General Certificate of Secondary Education
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Mathematics 43652H

(Specification 4365)

Paper 2 (Higher)

Report on the Examination

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General

The new linear specification has a greater proportion of functional, problem solving and applications questions; and this is the first calculator paper. However, students generally performed well on functional elements questions where familiar contexts allowed them to access the mathematics required. Responses to problem solving questions were more variable. There was no evidence that students were short of time.

Topics that were well done included:

- inverse operations
- substitution
- solving linear equations
- Pythagoras' theorem
- cube numbers
- percentage reduction.

Topics which students found difficult included:

- rotational symmetry
- reasoning
- solving inequalities
- perimeter of a semicircle
- areas in similar shapes
- proof
- conditional probability.

Question 1

This was a good starter for most students at this tier. Some students only reversed one of the operations, with 52.8 and 0.3 quite common incorrect answers.

Question 2

This question proved to be quite a good discriminator, although, surprisingly, challenging for many students. On this type of question, where a decision is required, students should always check that they have answered the question. Many did all the mathematics that was required and then omitted a conclusion or gave an incorrect conclusion. The most successful methods used were either to work out the distance covered in 2.5 hours and compare that with 169 miles, or to obtain the time taken for the journey as 2.6 hours and compare that with 2.5 hours. Those who tried to work out the time of arrival were less successful. It was common to see 2.6 hours changed to 3 hours (2 hours and 60 minutes). Other errors in the use of 2.6 hours were common, for example 6.30 + 2.6 = 8.90, 6.30 + 2.60 = 9.30, or 6.3 + 2.6 = 8.5 giving an arrival time of 8.50 am. Others stated that 9.00 – 6.30 = 2.7 hours.

Question 3

In both parts, students usually obtained the correct answers of 147°. However, a majority of students did not give the correct reason in part (a). In part (b) there was more success as there were two acceptable reasons, as the angle found in part (a) could be used. Many stated that "angles in parallel lines are equal" as the reason in both parts.

Question 4

This question was generally well answered but many students made errors in calculating the VAT, with some adding VAT for both companies. Many students only found ⅓ while others used 30% or 0.3 for ⅓. A few gave 780 – 0.3 = 779.7 In calculating the mileage cost, students often had a mixture of pence and pounds leading to, for example, 36 + 9000 or even 36 + 900. A small number of students, having carried all the calculations correctly, then chose the more expensive company.

Question 5

This algebraic substitution question was generally well answered.

Question 6

In part (a), many correct formal algebraic methods were seen, although many other students used a numerical approach successfully. However, a small minority of students assumed that the lines were parallel and gave 180° – 134° to obtain 46°, which although a correct numerical answer, came from an assumption that could not be made. Responses in part (b) were generally poor. The most common incorrect answers were "they are parallel because the lines never meet" or "parallel because it is a trapezium". A few stated the lines were not parallel as they did not have arrows on them. Others stated the lines were not parallel as, for example, A and D or B and C were different angles.

Question 7

A significant proportion of students did not score on this standard question for finding the area of a triangle, with a significant number making no attempt. Of those who found an area, many did not give their answer to one decimal place. The most common error in using the formula for the area of a triangle was to omit the division by 2.

Question 8

This was very well answered by most students. The most common method used was to multiply out the bracket first. Setting out for this question was usually very clear.

Question 9

The most successful method (and the expected method) used in this question was to list the possible outcomes. Those who used probabilities of ⅓ and ½ often added the probabilities and frequently gave answers of 1/5, 2/5 or 2/6.

Question 10

Responses to this trial and improvement question were generally good, with almost all students reaching the final stage. Many gave answers to two decimal places, whilst others chose 3.8 as it was closer than 3.9. This simple statement is insufficient as a reason.

Question 11

Those who scored marks usually gave a fully correct solution with good presentation. Some students used $c^2 = a^2 + b^2$, without realising that c was not the hypotenuse in the diagram for this question. A small number of students used trigonometry but usually without success.

Question 12

Only a minority of students gave a fully correct answer, although most were able to give a suitable question with a time frame. Common errors with the response section were to omit a section for zero, not have an open-ended final response or some gave overlapping responses.

Question 13

Part (a) was a good discriminator. Many answers of 7 were seen but often the inequality was not used correctly. Over half of the responses to part (b) were correct with a fairly even share between the two incorrect responses.

Question 14

A majority of students were unable to complete a correct frequency polygon, with lots of histograms drawn and many plotting 17 at one square above 16 (16.4). A large number correctly plotted the points but did not join them up, or joined the points and then completed a polygon shape by joining the first point to the last point. Some students plotted at upper class boundaries.

Question 15

Very few part marks were scored on this question as generally those students who set up an equation went on to solve it correctly and check that all three sides were equal.

Question 16

This question was very well answered by most students although a few used squares instead of cubes.

Question 17

This question was generally quite well answered. Common errors were to stop at 83% or 83.3%, or to work out 3000 ÷ 2500 = 1.2 and then give an answer of 20%. A lot of students used trial and improvement to obtain 17% of £3000 is £510, giving the answer of 17%.

Question 18

In part (a) only one-quarter of students chose the correct expression out of the four given. The most popular choice was $\frac{1}{2}\pi r^2$, followed by the correct answer of $\pi r + 2r$, then $2\pi r$, with πr the least popular choice. Part (b) proved challenging to even the most able students, although many gave their answer to a suitable degree of accuracy,

Question 19

This question was generally very well answered.

Question 20

The table of values was usually completed correctly. Part (b) was assessing whether students could decide on sensible scales and complete a fully labelled graph. This part proved to be a very good discriminator, with responses varying in quality. A significant minority did not attempt this part. Some students had difficulty labelling axes sensibly, whilst others, having chosen to use 1 cm to 1 unit on the x-axis, had difficulty then drawing a smooth curve. Some axes were drawn at the edges of the graph paper with the point (–2, –3) at the intersection. Another common error was the points being joined by straight lines.

Question 21

Students who made progress with this question usually scored full marks. The common error was to simply add up the given masses and state that it was not true. The common error when using bounds was to use ± 0.1 kg. A popular solution was to give 8.24 + 3.44 + 4.54 = 16.22 kg for Kate, and 6.75 + 4.25 + 5.15 = 16.15 kg for Amy. The upper limit for Kate of 16.25 kg was accepted.

Question 22

Many students did not attempt this question and seemed unfamiliar with similar triangles work. Success was limited to the more able students. Common errors were trying to use Pythagoras' theorem to find BC and making no further progress, or assuming that angle C was 45° or that ED was 8 cm. A significant number of students could not put 12 cm, 8 cm and their answer for ED into the area of trapezium formula in the correct order.

Question 23

This question was not well answered. Many students ignored the statements at the start of the question and worked with the full range of 6 numbers. Others included 3 in the values that were less than 3. Some added probabilities instead of multiplying. Listing all the possible outcomes was often a successful method.

Question 24

Approximately half of all students did not score marks on this question. Common errors amongst those who made some progress were to write $5x^2$, $+15xy$ or $-5y$. These errors were more frequent when a grid method was used.

Question 25

A significant majority did not score marks on this standard quadratic formula question with many making no attempt at it. Students who used trial and improvement had no success as they only found one solution at best. A few students attempted to complete the square, usually unsuccessfully. Of those who did realise to use the quadratic formula, the most common errors were using 6 for b or + 5 for c or only having the division line beneath the root.

Question 26

Part (a) was generally quite well answered, although 4/3 πr^2 was often used for the volume formula, even though it is given on the Formulae Sheet. Some students misused the 25 packs, giving 25 × 10 and 25 × 4 and then 250 × 250 × 100. Part (b) was one of the least attempted questions on the paper. Common errors were 500 × 400 and 400 ÷ 500.

Question 27

This question was the least attempted question on the paper, with only the most able making any progress, despite it being a routine procedure. Presentation was often poor, with brackets being omitted at random and a lack of rigour in showing every step. Weaker students tried to 'prove it' by substituting values into both sides to verify the answers were equal.

Question 28

This question proved challenging for most students. Of those who attempted the question, most used a tree diagram method, with errors including adding instead of multiplying probabilities.

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