LEVEL 3
CERTIFICATE IN MATHEMATICAL STUDIES

1350/2B Critical Path and Risk Analysis
Report on the Examination

1350/2B
June 2023

Version: 1.0

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

General

The paper was accessible to students, with questions being attempted at an increased level compared to earlier series. It was extremely rare for students to not attempt questions and there was little evidence of students running short of time.

As with previous series, students are generally very well prepared for this component. This was especially true for the critical path analysis questions. However, risk analysis, especially calculating expected values, remains a topic that is not well answered. This year's question was more accessible in the early stages, with three marks available for students who made calculations with money values even without calculating expected values.

Question 1

Students scored well on this question. In part (a), the vast majority of students were able to work out the correct ratio. A common incorrect response was the first option as they had chosen the reverse order for the ratio.

In part (b), most chose the first alternative method to check if the data given supports the claim. On some occasions, mistakes were made as a result of choosing the wrong values from the table. While most students were able to work out the total number of medals for the two countries identified, some made arithmetic errors in the division or rounded the final values incorrectly. Students who used the second alternative method, often made incorrect conclusions at the end. Those who followed this method, usually scored two marks but lost the final mark. A few students continued with further incorrect methods after getting the right answer and as a result they did not gain the final accuracy mark. They were instances of missing brackets which were not recovered and led to incorrect answers.

Question 2

Just over one third of students scored the full marks in part (a). The common responses were relating to adding the y-axis or adding gridlines or avoiding the symbols from overlapping each other. Some students made criticism about the graphs, but did not make any recommendation to improve them. These students were able to gain one mark for writing at least two errors on the graphs. Common incorrect responses on the improvement included labelling the axes or using colours.

On part (b), about 85% of students correctly identified from the preliminary material that 35 (children aged 7) equated to 42% of the data. Just over half of students went on to apply a valid reverse percentage method to establish the correct answer, with many students attempting to combine their findings with other percentages from the graph. There was no tolerance of subsequent working on the mark scheme.

Only 29% of students got full marks on part (c). Students found identifying or describing the mistake difficult, in many cases offering an alternative method instead. The most common incorrect response was suggesting that there needed to have been a conversion to minutes. Building on this

conversion would still typically lead to a correct re-calculation for two marks, with 28% of students being awarded as such. There are many examples in the additional guidance on the mark scheme that highlight the tolerance to the range of responses, but simply stating that 4hr 45m does not equate to 4.54hr would have been adequate.

Over one third of students obtained the single mark available on part (d). The ideal response was to reference unknown population sizes, but there was a common misconception that different sample sizes impacted the claim. A typical incorrect response would state that a small percentage from a large sample was greater than a large percentage of a small sample. The mark scheme was tolerant of some other responses such as those that indicated the survey may not be representative. Simply stating a sample was taken was insufficient. Some students did make the argument that children (or parents) may disclose incorrect information due to the age restrictions for social media. This was accepted.

Despite being told not to comment on the graphs in part (e), many students proceeded to do so and so could not gain any credit for their remarks. However, more than two thirds of students were able to make at least one valid comment, with the most common being to point out the mixture of fractions and percentages, as well as noting various issues with the age groups used. Some students stated that the report would have been better if actual numbers of people were used rather than percentages. This was not accepted as a valid reason because it would have made it more difficult to make comparisons between ages or groups of ages.

Part (f) required students to use the values given in the question along with one sourced from the preliminary material to make an estimate. The required value from the preliminary material was stated as two thirds in the text but 66% on graph 2. Both values led to the same rounded answer and we accepted working that used either. Around a quarter of students were able to reach the rounded answer of £28 million. Many students made place value errors when working with millions and billions. The mark scheme allowed for such errors without penalty up to a maximum of four marks. Around 88% of students were able to gain at least one mark. Those who scored 1-3 marks generally missed one or two parts of the chain of calculations required. It was also common to see the currency conversion applied incorrectly.

Question 3

This question was extremely well answered, with an average of more than 7 marks out of the available 9 being awarded. The activity network was provided this series, which eliminated early errors in constructing the network. Centres should note that we do sometimes expect students to construct these for themselves.

On part (a), mistakes on the forward pass were rare; at least 90% of students were able to carry out this part of the algorithm accurately. Mistakes on the backward pass were more common, but happened at a lower rate than on previous series, with nearly three quarters of students gaining full marks on this part.

Part (b) was also well answered. However, a few students with fully correct networks did lose this mark as they listed certain critical activities (typically C and H) rather than the critical path.

Even some students who scored zero on part (a) were able to score marks by accurately constructing the required Gantt chart in part (c). This suggests that some students are doing so from the precedence table rather than their network. The mean mark on this question was more than 3 of the available 4 marks. Those students who lost marks typically did so through inaccurate plotting of activities, or by not plotting the floats on the three non-critical activities.

Question 4

Part (a) provided a good start for most students, with over 80% correctly writing down the required probability. Centres should encourage students to be careful when their calculator shows a recurring decimal on their screens. In this case $0.0\dot{8}\dot{5}$ was often truncated as 0.085 rather than being rounded correctly as 0.086 or 0.0859. We did ignore such incorrect truncation if a correct fractional answer was also written down. However, if the incorrect decimal was written alone, no credit was given.

Whilst many students started part (b) with the correct fractions of $\frac{180}{390}$ and $\frac{330}{990}$, fewer than 40% of students chose to multiply these to find the required answer. More commonly, they were incorrectly added or combined as $\frac{510}{1380}$. Neither approach was given credit.

Part (c) asked students to use the sample of one primary and one secondary school to estimate a value in the population of the whole town. Around two thirds of students successfully worked out at least one correct value for either primary of secondary, but only 40% were able to accurately combine both types of school to find the final estimate.

Nearly half of students were able to give clear, well-reasoned arguments that the two schools may not be representative of the whole town in part (d). The different uses of the word ‘estimate’ may have caused confusion for some students, who stated that rounding of decimals (‘you cannot have a decimal number of people,’ for example) was the reason their answer to part (c) was not a good estimate.

Question 5

The second question about critical path analysis was also well answered, with more than three quarters of the six available marks being awarded on average.

Nearly 95% of students made a successful start on part (a) by correctly calculating the duration from the earliest start and latest finish times of activity B.

Over 80% of students also correctly gave two durations with a total of 5 weeks in part (b). Whilst decimal answers were not common, credit was given to answers such as 2.5.

Part (c) was less well answered, but most students were able to give a clear explanation that, as activity G is not critical, working out its duration would not be possible as we would not know how much float it has. When students lost this mark, it was generally because their explanation was non-specific, for example 'we do not know information about activities C and D'.

A variety of methods were accurately used in part (d), including many successful informal approaches that were given full credit. Around 80% of students made some progress on this question, with 70% able to accurately calculate the values of x and y.

Question 6

Whilst the vast majority of students were able to successfully complete the Venn diagram in part (a) with the required three values, around 15% made at least one mistake. The most common error was writing 19 and 21 straight into the diagram, without accounting for the 16 in the intersection.

In part (b), around half of students correctly wrote a fraction with the denominator of 19, necessary because the question stated that the chosen student was known to have passed their theory test at the first attempt.

Less than 15% of students were able to calculate the correct probability requested in part (c). Marks were only awarded to those students whose working showed an understanding of dependent probability, for example by multiplying their initial fraction with one whose denominator and numerator had decreased by one.

Question 7

Whilst the average mark on the risk analysis question was higher on this paper than in previous series, we continue to see a significant number of students not calculating expected values (ie by multiplying a revenue by the probability of that revenue happening). These students often gained up to three marks by correctly calculating revenues for various situations (such as the revenue made if Clara orders 100 barbeques and it is not hot). Some also correctly calculated the probability of it not being hot, but failed to make use of this in an expected value calculation.

Less than 5% of students were able to correctly work out expected values for both of Clara's options and to reach a correct conclusion. More students were able to calculate one of the two, but incorrect combinations of the components that went into the other expected value limited the awarded marks.

Mark Ranges and Award of Grades

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