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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*

## General

There were good attempts by many students in the first half of the paper. Some good answers were seen to the more difficult questions but they were relatively few and far between. Some students did not attempt all the later questions. Basic arithmetic errors were plentiful. Answers needed to be checked carefully to make sure that they are realistic when viewed in the context of the question, particularly on some of the multi-step questions.

Questions 7 and 11 assessed the quality of written communication. In question 7 it was necessary for working to be shown and a conclusion to be stated, the overall response to this question was excellent. In question 11, all steps had to be clearly shown, with a fully correct method and here the success rate was significantly less.

Topics that were well done included:

- substitution in a formula
- place value calculations
- percentage change calculation
- fractions money problem
- percentage increase money problem
- simple laws of indices
- expanding a bracket.

Topics which students found difficult included:

- prime number problem
- equation with fractions
- straight line problem ($y = mx + c$)
- algebraic fractions
- complete the square/expand and compare coefficients
- surds calculation
- simultaneous equations, with one linear and one quadratic.

## Question 1

This question was generally well answered. A number of students obtained 5(18 – 6) but then wrote 90 – 6 obtaining –21 as the answer. Others obtained the same answer from 5 × 2 = 10, then 10 × 9 = 90, then 90 – 6. Most students showed their substitution of numbers into the formula. Many obtained $\frac{60}{-4}$ but gave 15 as the answer. Some wrote $\frac{5(29-6)}{-4}$.

## Question 2

These place value calculations were both well done.

## Question 3

This question had mixed success. The most common error was to use 1 as a prime number. Some thought that one pair being 2 and 5 made another pair –2 and –5. Others thought that if 2 and 5 worked then so must 5 and 2, not realising that in the substitution of values for $a$ and $b$, the order was important.

**Question 4**

Most work was clearly presented with the conclusion stated. A few students rounded up to 70, but usually then continued with the correct method to reach a conclusion. Some reached £48 but forgot to state a conclusion, and a few got to £48 but stated 'No'. Others worked out the £12 reduction but subtracted it from £64 instead of £60. Some students calculated the reduction of £12 but treated this as the price paid.

**Question 5**

Many students arrived at the correct answer, the majority of them using trial and improvement, which was the favourite method used and by far the most successful. A logical approach to trial and improvement however was rare. Very few used an algebraic approach. A number of students went straight to an input of 0.5 and output 1 with no indication of any previous work. Negative number work was poor in this question. Examples such as $-2 \times 6 - 2 = -12 - 2 = -10$ were common. Some trial and improvement attempts included a substitution of 0.5 with a correct output of 1, but some did not realise that this was the solution to the question and carried on trying more values. Those students that attempted to use algebra often stopped at the $6x - 2$ step, or correctly wrote $6x - 2 = 2x$ and then stopped. Quite a few who used an algebraic method, and having reached, for example $4x = 2$ then gave $x = 2$ or $\frac{1}{4}$.

**Question 6**

There were many correct solutions clearly set out and most students understood what was required. A few lost the accuracy mark through an arithmetical error. Some attempted to find the number of weeks using 429 ÷ 30 and many of these were correct. However the build-up method was more popular and was usually successful if 30 was used. Some misunderstood the question and thought the £30 weekly savings were to be put away and used £120 as the weekly contributory amount towards the iPad which resulted in an answer of 4 weeks.

**Question 7**

This question required all working to be clearly shown, with a conclusion. The standard of arithmetic was good and there were many correct answers of £184 for the cost of the tickets, meaning the students had enough money. Any errors made, usually concerned the percentage increase calculation. There were four different possible approaches, but by far the most common was to work out the cost of one ticket 'last' year (£20) and then increase this by 15% to find the cost 'this' year (£23) before multiplying by 8.

**Question 8**

Parts (a) and (b) were both extremely well done. There were many correct solutions to part (c) and a reasonable number with $x = \frac{(2 - y)}{3}$ as a result of careless rearranging. Many students made basic errors such as $y - 3 = x + 2$, or $2y = 3x$, or $\frac{y}{3} = x + 2$ for their first step, or, as a complete solution, $3x = y + 2$, then $x = y + 5$. Some had a correct first step but then could not deal with the 3 correctly. Some did not understand what was required and simply reversed the question to give $3x + 2 = y$ as their answer. A common error was to swap the $x$ and $y$ to get $x = 3y + 2$.

**Question 9**

Many gave fully correct solutions either by correctly equating 2 parts to 10 marks or by trying equivalent ratios until they reached 25 : 15 with the required difference of 10. Students who found the total number of parts and started working with 8 obtained erroneous values for B which were then used to obtain their A and C. Some set up equations in A, B and C. A small number of students did not attempt the question.

**Question 10**

Part (a) was well answered. Most students attempted part (b) but with mixed success. Common errors were usually due to only partial factorisation. A few tried to give their answer as a product of two brackets, treating it as a standard quadratic.

**Question 11**

This question was well answered by about a quarter of students. A number transferred the denominators to the numerator position to give $4(2x - 3) + 3(x - 1) = 2$ as their first step and others gave $\frac{(3x-4)}{7} = 2$ as the first step. Those who tried to use 12 as a common denominator often made errors in the numerator terms. For example, $3(2x - 3) + 4(x - 1)$ often became $6x - 9 + 4x - 1$ or $6x - 3 + 4x - 4$.

**Question 12**

Most of the students factorised correctly in part (a). Some did not realise that two brackets were needed and $n(n + 7)+6$ was often seen. Using 1 and 7 in the brackets was also a common error. Few students realised the connection between part (b) and part (a). Most of the correct solutions for part (b) used a factor tree. Some arithmetical errors were seen but the first step was usually correct ($176 = 2 \times 88$). A number found the correct tree but gave their answer in the form $2^4 + 11$. A few used factor pairs and often the answer was then $11 \times 16$. Some found the correct tree but left the factors on the tree and did not write a product. Some did not give the answer in index form but left their answer as a product of the 5 prime factors.

**Question 13**

This question was usually attempted but not well done. Students usually showed little or no working and some appeared to guess. Testing a point was all that was required.

**Question 14**

This was an AO3 question targeted at grade A. It did not specifically state what method was required and many did not know where to start. Those who tried $y = mx + c$ and substituted values into their equation, almost always worked out the coordinates of *C.* Others tried to come down the line in steps of 300 (for $y$) and 150 (for $x$). They usually found the intermediate point (100, 320) next and then realised that another drop of 200 (for $y$) and 100 (for $x$) would give *C.* The coordinates of *D* were then obtained in a similar way. The large values of the given coordinates appeared to put off many students, but they were chosen to give a gradient that would be easy to work with, and were an important part of the problem solving process that this question tested.

**Question 15**

Many numerical answers were seen in part (a). Stating 'the bottom is one more than the top' was a popular answer, as was 'add 1 to the top and 2 to the bottom', but neither was sufficient. Describing the numerator as the position of the term and the denominator as 1 greater was accepted, and the simple alternative described above was often given as $n + 1 + 1 = n + 2$. The most common start in part (b) was to expand $(n + 1)(n + 2)$. Others gave the two relevant expressions but then incorrectly 'cancelled the $n$ terms'. A small number managed all the steps but some made sign errors towards the end of their solution. Part (c) was poorly answered and few realised they could use the formula given in part (b) to help in this part.

**Question 16**

A number of students expanded $(x – 7)^2$ correctly but did not make the connection between '$ax$' and '$–14x$'. Some extracted $a = –14$ and $b = 49 – (–14)$ and then gave $b = 35$. This error was as common as the correct answer of 63. $a = –14$ and $b = 49$ was another common error. Some stated that $a = 14$ after a correct expansion and went on to get the correct corresponding value of $b$. Many who tried to expand $(x – 7)^2$ gave $x^2 – 49$ or $x^2 – 14$. Of those who obtained four terms, –49 (instead of +49) was a common error. A few obtained the correct four terms but then cancelled $–7x$ and $–7x$ to give $x^2 + 49$.

**Question 17**

There were a few fully correct answers but most made errors in an attempt to square the surds. A few found 162 correctly but then calculated $25\sqrt{36}$ as $25 \times 36 = 900$. Other common errors included $18 – 30$ (from $9 \times 2 – 5 \times 6$), $81 \times 4$ and $25 \times 6$ calculated. $\sqrt{12} = 3\sqrt{2}$ or $3\sqrt{4}$ or $4\sqrt{3}$, $81\sqrt{4}$ evaluated as $81 + 2 = 83$ and $25\sqrt{6}$ as $25 + 6 = 31$, then $\sqrt{52} = 2\sqrt{13}$.

**Question 18**

Most students attempted this question. There were a number of excellent solutions. Some reached $(x – 10)(x + 2) = 0$ but then gave $x = 10$ and $x = –2$, omitting the corresponding $y$ values. Many did not use the method of substitution when solving simultaneous equations where one is linear and one quadratic but tried to use the elimination method as they would for a pair of simultaneous linear equations.

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