



Level 3

Certificate in Mathematical Studies

1350/2A

Report on the examination

Version: 1.0

June 2025

Further copies of this report are available from aqa.org.uk

AQA retains the copyright on all its publications. However, registered centres for AQA are permitted to copy material from this booklet for their own internal use, with the following important exception: AQA cannot give permission to centres to photocopy any material that is acknowledged to a third party even for internal use within the centre.

General

Overall, students found this year's examination paper more accessible than last year's and demonstrated improved proficiency with advanced scientific calculators. There was clear evidence that very few students used the statistical tables. Students showed better progress in questions requiring the analysis of figures and graphs from the preliminary material. However, many still struggle to present complete solutions. It is advisable, when teaching statistical concepts such as the normal distribution, to ensure students attain a thorough theoretical understanding, possibly by using bell-shaped diagrams to illustrate how probabilities operate within this distribution.

Question 1

In part **(a)**, the vast majority of students were able to work out the fraction required.

In part **(b)**, although the majority of students arrived at the correct answer, several recurring misconceptions were evident. A number of students misused decimal shorthand for time, writing 6 m 23 s as 6.23 and then calculating the African range as $6.23 - 3.44 = 2.79$, thus treating minutes and seconds as a decimal value. This misrepresentation of minutes and seconds prevented students from earning the accuracy mark. Others identified the two chronologically furthest eclipses rather than the shortest and longest durations when determining the range. A further error involved adding the durations of the two European eclipses and the three African eclipses and comparing these totals, instead of subtracting the minimum from the maximum time.

Part **(c)** proved significantly more difficult. misunderstanding of the term "and/or" led many students to split the data into two separate lists and compute two medians. Among those who did work with the correct combined list, several could describe an acceptable method such as averaging the two middle values in an even-sized set but then did not carry out the calculation. Others correctly identified which values to use but made arithmetic slips when locating the central data points, preventing them from obtaining the correct median.

Question 2

Part **(a)** was well answered, with most students correctly using Alternative Method 1 by calculating and comparing the proportions $294 \div 731$ and $74 \div 190$, whether expressed as decimals or percentages. A small number, however, misinterpreted the instruction to give an approximate comparison and argued that the report was "incorrect" simply because the two proportions did not match exactly, thereby forfeiting the final mark.

There were good responses by students in part **(b)** with Alternative Method 1 being the most popular and reliable route to full marks. Methods 2 and 3 also yielded success when fully

executed. Although Alternative Method 4 attracted many attempts, students frequently omitted the intermediate calculation of $133 \div 44$, costing a method mark. Those choosing Method 6 typically earned two marks but neglected the final ratio comparison to 3:4:1.

Only about 15% of students scored the mark in part **(c)** making this the most poorly performing question on the paper. Many students merely speculated about possible rounding errors without performing any calculations. Among those who did calculate values for each revenue source, two errors recurred: first, totals that summed to 715 or 714.5 (for example, $303.8 + 319.8 + 90.9$), and second, correct overall sums paired with one figure falling outside the valid range (for instance, $304 + 320 + 90$).

In part **(d)**, a considerable number treated the 2021/22 figures as the original amounts when reversing the percentages, yielding calculations such as 270×0.84 and 144×1.06 and scoring no marks. It was also common to see a correct reverse-percentage method applied for AC Milan ($270 \div 1.16$) followed by an incorrect approach for FC Porto (144×1.06), resulting in only one mark. Students who applied the correct reverse-percentage process to both clubs typically achieved full marks; a few lost the final accuracy mark by failing to round their answers to the nearest million euros, as required.

The question in part **(e)** on criticism on the graph was generally answered well, with many students earning both marks. The most frequent criticism concerned missing axis labels; the next most common observation flagged the use of 3D shapes, which can distort interpretation. The strongest answers not only named the 3D format as a drawback but also explained how misaligned pyramid bases do not correspond accurately to the vertical scale. Among those who scored only one mark, the typical error was to repeat essentially the same criticism twice (for example, “missing y-axis label” and “no currency units”), or to make incorrect observations such as “there are no gridlines.”

Students who recognised the need to calculate a mean generally gained both marks in part **f(i)** by showing a correct working and arriving at a value close to –€50 million. Errors occurred when students omitted essential steps or confined their calculation to the four loss-making clubs only. A significant minority did not attempt any statistical computation, instead commenting on individual club losses, and so did not score.

The most common successful answer in part **f(ii)** was to identify Paris Saint-Germain as an outlier whose large loss unduly influences the mean. Some students hinted at the presence of an outlier without naming PSG and consequently did not score. Incorrect responses often noted simply that not all clubs incurred losses, which did not address the question of the mean’s sensitivity to extreme values.

Question 3

In part **(a)**, most students demonstrated a clear understanding of how to combine separate samples into a single weighted point estimate, marking an improvement over previous exam series. Just over 70% of the students earned full marks, with a small proportion who slipped up through minor arithmetic or place-value errors, and some who omitted crucial steps in their working. Those unfamiliar with the precise weighting method often still secured one

mark for correctly summing the sizes of the three samples, while the few who scored zero either made no attempt or averaged the three given mean annual salaries without applying the appropriate weightings.

In part **(b)**, many students misread “population” as referring simply to the number of respondents, commonly answering “40” and thus losing the mark. Others provided an incomplete definition by omitting essential qualifiers such as “senior” or “London,” or by describing the sample rather than the target population—for example, stating “senior nurses from three hospitals in London.” Only answers specifying the entire group of senior nurses in London were awarded credit.

In part **(c)**, most students understood that increasing the sample size improves the precision of a point estimate, commonly suggesting surveying additional senior nurses or including more hospitals within London. Only a minority mentioned enhancing the sampling method through random selection, and several students introduced stratified sampling, which, although a valid technique, exceeded the question’s scope and did not directly address the improvement of estimate reliability.

Question 4

Almost 80% of students correctly identified the standardised normal distribution as $N(0,1)$. The most common incorrect response was $N(1,0)$, which indicates a confusion between the distribution’s mean and variance parameters.

Question 5

Constructing a 92% confidence interval proved challenging for many students in part **(a)**. The first hurdle was identifying the correct critical value: several students used $z = 1.41$ or 1.65 instead of 1.75 . While most were able to set up expressions for the lower and upper bounds, a common arithmetic error was substituting 425 for the observed mean of 410. This led some to produce two conflicting intervals, one based on 410 and another on 425. It was also common to see many omitted any statement on whether 425 falls within their interval before making their conclusion. Even when a correct comparison was made, students frequently stopped short of a clear conclusion about the claim’s validity.

In part **(b)**, very few students recognised that the regions outside the central 92% is 8%, and that each tail therefore contains 4% with less than 12% gaining any credit. Although a few sketches annotated their working, most explanations were vague, and students rarely communicated the final 0.04 probability explicitly. To score full credit, students needed to subtract 92% from 100% and divide by two, clearly stating the resulting 4% (or 0.04) for the lower tail.

Question 6

Students performed very well on this question, with about 80% correctly circling 1. However, it was quite common to see two answers circled.

Question 7

In part **a(i)**, almost all students correctly identified the age outlier. However, a few chose 23 (the y -value instead of the x -value).

In part **a(ii)**, most of the students successfully used their calculators to work out the pmcc, with a large proportion earning full credit. The most frequent slip was omitting the negative sign, for example reporting 0.93 instead of -0.93 , yet still describing the relationship as “strong negative.” Despite the question’s explicit instruction to exclude the outlier, some still included it and ended up with a Pearson correlation coefficient of -0.77 .

Many students struggled to explain how an increase in a negative correlation coefficient affects its value in part **a(iii)** with fewer than half the students gaining both marks. A common mistake was to claim that the correlation had “decreased.” Nonetheless, about 35% of students still earned one mark by correctly stating the effect on the type and strength following on their answer in the previous part.

In part **(a)(iv)**, just under two—thirds of students correctly pointed out that the sample size was too small and that correlation does not imply causation, whereas the most frequent incorrect answer focused on the influence of an outlier in context.

In part **b(i)**, students needed to present the regression model explicitly as an equation in terms of x and y . Many provided correct values of a and b but stopped short of forming the full expression. A common error was using data including the outlier to derive the regression line; nonetheless, those students often achieved the final two marks by then substituting $x = 70$ to obtain a y -value. Most students did the algebraic substitution over graphical solution.

Part **b(ii)** saw students typically mention the removal of an outlier, offer qualitative speculations about the 70-year-old’s internet usage or rounding error or cite the small sample size. Popular but incorrect justifications included “small sample size,” “outlier excluded,” or “rounding error” with just over half the students failing to score. The most common correct reason was the use of extrapolation. Very few also noted that the predicted point might itself be an outlier.

Question 8

Two-thirds of the students scored the mark in part **(a)** by correctly stating that $P(R < 1200) = 0.5$, whereas common errors included writing 0 or offering an approximate value near 0.5 instead of exactly 0.5.

As this was the first time question of this type in part **(b)** was asked, many struggled to display their full working using normal-distribution question. However, students who obtained the correct probability from their calculators still received full credit, provided their answer fell within the acceptable tolerance and their method contained no clear contradictions. It is recommended that students standardise 950 and 1250 either using the statistical tables or directly via calculator and subtract the resulting cumulative probabilities to find $P(950 < R < 1250)$. The use of a sketch of the normal distribution curve to aid their working would have been helpful.

In part **(c)**, a significant proportion of students mistakenly treated the interquartile range as if it referred to the z-scores calculated in part (b), which led to little progress. The mark scheme required calculation of the lower and upper quartiles via standard normal tables, although calculator-based methods were acceptable when correctly applied. Such approaches, however, were relatively uncommon. Many students simply subtracted 950 from 1250 or attempted to reuse the probability from part (b) to construct a different interval. Just under 15% of students gained full marks with almost 80% failing to gain any credit.

Part **(d)** proved challenging for many, as most did not recognise that “four standard deviations” implies two standard deviations on either side of the mean. Although many could recall that approximately 95% of data lie within two standard deviations, they often did not connect this fact to the question’s wording. They did not mention about the 5% of the population. To earn full marks, students needed to comment that $\pm 2\sigma$ encompasses only around 95% of data, so a four- σ span cannot represent the entire population. Under 3% of students gained both marks for this high demand question.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the [Results Statistics](#) page of the AQA Website.