Course report 2023

Higher Applications of 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: 868

Number of resulted entries in 2023: 1,614

Statistical information: performance of candidates

Distribution of course awards including minimum mark to achieve each grade

A	Number of candidates	401	Percentage	24.8	Cumulative percentage	24.8	Minimum mark required	67
B	Number of candidates	370	Percentage	22.9	Cumulative percentage	47.8	Minimum mark required	55
C	Number of candidates	419	Percentage	26	Cumulative percentage	73.7	Minimum mark required	43
D	Number of candidates	291	Percentage	18	Cumulative percentage	91.8	Minimum mark required	31
No award	Number of candidates	133	Percentage	8.2	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 was accessible to most candidates. Feedback suggests it gave candidates a good opportunity to demonstrate the breadth and depth of their knowledge of the subject at this level.

Question paper

The question paper did not perform as expected. The overall level of demand was higher than intended. The grade boundaries were adjusted to take account of this.

Candidates found questions 2(b), 3(a), 4, 5(a), 5(b)(ii), 5(c)(i), 5(c)(ii), 5(d), 6(a), 7(b), 8(a), 8(b)(ii), 9(a), 9(b), 9(c), 10(b)(i), 10(c), and 11(c)(ii) more demanding than expected. Most candidates attempted all questions apart from questions 5(c)(ii), 8(b)(ii), 8(d), 11(c)(i), and 11(c(ii).

Project

The project performed as expected. Feedback from the marking team indicates it was positively received by centres and was fair and accessible for most candidates.

Section 2: comments on candidate performance

Question paper

Many candidates attempted most questions. Many candidates used appropriate statistical software. However, a few candidates did not provide printouts for questions 5, 8, and 11 and, of those who did, many did not print out the formula view for questions 8 and 11 as stated in the question paper.

Question 1: estimate the number of hours

Most candidates performed well in this question and stated appropriate assumptions.

Question 2(a): complete the PERT chart

Most candidates were able to put the tasks and durations in the correct sequence and successfully complete the forward scans. However, some candidates were unable to complete the backward scan for H correctly.

Question 2(b): determine whether they can still finish on time

Many candidates did not give an adequate conclusion with a justification.

Question 3(a): state the type of data

Many candidates simply stated ‘numerical’ rather than ‘discrete numerical’.

Question 4: calculate net annual salary after deductions

Many candidates did not calculate or deduct the pension contribution, so obtained the incorrect taxable income.

Question 5(a): construct a scatter plot

Most candidates plotted a scatter plot of carbohydrate content on calories instead of calories on carbohydrate content.

Question 5(b)(i): find the correlation coefficient

Many candidates were able to generate the correlation coefficient using appropriate statistical software. However, some candidates were unable to state the correlation coefficient from the generated information.

Question 5(b)(ii): interpret correlation coefficient

Many candidates did not use the words ‘positive’ and ‘linear’ or state that it was a positive correlation when interpreting the correlation coefficient.

Question 5(c)(i): find the equation of the regression line

Most candidates were able to generate the appropriate statistical output. However, most candidates were unable to state the equation in context.

Question 5(c)(ii): interpret the slope and intercept parameters

Most candidates were unable to write appropriate comments for either the slope or intercept parameters.

Question 5(d): estimate the number of calories

Many candidates did not use their answer from c(i) to estimate the number of calories.

Question 6(a): state the critical path

Some candidates were unable to interpret the Gantt chart to find the critical path.

Question 6(b): state the duration of the float time

Most candidates were able to interpret the Gantt chart to state the duration of the float time.

Question 6(c): state one advantage of using a Gantt chart

Most candidates stated a valid advantage of using a Gantt chart.

Question 7(b): calculate how much they deposited

Many candidates performed the present value calculation using an incorrect power or simply subtracted their answer to part (a) from £1000.

Question 8(a): complete the worksheet

Many candidates did not attempt to use the INT function leading to an incorrect interpretation of the predicted units of stock.

A few candidates did not produce the printouts required for this question.

Question 8(b)(ii): using the graph, state the type of mathematical model

Some candidates seemed unsure of what was meant by ‘mathematical model’ and gave answers such as ‘continuous’, ‘numerical’, or referred to distribution of data.

Question 9(a): explain relative purchasing power

Most candidates were unable to make the link that as the prices rise the same amount of money will buy less. Most candidates simply stated, ‘the prices have risen’ and made no mention of purchasing power.

Question 9(b): calculate the price

Most candidates did not approach this question as a present value or reverse percentages question. Many candidates simply calculated 10.4% of £14,108 then subtracted their answer from £14,108.

Question 9(c): determine if the minimum wage was in line with inflation

Most candidates were unable to calculate the relative rate of inflation.

Most candidates were unable to state an appropriate conclusion based on their previous working.

Question 10(b)(i): state the independent variable

Many candidates seemed unaware that the variables were either F or m. They gave answers such as 'kilograms' or '0.98'.

Question 10(b)(ii): estimate the fuel economy

Many candidates successfully estimated the fuel economy using the equation given.

Question 10(c): explain which graph could model the depth

Most candidates were unable to identify the correct graph. Most who identified the correct graph were unable to explain the shape of the graph in terms of depth instead of volume, and most explanations were incomplete.

Question 11(c)(ii): determine difference in total interest

Some candidates did not provide an answer for this question despite having completed the previous worksheets.

Project

Introduction

Most candidates were able to gain marks 1 to 4. However, some candidates did not state research questions clearly and did not always use appropriate statistical language.

The research questions should be of the form:

- I am going to investigate if there is a difference in means between…
- I am going to investigate if there is a relationship between…
- I am going to investigate if there is a difference between two proportions…

Due to poorly formed research questions, some candidates did not perform appropriate statistical tests later in the project.

For marks 5 and 6, most candidates did not explain sufficiently why their data was valid or unbiased. Some candidates simply made a statement saying that their data was valid or referred to their source as reliable without the necessary explanation, for example 'Since this is a government website, it's valid and unbiased.'

Subjective impression

Many candidates achieved marks 7, 8, and 11 by generating appropriate graphical displays including titles, labels, and scales. However, some candidates included additional graphs that were inappropriate. Some candidates who chose time graphs did not choose an appropriate second graph and some candidates chose to produce scatter plots that were inappropriate for their research question or data.

Many candidates did not achieve marks 9 or 10 because they only analysed the graph instead of describing its helpfulness. Candidates should make statements such as, 'The boxplot allows me to visually compare the median of the two data sets and gives an indication of the spread of data.'

Most candidates who used categorical data did not achieve marks 12, 13, and 14.

Presentation

Most candidates gained marks in this section and managed to stay within the word count. However, candidates should place more emphasis on introducing graphical displays, descriptive statistics, and additional statistics.

Most candidates used appropriate headers and maintained a flow in the reports.

Conclusion

Many candidates did not make appropriate connections or provide a summary between their graphical displays, descriptive statistics, or additional statistics in their conclusion. Some candidates did not gain any conclusion marks because they did not state an appropriate research question.

Section 3: preparing candidates for future assessment

The following advice may help prepare future candidates for the Higher Applications of Mathematics course assessment.

Question paper

Teachers and lecturers should:

- remind candidates that they should print spreadsheets in both value view and formula view
- encourage candidates to use the checklist on the inside of the front page of the question paper to ensure that they have printed all relevant documents
- encourage candidates to use the data booklet to help them create statistical diagrams
- consider what types of questions may feature in the question paper after the release of the data booklet
- consider the best way to allow candidates to practise skills for questions that require them to use software packages
- encourage candidates to set out clear, concise, and appropriate working for all questions
- remind candidates that they should use the INT/ROUND function in spreadsheets, where appropriate

Project

Teachers and lecturers should:

- ensure that candidates use appropriate data sets
- ensure that candidates have a suitable research question based on their data
- remind candidates that they should not use the example projects on the Understanding Standards website as a template for their project
- remind candidates that they must generate any statistical diagrams they use in their project themselves and not copy diagrams from textbooks and/or journals

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.

