Course Report 2017

Subject	Mathematics
Level	National 5

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

This report provides information on the performance of candidates which it is hoped will be useful to teachers, lecturers and assessors in their preparation of candidates for future assessment. It 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.

Section 1: Comments on the Assessment

Summary of the course assessment

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

The examination largely performed as expected, but the overall level of demand was less than intended, with the stronger candidates benefitting most. The Grade Boundaries were therefore amended to take account of this.

Component 1 — question paper: Paper 1 (Non-Calculator)

This paper performed as expected except for question 4, which candidates found less demanding than expected, and question 14 which candidates found more demanding than expected. The majority of candidates made a good attempt at all questions apart from questions 11, 14 and 15. Poor basic number skills resulted in some candidates dropping marks in some questions.

Component 2 — question paper: Paper 2

This paper performed as expected except for question 15(c), which candidates found less demanding than expected. The majority of candidates made a good attempt at all questions apart from questions 8(b), 11, 12 and 15(b).

Section 2: Comments on candidate performance

Areas in which candidates performed well

Component 1 — question paper: Paper 1 (Non-Calculator)

Question 1: **Functional Notation**. Most candidates scored full marks, but some showed a lack of understanding of functional notation by continuing on from $f(-5)=10$ to divide throughout by -5, suggesting that they thought $f(-5)$ was the same as $-5f$.

Question 3: **Divide a mixed number by a fraction**. Most candidates divided correctly but some were unable to give the answer in its simplest form.

Question 4: **Expand brackets**. Most candidates scored full marks.

Question 5: **Three dimensional coordinates**. Evidence of improved performance in this topic. Most candidates scored full marks and few failed to score any marks.

Question 8: **Inequality**. Evidence of improved performance in this topic, but some candidates were still unable to correctly divide by a negative in the final step.

Component 2 — question paper: Paper 2

Question 1: **Magnitude of a 3D vector.** Most candidates scored full marks but some incorrectly calculated $\sqrt{18^2+(-14)^2+3^2}$ as $\sqrt{324-196+9}=\sqrt{137}$.

Question 2: **Appreciation**. Most candidates scored full marks and used an efficient method to obtain the answer. There was little evidence of candidates using a year by year approach.

Question 3: **Cosine Rule**. Most candidates scored full marks; any lost marks were usually due to either stopping after finding QR^2 or calculating errors caused by evaluating the cosine rule a step at a time.

Question 4: **Quadratic equation using the quadratic formula**. Most candidates scored full marks. Some only achieved partial credit for a number of reasons including: incorrect substitution into the quadratic formula, incorrect evaluation of the discriminant and incorrect rounding of the final answer. Some candidates tried to solve the equation by factorising, not realising that since rounding was required that the quadratic formula should be used.

Question 5: **Reverse use of Percentage**. Performance in this type of question continues to improve, but there was still a significant number of candidates who simply worked out 85% of 4830.

Question 15(a): **Evaluate a trigonometric formula.** Most candidates scored full marks.

Areas which candidates found demanding

Component 1 — question paper: Paper 1 (Non-Calculator)

Question 2: **Semi-Interquartile Range**. Most candidates were able to identify the quartiles but a significant number were unable to continue and calculate the SIQR. Some calculated the IQR. Some who did know how to proceed made calculation errors.

Question 7: **Area of triangle**. A common error was to use $\sin\frac{2}{3}$ instead of $\frac{2}{3}$. Many candidates were unable to work out $\frac{1}{2}\times 8\times 12\times\frac{2}{3}$ correctly.

Question 10: **Change of subject**. Many candidates could not deal appropriately with the t^2.
There were square roots in many responses eg
$b=\sqrt{\frac{Fc-t}{4}}$, $b=\frac{\sqrt{Fct}}{4}$, $b=\sqrt{\frac{cF}{t-4}}$.

Question 11: **Subtract algebraic fractions**. Many candidates achieved the first mark for $\frac{3a-2a^2}{a^3}$ but few were able to give the final answer in its simplest form. Some candidates found the correct answer but then proceeded to cancel incorrectly eg $\frac{3-2\cancel{a}}{\cancel{a}^2}=\frac{3-2}{a}=\frac{1}{a}$.

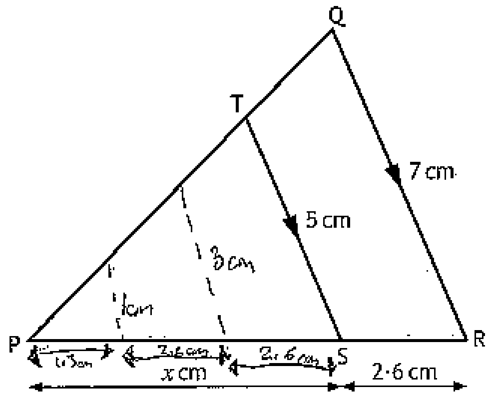
Question 12: **Standard deviation and simplification of surds**. Most candidates knew how to calculate the standard deviation but some substituted incorrectly into the standard deviation formula eg $\frac{\sqrt{18}}{4}$ instead of $\sqrt{\frac{18}{4}}$ was fairly common. Few candidates were able to express $\sqrt{\frac{18}{4}}$ in the form $\frac{a\sqrt{b}}{2}$.

Question 13: **Simultaneous equations in context**. Most candidates used the correct strategy but many struggled to solve equations with decimal solutions. A number of candidates were unable to divide 16·5 by 3 correctly.

Question 14: **Graph of quadratic function**. This question was poorly attempted. Most candidates misinterpreted the coordinates of the point (–3, 8) to

obtain the answers a = –3 and b = 8. Those candidates who correctly substituted in part (b) often evaluated
$(–3 + 5)^2$ incorrectly eg 9+25 = 34, or inefficiently eg (–3 + 5)(–3 + 5) = 9–15–15+25 = 4.

Question 15: **Similar triangles**. This question was poorly attempted. Some candidates achieved the first mark for stating an appropriate scale factor but few knew how to proceed after that or calculated $^5/_7 \times 2{\cdot}6$. For the candidates who did achieve full marks a method similar to that shown below was often used.



$x = 2{,}6 + 2{,}6 + 1{,}3 = 6{,}5$cm

Component 2 — question paper: Paper 2

Question 7: **Converse of Pythagoras' Theorem:** Many candidates lost marks due to making one or more of the following common errors:

- proving that the wrong triangle was right-angled
- using an incorrect combination of sides eg $8^2 + 22^2$ and 19^2
- starting by assuming that eg $8^2 + 19^2 = 22^2$

Question 8: **2D Vector pathway.** Most candidates performed better in part (a) than in a similar question in 2016 but the vast majority scored no marks for part (b). A common error for those who obtained the correct answer to part (a) and then made some progress with part (b) was to use $\frac{1}{2}\mathbf{d} - \mathbf{c}$ for $\overrightarrow{\mathbf{PV}}$ instead of $\frac{1}{2}(\mathbf{d} - \mathbf{c})$.

Question 9: **Factorise Quadratics and Simplify Algebraic Fraction**. Most candidates were able to factorise the difference of two squares in part (a) but many were unable to factorise the denominator. A significant number of candidates cancelled incorrectly, sometimes subsequent to a 'correct' answer eg $\frac{2\cancel{x}+5}{\cancel{x}+2} = \frac{7}{3}$.

Question 10: **Bearings and Sine Rule**. Many candidates were unable to calculate the correct size of angles DEF and DFE but most could then follow through to use the sine rule appropriately.

Question 11: **Find the gradient of a straight line given its equation.** Many candidates did not realise that the equation had to be rearranged into the form $y = mx + c$. Some who knew the correct method found it difficult to rearrange the equation. Some who rearranged the equation correctly either did not state the gradient explicitly or stated an incorrect gradient eg gradient = $\frac{3}{5}x$.

Question 12: **Indices**. This question was poorly attempted. Few candidates were able to deal with the cube root or express the answer with a negative power.

Question 14: **Find angle at centre of arc.** There was a mixed response to this question. Many candidates misinterpreted the question and used πr^2 instead of πd or used the cosine rule. Many candidates calculated the size of the **acute** angle AOB.

Candidates who started with $\frac{\text{angle}}{360} \times \pi d = 31 \cdot 5$ were often unable to rearrange the equation to find the correct angle. Candidates who started with $\frac{\text{angle}}{360} = \frac{31 \cdot 5}{\pi d}$ had much more success in finding the correct angle since the resulting rearrangement was more straightforward.

Question 15(b): **Find the minimum value of a trigonometric function.** Many candidates did not know that the minimum value of $\cos x^\circ$ occurred at 180°.

Question 15(c): **Solve trigonometric equation in context.** There was a mixed response to this question. Most candidates achieved the first mark for forming the equation but many lost the second mark for being unable to rearrange the equation correctly and/or the final mark for finding the second angle.

Section 3: Advice for the preparation of future candidates

Centres deserve credit for the preparation of candidates for the National 5 Mathematics course assessment. The majority of candidates were well prepared in dealing with most questions, working was usually displayed clearly, and correct units were stated where appropriate.

The following advice may help prepare candidates for the demands of the National 5 examination:

- In question paper 1, performance in number skills was disappointing, and cost many candidates valuable marks. Centres should consider how best to maintain and practise number skills in preparation for the non-calculator paper in the course assessment.
- Centres are reminded that calculating the **semi-interquartile range** of a data set is a mandatory skill for the National 5 Mathematics course. In question paper 1, question 2, most candidates could find the lower and upper quartiles but were unable to proceed correctly from there.
- In questions that involve angles in a diagram, candidates should write the sizes of any angles they use, in the diagram. Where candidates do not write the sizes of angles in the diagram, their working must clearly attach calculations to **named** angles**.** This allows the marker to follow the candidate's working, and increases the opportunity for marks to be awarded.
- Centres should consider how best to practise Converse of Pythagoras' Theorem questions. In question paper 2, question 7, many candidates incorrectly started by stating that $8^2 + 19^2 = 22^2$.
- Centres should consider how best to practise two-dimensional vector pathway questions. There was evidence of improved performance in question paper 2, question 8(a) compared to a similar question last year, but few candidates were able to answer question 8(b) correctly.
- Centres should encourage candidates to avoid inappropriate premature rounding, which leads to inaccurate answers.
- Centres should consider how best to maintain and practise basic algebraic skills, eg rearranging, factorising and simplifying. In both papers, performance in basic algebraic skills was disappointing, and cost many candidates valuable marks.
- Centres should consider how best to practise problem solving skills, which candidates require to tackle questions that assess reasoning.
- The SQA website contains the marking instructions for the 2017 course assessment (as well as previous years). All those teaching National 5 Mathematics, 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 2016	41780

Number of resulted entries in 2017	42191

Statistical information: Performance of candidates

Distribution of Course awards including grade boundaries

Distribution of Course awards	%	Cum. %	Number of candidates	Lowest mark
Maximum Mark -				
A	31.1%	31.1%	13106	66
B	16.6%	47.7%	7014	56
C	16.1%	63.8%	6807	46
D	7.2%	71.0%	3024	41
No award	29.0%	-	12240	-

General commentary on grade boundaries

- While SQA aims to set examinations and create marking instructions which will 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.

- Each year, SQA therefore holds a grade boundary meeting for each subject at each level where it brings 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.

- An exam paper at a particular level in a subject in one year tends to have a marginally different set of grade boundaries from exam papers in that subject at that level in other years. This is because the particular questions, and the mix of questions, are different. This is also the case for exams set in centres. If SQA has already altered a boundary in a particular year in, say, Higher Chemistry, this does not mean that centres should necessarily alter boundaries in their prelim exam in Higher Chemistry. The two are not that closely related, as they do not contain identical questions.

- 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.