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Mathematics 43651H

(Specification 4365)

Paper 1 (Higher)

Report on the Examination

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General

The standard of arithmetic was generally very poor and many marks were lost even by the most able students. On the whole, students' working and presentation was good. Many students struggled with algebraic manipulation.

Topics that were well done included:

- angles in parallel lines
- basic probability
- solving a linear equation
- factorising
- problem solving with perimeter.

Topics which students found difficult included:

- describing a translation
- inequalities in 2 dimensions
- comparison of distributions using an average and a measure of spread
- fractional indices
- quadratic equations and their relationship to a quadratic graph.

Question 1

All parts of this question were well answered.

Question 2

Both parts were well answered. The main common error was in working out the totals in part (b): 1 + 2 + 2 + 1 was often given as 5, and 8 $\times$ 8 resulted in a variety of answers. Cancelling $\frac{6}{64}$ was not always done accurately but students were not penalised if the correct fraction was seen. Some students gave 6 : 64 or *6 out of 64* which are not in the correct format for probability.

Question 3

This question was quite well answered. The most common error was to misread the question, so that the same angle (70°) for men was drawn for the 5 kilometre for women, giving 100° each for the 10 kilometre and the Marathon. Some students clearly did not have use of a protractor.

Question 4

Part (a) was not well answered with fully correct answers quite rare. Very few described it as a translation. Part (b) was answered a little better than part (a) and once again students had some idea of a reflection, but only a minority gave a fully correct solution. Reflections in y lines other than $y = -1$ were common as was a reflection of B in $x = -1$ and A in $y = -1$.

Question 5

This question was well answered. The main errors were in rearranging the variables or poor arithmetic.

Question 6

Both parts were well answered.

Question 7

The majority of students knew to expand and collect terms, but many arithmetic errors were seen. The main one of these was $-2 \times -1 = -2$.

Question 8

Part (a) was quite well answered. This question assessed Quality of Written Communication and required a complete method; i.e. a comparison of the gradients and a conclusion based on their comparison. Diagrams were common, followed by a justification about the distance travelled being shorter for the 1 in 120 track. Other successful methods compared the height risen over the same distance (for example 600m), or calculated the gradient from 100 ÷ 150, or 100 ÷ 120. Those students who were unsuccessful often repeated the information in the question or stated that as 150 was a larger number then it must be the steeper gradient. Part (b) was not well answered. Very few students took the straightforward option of writing 2.5% as a fraction then cancelling to get a numerator of 1. Some students were defeated by the numerical demands.

Question 9

This question was well answered. There was some confusion with width, which was often given as the horizontal distance of 9 cm. The main errors were misinterpreting which diagram had a perimeter of 24 or, less often, taking the area as 24 cm^2. There were few trial and improvement methods seen with most students using an algebraic approach.

Question 10

This question was not well answered. Boundary lines were not plotted correctly. $x = 4$ was the most common followed by $y = x$, whilst $y + x = 4$ was rarely correct. The region was then often shown on the wrong side.

Question 11

Part (a) was very well answered, although arithmetic errors were often seen. Part (b) was not well answered. The mark for Quality of Written Communication was for realising that a 90° triangle is formed within a semi-circle (angle in a semi-circle = 90^o). Many simply defined a diameter as a line passing across a circle passing through the centre.

Question 12

This question was very poorly answered. In part (a) just over half of all students worked out the correct scale factor. 9 was a common incorrect answer but a lot of students could not divide 15 by 6 with 2.3 being a common incorrect result. In part (b) many wrote down 150°. In part (c) many students were able to show a correct method, although using an incorrect scale factor often led to problems with the division. Those who wrote 9 in part (a) usually gave 11 as the answer to part (c).

Question 13

Part (a) was well answered but part (b) was the worst performing question on the paper. Students often wrote down facts about the two box plots but rarely interpreted them, or they wrote down a conclusion but rarely backed it up with a reason. Also, some reference to the values was necessary for full marks. It was not enough to say 'greenhouse cucumbers are longer' or 'the median for cucumbers in the greenhouse was 1 cm more than the garden'. Interpretive comments backed up with correct numerical were needed; for example, 'greenhouse cucumbers are longer as the median was 1 cm more than the garden cucumbers'. Similarly, it was not enough to say 'greenhouse cucumbers are more consistent', or 'greenhouse cucumbers had a smaller IQR'. It was necessary to say 'greenhouse cucumbers are more consistent as they had a smaller IQR of 11 cm compared to 15 cm for the garden'.

Question 14

In part (a), less than half of all students recognised this as a difference of two squares. In part (b) students who knew to attempt to factorise the denominator usually scored well. The main error was simply to cross off the x^2 term or cancel 9 and 3 without any attempt to factorise.

Question 15

In part (a), if students realised this was a limits question then they usually gave a fully correct solution. Poor arithmetic was again quite common. Otherwise, an answer of 39 cm^2 was the most common incorrect answer. Part (b) was not well answered. The majority of students over-complicated the algebra. The first problem was dealing with the fraction. The 2 was rarely 'cross multiplied'. The second problem was then dealing with the bracket. This was often subtracted. h often appeared in the final answer as well as being the subject.

Question 16

This question was a good discriminator. Those students who worked out 20%, often gave the final answers as decimals. Some students did not have a final total of 8.

Question 17

Students who knew the method for simplifying surds usually gave a fully correct answer. $29\sqrt{3}$ or $\sqrt{87}$ were common incorrect answers.

Question 18

Many students clearly did not understand rules of indices, with a lot of fraction calculations seen. If the rules were known, arithmetic errors were occasionally made. The cube root of 64 was sometimes seen amongst some wrong fraction calculations.

Question 19

This question was not well done and was the least well attempted on the paper. The starting point for the method mark was to work out the volume in terms of x. Calculating the area of the base proved difficult for many. $2x$ was a common answer when using ½ base × height and there were attempts to use $\frac{1}{2}ab\sin C$ or Pythagoras' theorem. The next problem was realising that $AB = 2x$. Those students who did obtain a correct area often could not manipulate the fractions within the algebraic solution. 24 instead of 216 was a common error.

Question 20

This question was not well answered. There were many non-attempts. The most common method was to substitute $x = 2$ and $x = 4$ into the equation to obtain two simultaneous equations. Often these were not made to equal zero so progress was limited. The few who did manage to make some progress sometimes made errors in eliminating a variable. A less common approach was to use $(x – 2)(x – 4)$ and expand the brackets. This usually led to the correct answer. $(x + 2)(x + 4)$ was also seen.

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