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General Certificate of Secondary Education
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Mathematics 43602H

(Specification 4360)

Unit 2: Number and Algebra (Higher)

Report on the Examination

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General

Candidates had time to complete the paper and demonstrate what they knew. Most questions proved to be accessible. Many candidates showed sufficient working with their answers. There were instances of poor presentation and poor arithmetic. Basic errors in multiplication tables, addition and subtraction, which, together with other slips, such as mis-copying their own figures, resulted in needless loss of marks.

Topics that were well done included:

- sequences
- proportion
- substitution
- special offer/percentage problem
- simple expand/factorise/solve
- dividing quantities in a given ratio.

Topics which candidates found difficult included:

- comparing hire cost from two firms (graphical/numerical)
- straight line problem
- standard form
- indices (fractional powers)
- solving a quadratic equation
- surds problem
- algebraic proof.

Question 1

Part (a) of this question was done well. In part (b), most candidates showed good knowledge of sequences. Many correctly substituted into $n^2 + 50$ and gave a full list ... $4^2 = 16 + 50 = 66$, $5^2 = 25 + 50 = 75$ ... or just the last two ... $6^2 = 36 + 50 = 86$, $7^2 = 49 + 50 = 99$, and some included the next term in the sequence, $8^2 + 50 = 114$. Some only stated $6^2 = 36$ and $7^2 = 49$ or showed $\sqrt{49} = 7$, which was sufficient. Others only listed square numbers ... 16, 25, 36 and 49. A few lists included an error.

Question 2

This was another well answered question. The most popular method was to work out 450×3 and then add 225 which provided a very efficient solution. Another method, seen quite often, was to divide 450 by 2 then multiply by 7. Finding the amount for 16 people then subtracting 225 was also common. There were some arithmetical errors, usually in multiplication by 14 or finding $450 \div 2$.

Question 3

After substituting correctly and obtaining $–24 \div –8$, some candidates gave an answer of –3.
$–24 \div 8$ was seen frequently, as was $–24 \div –4$ and $–24 \div 4$.

Question 4

This was a very successful question for most candidates. Again, some poor arithmetic was seen, such as $50 – 15 = 45$, $48 \times 9 = 422$ and $48 \times 3 = 124$. Some candidates made some progress but then gave, for example 30% of 50p = 15p followed by 12×15p = £1.80 but did not subtract 15p from 50p. Others misunderstood the question. Calculating 8 × 48p = £3.84 was a popular wrong concept (pay for 3 get 1 free = pay for 12 get 4 free) or 48p × 11 thinking only 1 tin was free; 2 × 48p = 96p ... thinking buy 3 and one of those is free 48 × 3 = 144 followed by 144 × 4 = £5.76. The quality of candidates' written presentation was variable, sometimes making it difficult to decide whether they were working with 1 tin, 4 tins or 12 tins. Correct answers generally came from the 12 tin or 4 tin calculations with only a few using 1 tin calculations.

Question 5

Part (a) of this question was quite well answered. In part (b), the most efficient solutions usually involved a counter example to disprove the statement. However, many candidates made no progress with this part. A small number tried to draw the graph for Woods Tool Hire, with varying degrees of success. Others substituted two or three values in the Woods' formula but chose those at the beginning (1, 2 or 3 days) giving a 'yes' answer that, wrongly, supported the claim. Some candidates tried to offer an argument relating to the gradient and intercept of the two lines; some of these were very well presented. Hardly any candidates used algebra to set up an equation showing that at $d = 5$ the two companies' costs were the same.

Question 6

Parts (a) and (b) of this question were answered very well. In part (c), using 'FOIL' to expand the brackets was more popular than the grid method. Some candidates went straight for the three-term answer, although this can be a risky strategy. Even in the grid method there were many answers of 5 instead of –14, making $y^2 + 5y + 5$ a very common answer. Other common answers were, $y^2 + 5$, $y^2 - 14$, $y^2 + 9y - 14$ and even $y + 7 + y - 2 = 2y + 5$. A few candidates worked out the correct answer but then went on to give a final answer, such as $6y^2 - 14$.

Question 7

Many candidates wrote 100 ÷ 0.5 = 50 (or sometimes 0.005). Dividing by a decimal usually causes problems and this question was no exception. Multiplying numerator and denominator by 10, was frequently followed by a divide 10 at the end. 0.496 was often rounded to 1 or 0. Some candidates did not follow the instruction 'use approximations' and so attempted to work out 10.13 × 10.13.

Question 8

This was generally well done. Some candidates experienced problems in trying to divide by 7. Some found the amount for all three components and gave the answer as a ratio. A few evaluated the quantity of sand instead of gravel. There were quite a number who simply calculated 455 × 4 = 1820.

Question 9

Many correct answers with clear working were seen in part (a). A common error was $4x + 3 = 17$ leading to an answer of 3.5. Some gave embedded answers and it was rare to see a non attempt. Some got as far as $4x = 5$ but then incorrectly rearranged to give an answer $\frac{4}{5}$ or 0.8. Others went straight to the incorrect decimal of 1.2 from $4x = 5$. Quite a few correctly expanded the brackets then used trial and improvement to find x, with only a small number using trial and improvement before expansion. In part (b), there were many correct answers. However, a large number of candidates ignored the inequality and obtained $n = 3$. Some used an equation then successfully replaced the inequality in their answer, which was condoned. There were errors in rearranging, giving $2n > 4$. $2n > 6$ followed by $n > 6$ was often seen, as was $2n > 5$ followed by $n > 5$.

Question 10

Most gave a wordy answer referring to the lines being parallel but without any evidence and did not appreciate that for a proof, it was necessary to show the two gradients were equal, with all steps clearly shown. Some correctly worked out the two straight line equations. Few candidates drew right-angled triangles on the diagram, and if drawn, it was rare to see useful lengths indicated. Others stated that there was a constant gap of 5 without evidence. A gradient of 3 was a fairly common error.

Question 11

A significant number of good attempts were seen and many candidates showed their ability to deal with ‘reverse percentage’ correctly. Many candidates stated £280 = 80% but then incorrectly calculated 20% of 280 leading to a final answer of £336 and ‘yes’. A few, who gave the correct answer of £350, did not state ‘No’.

Question 12

Part (a) of this question was quite well done. In part (b), many basic errors were seen in handling the ‘power to a power’ and there were many instances of candidates failing to square the 7. Many candidates correctly presented their answer in standard form. However, many candidates failed to show any significant working.

Question 13

Many obtained the correct expression, some leaving their answer in unsimplified form, particularly if their first step was to divide by 2. Some correctly reached $2h = 7y + 3$ but then stopped and gave this for their final answer. Common errors in the first step included no attempt to expand, incorrect expansion to $2h - y$ and attempts to eliminate 2 from the left-hand side by subtracting 2. After a correct expansion, a very common error was rearranging to get $2h = 3y + 3$. Some who did the division step first could not handle the $-y$ term correctly, so $h - y = \frac{5y+3}{2}$ became $h = \frac{5y+3+y}{2}$.

Question 14

There were a reasonable number of correct answers to part (a) of this question, although the standard of presentation was often poor - for example, $\sqrt{4} = 2^3 = 8$, $\sqrt{4} = 2^2 = 2 \times 2 \times 2 = 8$ and $4^3 = \sqrt{64} = 8$. An unusual correct answer was $4^{1.5} \times 4^{0.5} = 4 \times \sqrt{4} = 4 \times 2 = 8$. A common error was $4 \div 2 = 2$ then $2^3 = 8$. In part (b), those who started by working out 8^6 (= 262144) usually were unsuccessful. Common errors were $8 \div 2 = 4 \rightarrow 6 \times 2 = 12$, answer 12; and also $8^6 \div 2 = 4^3$, answer 3. Some candidates had the right idea but their calculation of fractions let them down, with $6 \times \frac{3}{2} = \frac{18}{12}$, a typical example of incorrect working. There was a strong hint from part (a) to replace 8 with $4^{1.5}$ but few candidates spotted it. There were a small number of elegant solutions.

Question 15

This question was generally poorly answered. Some candidates stopped after factorising correctly ie. $(5x - 6)(x + 4)$. Others who factorised correctly then followed up with answers of –4 and 6, and did not understand how the answers related to the previous stage. Many rearranged to $5x^2 + 14x = 24$ then unsuccessfully tried to solve this equation. Many of those who attempted to use the quadratic equation formula did not progress past $\sqrt{676}$ and those who tried to complete the square were usually unsuccessful.

Question 16

A significant number of candidates tried to use simultaneous equations rather than trial and improvement. The latter method will yield a solution, usually inefficiently, but it should not be the method of choice for able candidates. Presentation was sometimes unclear and there were some careless errors, for example getting $5b = 75$ when subtracting $b + 2g = 59$ from $6b + 2g = 124$.

Question 17

Many candidates made no attempt at this question. Those who realised that they needed to multiply by $(5 - \sqrt{3})$ often omitted brackets, for example $x\sqrt{2} = 5 + \sqrt{3} \times 5 - \sqrt{3} = 5 + 5\sqrt{3} - \sqrt{3}$. Of those who completed the multiplication successfully, many stopped at $x\sqrt{2} = 22$, not realising that there was more to do. Some candidates who got this far were unable to complete the final simplification, giving, for example $x\sqrt{2} = 22 \rightarrow x = \sqrt{22} = \sqrt{(11 \times 2)} = 11\sqrt{2}$ or $x\sqrt{2} = 22 \rightarrow 11\sqrt{2} = 22$, answer $x = 11\sqrt{2}$. A correct answer from an incorrect method cannot be accepted. Multiplying the top and bottom on the LHS by $(5 + \sqrt{3})$ was quite common. Multiplying the top and bottom on the LHS by $\sqrt{3}$ was also quite common.

Question 18

A small number of very good solutions were seen. The concepts of algebraic proof were rarely demonstrated well and very few factorised at the second stage. There was some good algebra, but the quality of written communication mark was only awarded to those candidates who were rigorous in their methods, starting with one side of the algebraic statement and working their way through to a point where they could make a comparison, deducing the required result. The mark was also sometimes lost because candidates gave no indication or explanation of the difference of 1. Many candidates made no attempt at all and many attempted to verify numerically. Some candidates did not know how to express consecutive numbers algebraically and used two different letters. Some knew how to show consecutive numbers but their algebra failed them. For some, squaring the consecutive numbers posed a problem, either because they expressed it wrongly, for example, $n^2 + n^2 + 1$, or simply because they could not expand the squared bracket. Some candidates did not understand the word ‘product’ and added their consecutive numbers instead of multiplying them.

Mark Ranges and Award of Grades

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