majority of candidates made a good attempt at all questions apart from questions 10, 15 and 18(b).

Section 2: comments on candidate performance

Areas in which candidates performed well

Component 1: question paper — paper 1 (non-calculator)

Candidates performed well in the following questions:

Question 1 **Add a fraction to a mixed number**
Most candidates achieved full marks.

Question 2 **Expand brackets and simplify**
Most candidates achieved full marks.

Question 4 **3D vector components**
Most candidates achieved full marks.

Question 14 **Change subject of formula**
There was evidence of improved performance in this topic, but many candidates could not deal appropriately with $\sqrt{x}$, for example

$\sqrt{x} = \frac{y - h}{g} \rightarrow x = \sqrt{\frac{y - h}{g}}$ was a common error.

Component 2: question paper — paper 2

Candidates performed well in the following questions:

Question 1 **Depreciation**
Most candidates achieved full marks and used an efficient method to obtain the answer. There was little evidence of candidates using a year-by-year approach.

Question 2 **Length of arc**
Most candidates achieved full marks. Lost marks were often the result of candidates calculating the length of the minor arc AB or the area of the major sector ACB.

Question 3 **Magnitude of a 3D vector**
Most candidates achieved full marks, but some incorrectly calculated $\sqrt{24^2 + (-12)^2 + 8^2}$ as $\sqrt{576 - 144 + 64} = \sqrt{496}$.

Question 4 **Inequation**
Candidates continue to show improved performance in this topic, but a significant number were still unable to correctly divide by a negative number in the final step.

Question 5(a) **Mean and standard deviation**
Most candidates achieved full marks.

Question 7 **Volume of a sphere**
Most candidates achieved full marks.
Lost marks were often the result of candidates calculating $\frac{4}{3} \times \pi \times 6 \cdot 4^3$ or $\frac{4}{3} \times \pi \times 3 \cdot 2^2$ and not rounding their final answer, or rounding it incorrectly.

Question 9 **Sine rule**
Most candidates achieved full marks.

Question 17 **Area of a composite shape**
Many candidates achieved full marks and most gained at least 3 marks for this question.

Areas which candidates found demanding

Component 1: question paper — paper 1 (non-calculator)

Candidates found the following questions demanding:

Question 5 **Solve quadratic equation by factorising**
Many candidates factorised correctly, but did not continue to solve the equation.

Question 12 **Cosine of angles 0º–360º**
Most candidates gave an incorrect answer. The most common answer was $240^\circ = 4 \times 60^\circ \rightarrow \cos 240^\circ = 4 \times \cos 60^\circ = 2$.

Question 15 **Indices**

Most candidates achieved the first mark for either $\frac{4}{9}$ or p^8 but many failed to achieve the second mark.

Question 16 **Sketch graph of quadratic function**
Most candidates achieved 1 mark or no marks. Where 1 mark was achieved, it was usually for finding the roots.

Question 18 **Trigonometric identity**

Most candidates made little progress towards a solution. Some wrote down $\tan x = \frac{\sin x}{\cos x}$ and $\sin^2 x + \cos^2 x = 1$ but did not know how to proceed from there.

Question 19(a)(ii) **Equation of axis of symmetry of parabola**

Most candidates gave an incorrect answer or no answer. Common answers were 3, axis of symmetry = 3 or (3, −90).

Question 19(b) **Solve quadratic equation and simplify expression involving a surd**

Few candidates scored more than the first 2 marks for this question. Most did not know how to start. Most candidates used the quadratic formula. Many calculated the discriminant to be negative by either incorrectly substituting $b = 6$ instead of $b = -6$ into the formula, or by evaluating $(-6)^2 - 4 \times (-6) \times (-81)$ incorrectly.

Poor basic number skills resulted in a significant number of candidates dropping marks in the following questions:

Question 3 **Simultaneous equations**

Most candidates used the correct strategy but many were unable to find the correct value of x. Common errors were:

- incorrect final step in solving an equation, for example $38x = 19 \rightarrow x = 2$
- $x = \frac{19}{38}$ not expressed in simplest form

Question 7(a) **Equation of line of best fit**

Most candidates used the correct strategy, but were unable to simplify $\frac{6}{4}$ correctly or deal with $\frac{3}{2}$ when either removing the brackets from $y - 14 = \frac{3}{2}(x - 8)$ or solving the equation $14 = \frac{3}{2} \times 8 + c$.

Question 7(b) **Substitution into equation of line of best fit**

Many candidates were unable to evaluate $\frac{3}{2} \times 5 + 2$ correctly. Many omitted the £ sign and/or the trailing zero from their final answer.

Question 8 **Use of discriminant**

Many candidates made the following errors:

- incorrect evaluation of $b^2 - 4ac$, for example $4^2 - 4 \times 2 \times 5 = 16 - 45 = \ldots$, $16 - 40 = -26$, $16 - 40 = -34$, $16 - 40 = -36$
- incomplete or inaccurate description of the nature of the roots, for example no roots, no real or distinct roots, no real and distinct roots

Question 10 **Cosine rule**

Many candidates made the following errors:

- incorrect substitution

  $10^2 + 8^2 - 2 \times 10 \times 8 \times \cos\frac{1}{8} = 164 - 160 \times \cos\frac{1}{8} = ...$

- incorrect order of operations

  $10^2 + 8^2 - 2 \times 10 \times 8 \times \frac{1}{8} = 164 - 160 \times \frac{1}{8} = 4 \times \frac{1}{8} = \frac{1}{2}$

- incorrect calculation $164 - 160 \times \frac{1}{8} = 164 - 1280 = ...$

Question 11 **Rationalise denominator of a surd**

Many candidates obtained $\frac{9\sqrt{6}}{6}$, but were unable to simplify this fraction correctly.

Question 17 **Reverse use of volume of pyramid**

Many candidates progressed as far as $\frac{1}{3} \times 36 \times h = 138 \rightarrow h = \frac{138}{12}$, but were unable to carry out the division correctly.

Component 2: question paper — paper 2

Candidates found the following questions demanding:

Question 5(b) **Interpret calculated statistics**

Many candidates made statements that showed that they did not have a clear understanding of the meaning of the terms 'mean' and 'standard deviation'. Common unacceptable responses included:

- The mean number of customers was more on Saturday.
- There were more customers at each stall on Saturday.
- The average number of people visiting the stall was better on Saturday.
- The standard deviation was more consistent on Saturday.
- On average, the customers were less varied on Saturday.

Question 6 **Functional notation**

Many candidates simply evaluated $f(73)$. Many solved the equation for x rather than a.

Question 10 **2D vector pathway**

Most candidates did not achieve any marks for this question.

Question 13 **Cosine rule and bearings**

A significant number of candidates did not attempt this question. Some simply assumed that the two missing angles at T were both 60°. Many knew to use the cosine rule but some substituted incorrectly and calculated the size of angle YFT or FYT rather than angle FTY. Few candidates were able to proceed from their calculated angle to the correct bearing.

Question 14 **Find the coordinates of the y-intercept of a straight line given its equation**

A significant number of candidates did not attempt this question. Many candidates tried to rearrange the equation into the form $y = mx + c$ but some made errors in trying to do so. A smaller number of candidates substituted $x = 0$ into the original equation, but some were unable to cope with the negative coefficient in the resulting equation. Some candidates who progressed as far as $y = -4$ did not state the coordinates of the y-intercept.

Question 15 **Divide algebraic fractions**

Most candidates achieved the first mark for $\frac{n}{n^2-4} \times \frac{n-2}{3}$ but did not factorise $n^2 - 4$ and could not proceed correctly from that point.

A lot of invalid cancelling was evident, for example

$$\frac{\not{n}}{\not{n}^2-4} \times \frac{\not{n}-2}{3} = \frac{-2}{-12} = \frac{1}{6}.$$

A common invalid response started

$$\frac{n}{n^2-4} \div \frac{3}{n-2} = \frac{n(n-2) \div 3(n^2-4)}{(n^2-4)(n-2)} = \ldots\ldots$$

Question 16 **Pythagoras' theorem in three dimensions**

Most candidates did not attempt to find the length of the space diagonal PM. Many calculated the length of one of the face diagonals and compared this to the length of the umbrella. Some calculated the volume of the locker or the length of some or all of its edges and compared these to the length of the umbrella.

Question 18(a) **Volume of similar shapes**

Most candidates achieved the first mark for using an appropriate linear scale factor but did not cube the factor when attempting to compare volumes. Many candidates did not state a conclusion.

Question 18(b) **Reverse volume of similar shapes**

A significant number of candidates did not attempt this question. Most who did, achieved the first mark for using an appropriate volume scale factor but did not use the cube root of it when calculating the required length.

Section 3: advice for the preparation of future candidates

The majority of candidates were well prepared to answer most questions. Workings were usually displayed clearly, and correct units were stated where appropriate.

The following advice may help prepare future candidates for the demands of the National 5 question papers:

- In paper 1, performance in number skills was disappointing, and cost many candidates valuable marks. Teachers and lecturers should consider how best to maintain and practise number skills (including mental) to prepare candidates for the non-calculator question paper.
- Many candidates did not give the expected response to question 8 in paper 1. Teachers and lecturers should make candidates aware that when determining the nature of the roots of a quadratic, the expected responses are:
- for $b^2 - 4ac > 0$: 'two real and distinct roots'
- for $b^2 - 4ac = 0$: 'one repeated real root' or 'two equal real roots'
- for $b^2 - 4ac < 0$: 'no real roots'
- Many candidates could not answer questions 10 and 12 from paper 1 correctly. Teachers and lecturers should consider how best to practise non-calculator trigonometry questions.
- There is evidence that performance is improving in questions requiring candidates to communicate an explanation or reason, but teachers and lecturers should continue to consider how best to practise these types of questions, as many candidates are still unable to make valid comments, for example, when comparing sets of data.
- Many candidates could not answer question 10 from paper 2 correctly. Teachers and lecturers should consider how best to practise two-dimensional vector pathway questions.
- Teachers and lecturers should encourage candidates to avoid inappropriate premature rounding, which leads to inaccurate answers.
- Teachers and lecturers should consider how best to maintain and practise basic algebraic skills, for example rearranging, factorising and simplifying. In both question papers, performance in basic algebraic skills was disappointing, and cost many candidates valuable marks.
- Teachers and lecturers should consider how best to practise problem-solving skills, where candidates can tackle questions that assess reasoning.
- SQA's website contains the marking instructions for the 2018 course assessment (as well as those from previous years). Teachers and lecturers delivering the National 5 Mathematics course, and candidates undertaking the course, will find further advice and guidance in these detailed marking instructions.

Grade boundary and statistical information:

Statistical information: update on courses

Number of resulted entries in 2017	42191

Number of resulted entries in 2018	41590

Statistical information: performance of candidates

Distribution of course awards including grade boundaries

Distribution of course awards	Percentage	Cumulative %	Number of candidates	Lowest mark
Maximum mark				
A	31.4%	31.4%	13069	78
B	17.8%	49.2%	7386	66
C	15.5%	64.7%	6439	55
D	13.8%	78.5%	5735	43
No award	21.5%	-	8961	-

General commentary on grade boundaries

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

SQA aims to set examinations and create marking instructions which allow a competent candidate to score a minimum of 50% of the available marks (the notional C boundary) and a well prepared, very competent candidate to score at least 70% of the available marks (the notional 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 every year for each subject at each level to bring together all the information available (statistical and judgemental). The Principal Assessor and SQA Qualifications Manager meet with the relevant SQA Business Manager and Statistician to discuss the evidence and make decisions. The meetings are chaired by members of the management team at SQA.

- The grade boundaries can be adjusted downwards if there is evidence that the exam is more challenging than usual, allowing the pass rate to be unaffected by this circumstance.
- The grade boundaries can be adjusted upwards if there is evidence that the exam is less challenging than usual, allowing the pass rate to be unaffected by this circumstance.
- Where standards are comparable to previous years, similar grade boundaries are maintained.

Grade boundaries from exam papers in the same subject at the same level tend to be marginally different year to year. This is because the particular questions, and the mix of questions, are different. This is also the case for exams set by centres. If SQA alters a boundary, this does not mean that centres should necessarily alter their boundary in the corresponding practice exam paper.