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General Certificate of Secondary Education
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Mathematics 43603H

(Specification 4360)

Unit 3: Geometry and Algebra (Higher)

Report on the Examination

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General

This was the second Unit 3 higher paper to be taken by students. The paper was accessible to the majority of students with no evidence of students being short of time.

Topics that were well done included:

- circumference of a circle
- reflection and rotation of shapes
- volume of a prism
- Pythagoras' theorem.

Topics which students found difficult included:

- interpreting a scale drawing
- simplifying expressions
- setting up and solving a quadratic equation
- inverse proportion
- multi-step cosine rule and area of a non-right angled triangle.

Question 1

This question was quite well answered. Common errors in part (a) were to use πr^2 or πr. In part (b) most students halved their answer to part (a) but did not add on the length of the diameter.

Question 2

This question was very well answered with part (b) more successful than part (a). In part (a) the most common error was to reflect in x-axis. In part (b) a majority gave a fully correct 180° rotation, although many gave 180° rotations about an incorrect centre, such as (1, 1).

Question 3

Students comparing equal quantities were more successful than those finding, for example, quantities per pence. Answers of £3.90 and £3.98 for 3 litres were the most popular and that was the most successful method.

Question 4

Responses to this question were mixed, with a significant number making little or no attempt. Many realised the need to measure AB but the proportion of students completing the question was low. Common errors included using 1000 cm = 1 metre or 10 cm = 1 metre, not dividing by 100 to complete the conversion or assuming the shape was a semi-circle and calculating the area.

Question 5

Parts (a) and (b) were quite well answered. In part (c) many calculated the surface area giving $120 \times 6 = 120$. The other common answer was $20^3 = 8000$. Those students who realised they needed to work out $\sqrt{20}$ usually went on to give a fully correct answer.

Question 6

Part (a) of this question was well answered at this tier. Some students worked out the three angles but made no reference to 360°. Those starting with $360 \div 12 = 30$ usually gave fully correct solutions. In part (b) only a minority had any success, with most of those unable to simplify their expression correctly. The most common error was to omit the brackets in $180 - (30 + x)$.

Question 7
Almost all students made some progress with this question and many fully correct solutions were seen. Common errors were incorrect calculations after correct substitutions, often 86.52 from multiplying 6.5 and 8.3. Others attempted to calculate $6.5 \times 8.3 \times 3.2$ or $0.5 \times 6.5 \times 8.3 \times 3.2$. A few students lost accuracy due to premature approximation.

Question 8
This question was a good discriminator. Common errors included just giving the positive square root, not giving answers to 1 decimal place, attempting to solve using trial and improvement and using the quadratic formula but with errors in the values for a, b and c, for example using $b = –5$.

Question 9
Although the question directed the students to 'set up and solve', fully correct responses were quite rare, with many making no progress at all. Students who did set up a quadratic equation often reached $x^2 – x = 110$ and then did not how to proceed. Some ignored the 90 and attempted to solve $x^2 – x – 20 = 0$. Others did not realise that the quadratic would factorise and made errors using the quadratic formula.

Question 10
In part (a) a majority of students were able to write down an unsimplified expression in terms of r but few gave a simplified formula. Part (b) was quite well answered but a significant number of arithmetic errors were seen, often due to omitting part of their formula, for example π or 4.

Question 11
A significant proportion of students made no progress with this question, with many not realising the equations needed solving simultaneously. Most success was achieved when students started with $15 + 20m = 40 + 15m$. Some students added the two equations, whilst many others multiplied the right hand sides by 3 and 4 but did not do the same operation to the T.

Question 12
Part (a) was not well answered. Answers such as sin 3/5 and $\sin^{-1}$ 3/5 were quite common. Part (b) was generally well answered.

Question 13
Part (a) was well answered, although some students chose to use trigonometry which sometimes led to premature approximation errors. Overall part (b) was well answered, with a majority giving a fully correct solution and many others working out the length of the rod but then either not answering the question or giving an incorrect conclusion.

Question 14
Part (a) was generally very well answered. The most common error was to leave the answer as 62°. Many arithmetical errors were also seen. In part (b), although a majority were successful, it was quite common to see students assuming that angles *BTO* and *ATE* were equal giving $(180 – 31) \div 2 = 74.5$. Students who worked on the diagram seemed to have fewer problems than those who tried to explain what they were doing in words.

Question 15
This topic is traditionally poorly answered and this question continued the trend. Those students who used a formal algebraic method were generally more successful than those who attempted a ratio method. The most common error was to use direct proportion leading to an answer of 7.2.

Question 16
Part (a) was well answered by almost all students. In part (b) many did not know the conversion between gallons and litres so made only minor progress with the question. Some of the students who obtained two values to compare did not understand the units they were working in and consequently gave an incorrect conclusion. Many did not connect the two parts of the question.

Question 17
Part (a) was well answered by the majority of students. Part (b) was less well answered, with common errors of not simplifying the answer, just working out vector *CD*, obtaining vector AD correctly as $3\mathbf{x} + 6\mathbf{y}$ but then putting = $\mathbf{x} + 2\mathbf{y}$. Part (b) was the least attempted question on this paper.

Question 18
Sketching graphs continues to be a topic which students find challenging. In part (a) many drew straight lines or parabolas. A small number drew a cubic graph but with two turning points. In part (b) many students knew to translate their graph in part (a) by 8 units in the *y*-direction, although a few did it in the *x*-direction.

Question 19
This question was designed for the most able to show what they could do. A significant proportion of students were able to use a scale factor method to obtain the length of *AC*. Some then correctly used cosine rule, but often made errors in rearranging their equation. Having obtained one of the angles, students were usually able to use ½absin *C* correctly, although a few students assumed the triangles were right-angled.

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