Course Report 2017

Subject	Mathematics
Level	Higher

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 from markers and teachers suggests that it gave candidates a good opportunity to demonstrate knowledge and skills. The course assessment performed in line with expectation at level C, and was felt to be slightly more demanding this year at level A. The boundary for A and upper A was therefore reduced by 1 mark compared with 2016.

Section 2: Comments on candidate performance

The majority of candidates made a good attempt at all questions, with the exception of questions 7, 14(b), 15(b) and 15(c) in paper 1, and questions 4(c), 8(b), 9, 10(b), and 11 in paper 2.

Most candidates showed appropriate working, and there were fewer no-responses in both papers compared to 2016.

Some candidates scored very high marks, but others scored very low marks and were perhaps inappropriately presented at this level.

Areas in which candidates performed well

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

Question 1(b): **Composite Function**. Most candidates scored full marks for this question. However, in 1(a) many candidates did not know that $\cos 0 = 1$.

Question 2: **Tangent to a circle.** The majority of candidates scored full marks, but a number of candidates lost the final mark because they did not simplify the equation of the tangent.

Question 6: **Inverse Function.** The majority of candidates scored well, but some lost the final mark due to writing $h'(x)$ instead of $h^{-1}(x)$.

Question 9: **Recurrence Relations.** Most candidates performed well in this question, and were able to calculate the limit successfully in part (c). However, there were a number of candidates who did not simplify their answer in (a), or who were unable to deal with the fractions in part (c).

Question 11: **Gradient.** The majority of candidates answered this question successfully. However, a significant number employed ‘non-algebraic’ methods to determine the value of a.

Component 2 — question paper: Paper 2 (Calculator)

Question 1: **Straight Lines.** Most candidates did well in this question. Errors were due to numerical mistakes rather than a lack of understanding.

Question 2: **Polynomials.** This was answered well by the majority of candidates. There was an improvement in communication for mark 2 in part (a).

Question 3: **Points of Intersection with Circle**. Most candidates answered this question well. Marks were lost due to algebraic errors eg $(3x)^2 = 3x^2$ leading to an incorrect quadratic equation.

Question 7: **Finding Stationary Point.** Most candidates were able to achieve 3 or 4 marks for this question with the last mark being lost due to numerical errors. However, some candidates were unable to express the equation in differentiable form.

Areas which candidates found demanding

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

Question 7: **Equation of Median**. Although most candidates interpreted the median correctly, common errors were:

$$\frac{4}{0} = 0 \text{ and } \frac{4}{0} = 4 .$$

Few candidates could interpret the gradient, and state the equation of a vertical line correctly.

Question 8: **Rate of Change.** Most candidates interpreted this correctly, but many lost marks due to poor algebraic and/or numerical skills. Common errors were:

- $\frac{1}{2t} = 2t^{-1}$ leading to $-2t^{-2} = -\frac{1}{2t^2}$.
- $5^{-2} = -25$.

Question 10: **Area between two curves**. Although most candidates were able to attempt this question, many solutions were poorly set out and contained basic algebraic and numerical errors. Errors included:

- dx missing from expression for integral.
- Setting $f(x) = g(x)$ and rearranging expression $= 0$, rather than using 'upper – lower' correctly.
- Missing or incorrect use of brackets leading to incorrect expression at mark 2.

- Failing to simplify ‘upper – lower’ leading to an overly complicated expression to evaluate at mark 4.
- Failing to consider lower limit of 0.

Question 14(b): **Sketching Trigonometric Graph.** There were a lot of disappointing responses to this question. Many candidates interpreted either the period of the graph or the horizontal shift incorrectly. Few candidates considered the end points of the graph. Many candidates’ sketches lacked accuracy.

Question 15(b): **Evaluate Definite Integral.** Very few candidates were able to interpret the area correctly.

Question 15(c): **Identify Gradient of Tangent.** Few candidates were able to interpret the symmetry of the parabola correctly. There were a significant number of no-responses to this question.

Component 2 — question paper: Paper 2 (Calculator)

Question 4(a): **Completing the Square.** Many candidates were unable to deal correctly with the constant term. There was a lack of rigour in the use of brackets. A common error was:

$$\begin{aligned} & 3(x+4)^2 - 16 + 50 \\ = & \, 3(x+4)^2 - 48 + 50 \\ = & \, 3(x+4)^2 + 2 \end{aligned}$$

Question 4(c): **Increasing Function.** Very few candidates were able to provide a satisfactory explanation in part (c). Candidates’ solutions either indicated a lack of understanding about what was being asked, or their answer lacked the necessary rigour in communication to gain either of the marks.

Question 5: **Vectors.** Part (a) was answered well by most candidates, but many struggled to gain both marks in (b). Common errors were:

- interpreting vectors as points
- interpreting ratio incorrectly
- applying section formula incorrectly

Many candidates used vector notation poorly throughout this question. Most candidates were able to attempt part (c), however, many of them applied the scalar product to the wrong vectors. The use of $\overrightarrow{QP}$ instead of $\overrightarrow{PQ}$ was a common error.

Question 7(b): **Closed Interval.** Many candidates were unable to attempt this question successfully. Most did not evaluate y at the end-points of the given interval.

Question 8(b): **Quadratic Inequalities**. Many candidates were unable to provide a satisfactory justification for the range of values to gain the last mark.

Question 9: **Equation from a Log Graph**. There was a disappointing response to this question. Many candidates seemed unclear as to how to attempt the question.

Question 10(a): **Collinearity**. Most candidates were able to gain the first two marks. However, there was a lack of rigour in communication for mark 3. Common errors were:

- not including both 'parallel' **and** 'common point' in communication
- stating that 'points A, B and C parallel'

Where a vector approach was used, some candidates failed to use vector notation correctly, and were often unable to state the ratio correctly.

Question 10(b): **Equation of Circle**. Most candidates were unable to determine an appropriate strategy to find the centre of the circle.

Question 11(a): **Trigonometric Identity.** Most candidates were able to make the correct substitution for the first mark. However, few candidates were able to simplify the expression further. A common mistake was to simplify $\frac{2\sin x\cos x}{2\cos x}$ as $2\sin x$.

A number of candidates either did not work with both sides of the identity independently, or equated the LHS to zero.

Question 11(b): **Chain Rule**. Many candidates failed to make the link with part (a). Candidates that did were often unable to complete the chain rule successfully.

Section 3: Advice for the preparation of future candidates

Centres deserve credit for the preparation of candidates for the Higher Mathematics Course Assessment. The majority of candidates were well prepared, and were able to attempt most questions. Workings were often well set out, and solutions were given in a clear and concise manner by a significant number of candidates.

The following advice may help prepare future candidates for the Higher Mathematics exam.

- Regular practice of arithmetic calculations, to help improve numerical skills.
- Consolidation of skills introduced at National 5, including working with surds and indices, vector pathways, and completing the square.
- Encouraging the correct use of notation throughout the course, eg vector notation, and integral notation.
- Appropriate use of brackets should be encouraged.
- Candidates should be encouraged to sketch curves to an appropriate degree of accuracy. Centres could help by providing pre-annotated axes as in this year's pupil answer booklet.
- Candidates should be encouraged to demonstrate clear and rigorous communication in their solutions.

The SQA website contains the marking instructions for the 2017 course assessment (as well as previous years). Those teaching Higher 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	18868

Number of resulted entries in 2017	18861

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	31.4%	31.4%	5919	96
B	22.9%	54.3%	4328	81
C	19.6%	74.0%	3706	66
D	7.8%	81.7%	1463	58
No award	18.3%	-	3445	-

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.