LEVEL 3 CERTIFICATE
MATHEMATICAL STUDIES

1350/2B: Critical path and risk analysis
Report on the Examination

1350
June 2019

Version: 1.0

General

The paper was accessible to most students, with more students than last year attempting each question. Students were well prepared for most topics in the specification. However, cost-benefit analysis continues to be answered less well. Marks on question 6 were much lower than others on the paper.

This year, there was more evidence of students using efficient methods to perform calculations. For example, students generally calculated percentage increases using a single multiplication on their calculator rather than working out the increase and adding it on to the original amount. Written mathematical communication continues to be good, with most solutions well signposted and easy to follow.

Question 1

Part (a) provided an excellent start to the paper for most students, with the vast majority scoring full marks. The most common error was matching the median to 10.30 g. Only a tiny minority of students did not correctly match at least one of the pairs of boxes.

On part (b), the majority of students correctly identified two errors and were able to explain them clearly. A common incorrect answer was that the y-axis was unlabelled. This was awarded no marks. Credit was also not given to ‘the bars should not be touching’ because, on a multiple bar chart, this is appropriate.

Students found part (c) more challenging and this part discriminated well between students. Students’ written working here was generally good, with solutions easy to follow. More successful solutions included units at each stage of working (for example, ‘fat per gram’ or ‘fat per 10p’). Errors in such solutions were rare as students were clear what each calculated quantity represented. Alternative method 1 was the most common, and also the least error prone. A number of students used incorrect values from the table which limited the marks available to them. For full marks, it was essential that the fat content of brand B’s prawn cocktail crisps was used. Various other values were incorrectly used, including the mean fat content of one or both brands.

Question 2 (a)

Many teachers had prepared students well for this question, with three clear and distinct improvements given. Students were more successful this year at stating improvements rather than errors which would not have given access to full marks.

In most cases, the improvements discussed were about the graphs rather than the article. Some students gave improvements that were too similar to be awarded multiple marks, for example ‘label the x-axis’ and ‘label the y-axis’.

Some students clearly had a good understanding of the PISA data from their research of the Preliminary Material, correctly stating that the y-axis should be titled ‘score’ rather than ‘ranking’.

However, it was relatively common for students to give improvements that were about the underlying PISA data rather than the article itself. For example, many suggested that the graphs should show 2015 and other years. This would not be possible, since PISA only collect data every three years.

Some improvements that were not awarded marks included suggestions that the graphs should be in colour. Newspaper articles and other printed reports will sometimes need to be printed in greyscale and so other methods to differentiate between data series will need to be used.

Question 2 (b)

Many students did not critically analyse the provided calculation, with around half of students scoring a single mark.

For full marks, we needed to see a critical analysis of what the researcher had done wrong. The best solutions documented clearly the two key mistakes: the denominator was incorrect and the calculation did not include multiplication by 100 to find a percentage.

A large number of students did not notice that the denominator was incorrect. However, those that fixed the multiplying by 100 issue were awarded one mark.

Question 2 (c)

Students generally provided a better response for Simon's claim than for Rukshana's.

Most students scored both marks for part (i). Despite the exact values being given in the article, it was common for students to estimate from the graph. This was generally done well, although a few students read values from the graph that were outside of the allowable range. This was for a number of reasons, but most often from using the wrong year or working out an average.

A larger than expected number of students did not gain the final mark for the conclusion for two surprising reasons: statements such as '16 is not bigger than 10 so Simon is not correct' were common, whilst many others did not answer the question of 'is Simon correct?' with a definitive 'yes'.

On part (ii), a common error was to find an absolute difference (for example, 13) and then subtract this again. This approach would achieve a repeated percentage decline and so was awarded no marks. As with part (a), students commonly read values from the graph rather than using the exact values provided in the article. Around a third of students scored full marks on this question. Those scoring partial marks typically made mistakes finding the percentage decrease. However, they were usually able to re-apply this percentage decrease correctly and were able to score the second method mark.

Question 3

Around three quarters of students did not score the mark on question (a). The most common incorrect answer was $\frac{28}{491}$ rather than the correct denominator of 41 (the number of asthma sufferers). Teachers would benefit from looking at a variety of potential wordings for probability questions where the denominator should not be the size of the entire sample or population.

On part (b), around 40% of students scored full marks on the key skill of estimating the prevalence of a condition in a population based on the results of a sample. A variety of valid approaches were taken and the quality of mathematical communication was good here to explain each stage of working.

Fewer students than in previous years made an assumption about the size of the UK population for the question. Those that did scored no marks as this question could be answered solely using the information in the table, as instructed in the question.

A few students struggled with the population being given as ‘5.4 million’ rather than being written as a number in ordinary form. With place-value errors, answers such as 8 billion or 65 billion were not uncommon. Teachers would always do well to continue to remind students to check whether their answer is reasonable, a key skill of this qualification.

In part (c), it was essential for students to make reference to the population in order to be awarded the mark. For example, ‘the sample is small’ scored no marks because this is a rather larger sample than is used in many situations. However, it is small in comparison to the size of the UK population; it was necessary to make reference to the size of the UK population for the mark to be awarded.

Question 4

Students performed well on the critical path analysis questions, with far fewer partial diagrams provided in part (a) than in previous years. It was impressive that most students scored full marks for constructing and completing the activity network. For those that scored partial marks, the backward pass continues to be the main source of errors, 22 for E being the most common mistake. Many students appeared to misread their own writing, especially when they had corrected values on their diagrams by writing over the top of the previous value.

On part (b), students showed a good understanding of completing a Gantt chart. The modal mark was 3, because very many students omitted the units of ‘days’ on their time axis despite an otherwise flawless solution. Errors with floats were also common. These often appeared incorrectly on the critical path. Despite this question not directly asking for the critical path, students should be reminded that there will always be at least one critical path on a Gantt chart. This means there should be at least one series of activities without floats that occupy the entire duration of the project.

As with previous years, students who chose unusual scales for the time axis (usually 3 or 4 days per ‘big’ square) were unable to construct their chart sufficiently accurately to be awarded many, if any, marks.

Three quarters of students correctly identified the float on activity I for question 4 (c) (i), with the incorrect floats being chosen broadly equally. However, few students saw the connection between part (i) and part (ii) and so gave the answer 0.92 by not taking into account that a packaging delay of 1 day would not cause a delay of delivery in the toys.

Question 5

The initial stages of this question proved challenging for many students. Almost all students correctly wrote 1000 into the Venn diagram as a first step. However, very many then went on to write 2000 rather than 1200. Allowance was made for this common mistake and most students went on to score a subsequent mark bringing the modal mark for part (a) to two.

It was not uncommon to see arithmetic slips on this question, the most common being
7000 – 1200 = 6800.

Even for students who correctly answered part (a), identifying the required value from the worded description was not always straightforward. Another common error was to state a percentage, despite the question asking 'how many'. Those students who had made a mistake in part (a) were awarded the mark if the correct value from their Venn diagram was selected.

As with question 3(a), many students did not realise that the denominator of their fraction should not represent the whole population in question 5(c). Those who did generally went on to score full marks, although a number of students did not follow the instruction to leave the fraction in its lowest terms and so did not gain the final accuracy mark.

Only around 5% of students scored full marks on part (d), generally because they did not consider that the two students could be selected in either order. Because of the large size of the population, answers whose denominators did not decrease by one were condoned as this error did not have an impact on the answer to the accuracy requested in the question.

Question 6

As in previous years, this topic was the most challenging for students on the paper. The question discriminated well between students.

Many students gave discursive answers to this question that did not include expected values and so limited the potential marks they could score. Up to three marks could be awarded for stating or calculating probabilities. Good written working was seen for these, often in the form of a tree diagram. However, too few students went on to multiply their probabilities by costs or gains, a process which lies at the heart of cost-benefit analysis. A majority of students made statements along the lines of 'there is a 40% chance of losing 120 thousand and a 60% chance of making 50 thousand' rather than combining these into expected values.

For those that did calculate expected values, option C proved to be the most challenging because of the conditional probability involved. A number of students also made sign errors, meaning their losses/gains could not accurately be compared.

Despite the challenge of part (a), those who attempted part (b) were generally successful in being awarded the mark for giving an explanation of why the producer might ignore the result of a cost-benefit analysis. Responses that were not awarded the mark were typically too vague, for example 'too risky' without qualifying what was at risk.

Use of statistics

Statistics used in this report may be taken from incomplete processing data. However, this data still gives a true account on how students have performed for each question.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.