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IGCSE

IGCSE Mathematics (4400)

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There was an entry of just under 2000 candidates (800 Foundation and 1150 Higher) who found that all four papers were accessible and gave them the opportunity to show what they knew, an opportunity taken by the majority of them.

The papers were marked online. It appeared that some candidates may not have received (or did not implement) some relevant advice. For each individual part of each question, candidates should be careful to write only within the given space for that part. If this space proves insufficient, candidates should not write elsewhere on the paper, even in the space for the following part. Instead, they should ask for extra sheets of paper and attach these to the back of the paper. It is also important that candidates should use only black pens (or blue, but this is less satisfactory) and HB pencils, making sure that drawing is not faint. The writing and/or drawing on scanned scripts was sometimes not visible.

Paper 1F

Introduction

This paper made appropriate demands of candidates and all questions had pleasing success rates. Most candidates showed their methods clearly.

Report on individual questions

Question 1

In parts (a) and (c), hardly any candidates were unsuccessful and errors were almost as rare in part (b) and (d), in which the most common wrong answers were 8100 and 7332 $(8091 - 759)$ respectively but even these appeared only occasionally.

Question 2

This pictogram question was very well answered, although, in part (c), a few candidates gave 30, the figure for Tuesday, instead of that for Thursday. In part (e), ratios which were either unsimplified or not in their simplest form appeared occasionally, often 4 : 6 but sometimes 10 : 15. An answer of 1 : 1.5 was not accepted as the simplest form of the ratio, although it received some credit. No credit was given for fractions. The small minority who made an error in part (d) usually gave an answer of 0.4. Part (g) proved somewhat more demanding, although it still had a high success rate. The misconception that 4% = $\frac{4}{10}$ was apparent and so an answer of $\frac{2}{5}$ appeared with some regularity. Some candidates lost a mark through failing to simplify $\frac{4}{100}$.

Question 3

It was clear from candidates' responses to parts (i) and (iii) that multiples and factors are well understood. Square numbers and prime factors, however, proved significantly more difficult, 10 being the most popular wrong answer to both parts (ii) and (iv).

Question 4

In part (a), the majority of candidates knew the name 'pentagon' but there were many other answers, especially 'hexagon' and 'diamond'. Part (b) proved far from straightforward, the number of candidates marking a pair of perpendicular sides suggesting that misunderstanding of the term 'parallel' or unfamiliarity with it may not be uncommon. There was no such uncertainty in part (c) with the line of symmetry, which was almost always drawn correctly. In part (d), a right angle was usually marked correctly, although occasionally an obtuse angle was marked. In parts (b) and (d), although only one pair of parallel lines and one right angle respectively were required, some candidates marked more than one. They scored full marks, unless one of their answers was wrong. Part (e) was well answered, many candidates finding the exact area by the expected method of counting squares. A minority performed a calculation using lengths measured from the diagram and obtained a less accurate answer but still received some credit if their area was in the range 16 cm^2 – 18 cm^2.

Question 5

In the first two parts, the majority of candidates were able to find the next two terms in the sequence and explain how they had worked out their answer. Many also successfully found the 15th term of the sequence in the third part, although a variety of arithmetic errors led to a range of wrong answers. Part (d) was well answered. An acceptable explanation could relate to either the numbers in the sequence e.g. 'They are all odd.' or to 724 e.g. '724 is even.' It was not necessary to do both. Incorrect explanations often stated either that the terms of the sequence had to be multiples of 8 or that 724 was not in the sequence, without explaining why e.g. 'If you keep adding 8, you won't get 724.'

Question 6

There were very few errors in part (a). Although more demanding, part (b) was also well answered, mistakes, if they occurred, usually being with rounding to 1 decimal place. 19.0 was the most frequent wrong answer but 19.09, 19 and 20.0 also appeared regularly. All of these were predictable but other occasional wrong answers such as 190.969 and 1.90969 were more surprising. The majority of candidates were able to use their calculators to find 2.6^3 in part (d).

Question 7

Most candidates read three values accurately from the conversion graph in the first part. The second part was much more demanding but there were many correct solutions, obtained by a variety of valid methods. These usually involved splitting up 120 in some way e.g. 4 × 30, 50 + 50 + 20, although a minority successfully made use of conversion rates or proportionality.

Question 8

In part (a), most candidates found the size of the angle correctly but found it harder to give a reason. Many did give the hoped for 'Sum of angles at a point = 360°' but others were fortunate that reasons such as 'A full circle is 360°' or 'A full turn is 360°' were also accepted. Neither 'The sum of the angles is 360°' nor a calculation such as $360 - (126 + 78)$ were accepted. Few marks were lost in part (b), where a reason was not required. In part (c), it was not only giving a reason that proved quite difficult but also finding the angle itself, answers of 56° ($180 - 2 \times 62$) and 236° ($360 - 2 \times 62$) appearing with some regularity. The most direct method required the reason 'Sum of angles on a straight line = 180°' but an alternative method, used by a minority, involved 'Opposite angles are equal' and 'Sum of angles at a point = 360°' and so either of these reasons was also accepted. When candidates are asked to give a reason in questions like this, a geometrical reason is required. Explanations of the method used to perform the calculation receive no credit.

Question 9

Probability was generally well understood and this question was well answered. It was very unusual to see probabilities expressed unacceptably e.g. 1 in 10 or answers such as 'impossible', when a probability of 0 was required. A small minority thought that a probability was required in the final part and so gave a fraction rather than a whole number.

Question 10

Very few candidates failed to gain at least one mark and there were many completely correct answers. Showing the decimal equivalent of each fraction increased a candidate's chances of scoring marks on this question.

Question 11

A substantial number of candidates gained full marks. The main errors made by the others were using a subtraction method to find the height of rectangle **P** e.g.
$16.8 - 14.4 = 2.4$ or working out the perimeter of **P** instead of its area. A few, having found the scale factor correctly as 4, also used this as the area factor.

Question 12

Weaknesses in algebraic manipulation were exposed by part (a). Although the simplification was often correct, a variety of wrong expressions was also seen; the most popular one was n^8 with $4n^8$ as runner-up.
The majority of candidates scored at least 1 mark in part (b) for evaluating $3p$ as 12 but dealing with the subtraction of $2 \times (-5)$ proved more difficult. Many evaluated the whole expression accurately but $2\,(12 - 10)$ was a common wrong answer.
The solution of the equation in part (c) was usually correct. A first step of $4x = 11 + 5$ appeared on a few occasions.

Question 13

Finding the median and the mean caused substantial problems. Some candidates found the mean in the first part. The most common wrong answers to both parts were 10 and 3, obtained by calculating the median or mean of the frequencies or scores respectively. In the second part, some candidates, having correctly found the sum of the products divided it by 5 instead of by 50, even though the answer this gave was not sensible.
In the third part, many candidates ignored the information in the table altogether and, assuming the spinner was fair, gave $\frac{1}{5}$ as the probability. This misconception was also apparent in the final part, where many candidates believed the spinner was fair because the illustration showed a spinner with each section the same size. Even of those who thought the spinner was not fair, a substantial proportion thought that the odd number of possible scores was the reason for this. Simple observations such as '3 only turns up 3 times.' or 'There is a wide range of frequencies.' with the 'No' box ticked were sufficient to earn the mark.

Question 14

Bearings were not well understood and there were many errors. The omission of the leading zero was not penalised in the first part, which was attempted much more successfully than the second part, in which many candidates gave the bearing as the acute angle between *AC* and North.

Question 15

Few failed to score in part (a) and many obtained full marks but a significant minority just found 35% of £180 and gave this (£63) as the sale price.
In part (b), which was quite well answered, candidates generally scored either full marks, if they interpreted the question correctly, or no marks, if they did not. Most wrong methods involved finding 35% of £84 and often led to an answer of £113.40.

Question 16

Foundation candidates' algebraic skills are variable but both parts of this question were quite well answered. Many were able to factorise $7p - 21$ correctly in the first part and achieve some success in the second part, even if it was only 1 mark for expanding $4(x + 5)$ correctly. This was almost always the first step, few candidates starting by dividing both sides by 4. Progressing as far as $4x = -8$ was no guarantee that the answer would be correct, as it was sometimes followed by $x = -\frac{1}{2}$.

Question 17

Few candidates included 'translation' or similar in their answers in part (a) and even fewer described the transformation fully. It was possible to score one mark for '7 to the left and 1 down' or the vector $\begin{pmatrix} -7 \\ -1 \end{pmatrix}$. Candidates were more successful in describing the rotation in part (b) but it was not unusual to see either the centre of rotation or, less often, 90° omitted.
No credit was given for terms such as 'move' or 'shift' in part (a) or 'turn' in part (b).
A single transformation was required in both parts and so answers which stated or implied two transformations received no credit, even if parts of the answer would, on their own, have been awarded marks.

Question 18

The majority of candidates evaluated the expression accurately using a calculator and, of those who made an error, many salvaged a mark by showing the value of either
7.9 + 3.8 or 8.6 − 2.1. The most common error was to evaluate 7.9 + 3.8 ÷ 8.6 – 2.1.

Question 19

Even though the formula Volume of a cylinder $= \pi r^2 h$ was provided, many candidates had difficulty in using it or used $2\pi rh$ instead. Some substituted the diameter instead of the radius, scoring 1 mark out of 3. $\pi \times 4.3 \times 7.6$ appeared regularly, sometimes the result of misunderstanding the formula and sometimes the result of confusing squaring with doubling. Premature rounding sometimes cost candidates one mark.

Question 20

There were many concise, correct solutions starting with either $\frac{2}{5} \times \frac{7}{4}$ or $\frac{14}{35} \div \frac{20}{35}$, each of which scored 2 marks. In both cases, candidates were expected to show a further appropriate step such as cancelling or $\frac{14}{20}$. The onus is on candidates to show examiners every necessary stage in the working. Attempts involving conversion to decimals went unrewarded.

Question 21

The algebra involved in this question, especially in parts (a) and (c), was unfamiliar to some candidates but posed few problems for others. The only frequent mistake made by those able to make meaningful attempts was with the final term in the expansion in part (b), −12 appearing regularly.

Question 22

Many candidates appreciated that trigonometry was required and there was a fair proportion of completely correct solutions. It was noticeable that some candidates wrote down cos $x° = \frac{5.4}{8.7}$ but did not know where to go from there. Others rounded $\frac{5.4}{8.7}$ to 0.62, instead of keeping at least four figures on their calculator display, losing a mark for the resulting inaccuracy of their answer.

Paper 2F

Introduction

There was some evidence of good basic skills, although the standard of algebra shown in Q13 and Q19 was generally rather poor. Candidates usually gave enough working to enable the marker to understand their thinking. The main exception to this was in Q7. Order of operations was poorly understood by many candidates. The question requiring written explanation (Q9(ii)) was poorly answered, with candidates unable to put their understanding into words. Understanding of time was poor in answers to both Q7 and Q17.

Report on individual questions

Question 1

This was well answered. A few candidates gave -7 or 7 in (b). Some candidates omitted 1 and/or 27 in (d) and many did not understand “prime” in (e).

Question 2

This was well answered, although a few candidates thought it likely that two randomly chosen people will have the same birthday.

Question 3

In (a) many candidates gave “tenths”. In (b) some rounded to two significant figures or three decimal places.

Question 4

This was well answered. In (a) a few gave 7 instead of -7.

Question 5

Circle vocabulary was not familiar to many candidates with answers such as “diagonal” and “sector” being common. Part (b) was better answered than (a).

Question 6

Some candidates confused the various averages. In (b) a few gave the top and bottom of the range but failed to subtract. In (c) a few candidates gave 4.5. In (d) some gave 5.5 or 5.6 without working, neither of which gained any marks.

Question 7

There were two common approaches to this question. The first was to work out the difference between 14:15 and 07:30 and then subtract the total break time (30 + 45) from this difference. The second was to add on the break times to the start time of 07:30 to get 08:45 and then work out the difference between this time and 14:15.
The main error in both methods was poor subtraction, obtaining 6:30 from 08:45 to 14:15 or 7:45 from 07:30 to 14:15. Some candidates were confused over the two break time intervals and subtracted 30 from 7:30 and added or subtracted 45 to or from 14:15. Some candidates showed confusion over the use of hours and minutes. For example, in the first method some candidates subtracted 75 from 6:45 and obtained 5:70 which was then often turned into 6 hours and 10 minutes.

Question 8

In (a) some candidates divided 432 by 0.375. In (b)(i) many candidates found the number of students rather than the fraction. Attempts at percentage in (c) were often poor. 1500 ÷ 4 was common. Some candidates used a build-up method based on 1% = £6 which is reasonable, although unnecessary, but others tried to do the same from 10% then 5% and so on.

Question 9

Part (i) was well answered, showing that most candidates understood the pattern. However, many could not put this understanding into words in (ii). There were many inadequate answers such as “You add two each time”. Some candidates wrote that the differences were the prime numbers.

Question 10

The measurement was almost always correct. However, division of 6.5 by 2 proved too difficult for many candidates. Common answers were 6.5 and 13. Occasionally an answer such as 192 metres appeared.

Question 11

Parts (a) and (b)(i) were usually correct. In (b)(ii) many candidates gave “rhombus” or “trapezium”. In (iii) many found 3 × 2, but some found the perimeter while others multiplied the lengths of two sides. Some counted squares, with varying degrees of success. Many omitted the units and some gave “cm”. The position of T in (c) frequently gave a triangle which satisfied only one of the given conditions. In (d) candidates generally either gave the correct answer or wrote answers such as $x4 \quad y4$ or (4, 4) or a series of points.

Question 12

This question was very well answered. A few candidates gave $^2/_6$ or $^2/_8$ in (b).

Question 13

Some candidates gave answers involving *P* and *U* and/or other vertices. Those who tried to find the algebraic expressions often gave the correct answer in (i). In (ii) subtraction of $a - b$ from $3a + 2b$ caused problems as it involved a double negative. Hence $2a + b$ was a common wrong answer. Some candidates obtained a correct answer but then proceeded to "simplify" it wrongly.

Question 14

It was pleasing to note that this new style question was well answered on the whole. Those who knew how to add fractions were usually able to show enough working to gain both marks. Those who did not, produced various "fudges". A few knew that a denominator of 12 or 24 was required but failed to find the correct numerators. Some used decimals, gaining no marks.

Question 15

Common errors were the use of 7 in (a) and the failure to use 8 in (b). In (a) many found $24 \div 3 \times 4 = 32$.

Question 16

Many candidates appeared to have no conception of dividing the shape into a triangle and a rectangle. Many candidates could not work out anything that was recognisably an area at all. For example, 7.9 was a common answer, appearing from 2 + 2 + 1.2 + 1.2 + 1.5, presumably a perimeter, although not the perimeter of the given shape. Many candidates found $(1.2 + 2) \times 1.5$. Even those who did split the area into two parts often did not calculate the area of the triangle correctly.

Part (b) also proved difficult – perhaps because of the awkwardness of the true area (3.9 m^2) as against the coverage (20m^2). A variety of approaches were adopted here, but many lost marks because of lack of knowledge that 1000ml = 1 litre. The 'natural' approach of $\frac{3.9}{20} \times 50$ was rarely seen and many candidates tried to get an answer from $\frac{20}{3.9}$ but often failed to divide this into 1000.

Question 17

Most candidates found $^{165}/_{6} = 2.75$ correctly, but thereafter understanding of hours and minutes often proved absent. Answers of 2h 75 min and 3h 15 min were common. A few candidates recognised that 60 km/h was equivalent to 1 km in each minute so the total time should be 165 minutes.

Question 18

Part (a) was usually correct, with a few candidates finding just 0.1 + 0.2 or even ½(0.1 + 0.2). Part (b) was usually correct, although a few candidates lost a mark by giving the answer $^{4}/_{20}$ instead of 4. Some candidates divided 20 by 0.2 or vice versa.

Question 19

Part (a) was generally correct. A few candidates went on to "simplify" incorrectly or to solve an equation, obtaining $x = 2$. Others "cancelled" to give $x - 2$ Some candidates gave $10x$ or $-10x$ as their answer. Candidates generally found (b) hard, with all the usual algebraic misunderstandings appearing. Some common incorrect first steps were $^{x}/_{4} = 37$ and $x + 3 = 10 - 4$. Although part (c) was found difficult by most candidates, it was pleasing to see some candidates correctly handling the inequality. Some obtained $x > 1.6$, although some of these then wrote $x = 1.6$ or just 1.6 on the answer line, thereby losing a mark. A minority of candidates wrote correctly that $5x > 8$ but then went on to $x > 3$ presumably from 8 – 5. Many candidates thought that they were looking for integer values and adopted a trial and error approach, often finishing with $x = 2$. Some candidates solved the inequality as an equation and then left the answer as $x = 1.6$. A few candidates reversed the inequality sign in the first line of working.

Question 20

Many candidates found $4^2 + 6^2$ but could not continue the calculation correctly. Some obtained 52 but not √52. Others wrote $4^2 + 6^2 = 52^2$ possibly confusing the number with the units (4 cm^2 + 6 cm^2 = 52 cm^2). A few did not give enough significant figures in their answer.

Question 21

This question was found difficult. Most candidates gave (i) Increasing, (ii) Steady speed and (iii) Decreasing. However, a few correctly gave Not moving in (ii).

Question 22

Part (a)(i) was generally correct, but in (a)(ii) many candidates gave 6 (confusing union with intersection) or just even numbers (ie *B*). Some gave the correct numbers but repeated 6, which lost a mark, or gave an extra number, such as 12, or omitted one, usually 10. In (b) answers were normally given in context although 12Y was often omitted in (i). In (ii) some appeared to think *R* was another subject. History was sometimes mentioned in the answer. Concise answers were usually the best.

Paper 3H

Introduction

The demands of this paper proved to be appropriate and strong candidates were able to achieve high marks. Methods were usually shown clearly and all questions, including the more demanding ones in the latter part of the paper, elicited many high quality solutions.

Report on individual questions

Question 1

Almost all candidates evaluated the expression accurately using a calculator and, of the small minority who made an error, many salvaged a mark by showing the value of either 7.9 + 3.8 or 8.6 − 2.1.

Question 2

There were few errors with the factorisation in the first part. The solution of the equation in the second part also proved straightforward, the minority who did not obtain a correct solution usually scoring 1 mark for expanding $4(x + 5)$ correctly. This was almost always the first step, few candidates starting by dividing both sides by 4.

Question 3

In part (a), finding the mean was routine for the vast majority. Occasionally, candidates gave answers of 10 or 3, obtained by calculating the mean of the frequencies or scores respectively.
In part (b), some gave probabilities with a denominator of 51, while others ignored the information in the table altogether and, assumed that the spinner was fair.
The latter misconception was also apparent in the part (c), where some candidates believed the spinner was fair because the illustration showed a spinner with each section the same size. Simple observations such as '3 only turns up 3 times.' or 'There is a wide range of frequencies.' with the 'No' box ticked were sufficient to earn the mark.

Question 4

A substantial number of candidates were unable to describe the transformation fully in the first part and descriptions which did not include 'translation' were quite common. It was possible to score one mark for '7 to the left and 1 down' or the vector $\begin{pmatrix} -7 \\ -1 \end{pmatrix}$. Several incorrect vectors appeared with some regularity, especially $\begin{pmatrix} 7 \\ -1 \end{pmatrix}$, $\begin{pmatrix} -6 \\ -1 \end{pmatrix}$ and $\begin{pmatrix} -1 \\ -7 \end{pmatrix}$. No marks were awarded for the coordinates (−7, −1). Candidates were more successful in describing the rotation in the second part, although occasionally the centre of rotation was incorrect or omitted.
A single transformation was required in both parts and so answers which stated or implied two transformations received no credit, even if parts of the answer would, on their own, have been awarded marks.

Question 5

There were very few errors with the sale price in part (a). Occasionally, candidates just found 35% of £180 and gave this (£63) as the sale price.

Part (b) proved slightly more demanding but was still very well answered. Some of the candidates who were unsuccessful in part (b) used a method which involved finding 35% of £84 and often led to an answer of £113.40. Others took £84 as the sale price and obtained an answer of £129.23 $(84 \div 0.65)$.

Reverse percentages usually cause problems and so it proved in part (c). Candidates generally scored either full marks, if they interpreted the question correctly, or no marks, if they did not. The most popular wrong answer was £596.70, the result of adding 35% of £442 to the sale price. Answers of £1262.86 ($442 \div 0.35$) also appeared often enough to be noticed.

Question 6

Occasionally, candidates substituted the diameter instead of the radius, scoring 1 mark out of 3, but the volume of the cylinder was almost always correct.

Question 7

There were many concise, correct solutions starting with either $\frac{2}{5} \times \frac{7}{4}$ or $\frac{14}{35} \div \frac{20}{35}$, usually the former. Each of these scored 2 marks. In both cases, candidates were expected to show a further appropriate step such as cancelling or $\frac{14}{20}$. The onus is on candidates to show examiners every necessary stage in the working. Attempts involving conversion to decimals went unrewarded.

Question 8

There were hardly any mistakes in applying the laws of indices in part (a). The only significant mistake made in part (b) was with the final term in the expansion, −12 appearing quite regularly. The absence of negative signs in part (c) reduced the possibility of errors and very few were made.

Question 9

Trigonometry posed no problems for the vast majority and there was a high proportion of completely correct solutions. Occasionally, candidates rounded $\frac{5.4}{8.7}$ to 0.62, instead of keeping at least four figures on their calculator display, losing a mark for the resulting inaccuracy of their answer.

Question 10

Although the first part was quite well answered, it proved more demanding than expected and there was a wide variety of incorrect answers.
Many candidates scored full marks on the second part but a sizeable minority were unable to attempt it. Between these two extremes, the most common error was to use gradient = $\frac{\text{horizontal difference}}{\text{vertical difference}}$ and obtain a gradient of $\frac{1}{2}$. Those who made this error or any other error in finding the gradient could still gain 2 marks out of 4 if their equation followed correctly from their incorrect gradient.

Question 11

Few candidates failed to score at least the mark for completing the table in part (a) and many went on to answer the whole question correctly. Apart from a minority who were unable to make a meaningful attempt, often drawing a bar chart in part (b), there were two main errors. Points were sometimes plotted mid-interval, although if this was done consistently and candidates then went on to use their graph correctly, the penalty for this was only 1 mark. To find the median, a cumulative frequency of 30 ($60 \div 2$) was sometimes used, instead of 27 or 27.5.

Question 12

Many candidates scored full marks in the first part, although two incorrect answers appeared quite regularly. These were 8.5 cm, the length of *AD*, and 3.06 cm $\left(5.1 \times \frac{6}{10}\right)$. A few candidates did not recognise the similar triangles and tried to use Pythagoras' Rule.
The majority of candidates made little or no headway with the second part but the minority who obtained the correct answer often did so using area factors in a concise and elegant way.

Question 13

There were many completely correct solutions. Candidates who made a slip in completing the table or plotting points were not heavily penalised. In the table, the y values for $x = 0.5$ and $x = 4$ were sometimes given as 3 and 4.0 respectively. If just one mark were lost, it was usually for part (b)(ii).

Question 14

The vast majority of candidates factorised $9ab - 12b^2$ completely. The success rate for simplifying $(2ab^2)^3$ was much lower and there was a range of incorrect answers, notably $8ab^6$, $2ab^6$, $2ab^5$ and $8a^3b^5$.

Question 15

The first part, which involved one product, caused few difficulties but the second part, which involved the sum of two products, proved significantly more demanding, although it was still well answered. The few candidates who answered the question as if it were 'with replacement' could score a maximum of two marks.

Question 16

Knowledge of circle geometry varied widely from those who gained full marks with clear, concise answers to those who did not answer any part correctly. There was a substantial number of candidates at each extreme.

In part (a), some candidates could find the size of the angle but were unable to give an acceptable reason, although 'alternate segment' was sufficient to earn the mark for this.

Only a minority gave a complete explanation in part (b). To score full marks, candidates had to include two facts, firstly that angle $BCD = 90°$ and secondly that the angle in a semicircle is a right angle. Few did both and most did neither. Some latitude was, however, allowed with the way in which the two facts were expressed.

Part (c) was generally well answered. The majority of candidates who successfully found the size of the angle usually scored the mark for a reason which included 'opposite' and 'cyclic'.

Question 17

In part (a), the majority of candidates converted the recurring decimal $0.\dot{7}$ to a fraction correctly, usually using multiplication by 10 or, less often, 100. It was not unusual, though, to see the correct answer with no working.

Part (b) proved very demanding. In part (b)(i), only a minority were successful in expressing $0.0\dot{y}$ as a fraction, which meant that their only hope in part (b)(ii) was to start from first principles, multiplying by a power of 10. A few did this successfully but many lost their way. Even those who progressed as far as equations like

$9x = 1.(y - 1)$ gained no credit until they interpreted it as $9x = 1 + \frac{y-1}{10}$. Even some of those who answered part (b)(i) correctly did not see how they could use it in part (b)(ii) and started from first principles anyway, usually unsuccessfully. Those who answered part (b)(i) correctly and realised how to use it obtained the answer directly just by adding $\frac{1}{10}$ to it.

Question 18

Manipulation of algebraic fractions polarised candidates. Apart from those getting as far as $\frac{3x+6}{(x+2)(x+3)}$ and then either leaving this as their answer or making a mistake, most candidates either performed the algebra correctly or could not make a meaningful attempt, although some scored a mark factorising $x^2 + 5x + 6$.

Question 19

There were many completely correct solutions and few candidates failed to gain some credit. Occasionally, candidates rounded prematurely and so could not give the segment area to the required degree of accuracy.

Question 20

Like Question 18, this question polarised candidates. The majority either used Pythagoras' Rule successfully and scored full marks or made no headway at all. The minority who started correctly but failed to score full marks often expanded $(r + 2)^2$ as $r^2 + 4$.

Paper 4H

Introduction

Most candidates showed competence in a good number of the topics tested on this paper. Performance on individual questions showed a wide variation, from excellent answers which were presented clearly and accurately to weak attempts showing little understanding. In this respect the paper seemed to offer sufficient for the more able candidates whilst allowing all but the weakest to demonstrate some success.

Report on individual questions

Question 1

This question was well answered by many. A few candidates gave answers involving P and U and/or other vertices. Others gave the correct answer in (i) but in (ii) subtraction of a - b from $3a + 2b$ caused problems as it involved a double negative. Hence $2a + b$ was a common wrong answer. Some candidates obtained a correct answer but then proceeded to "simplify" it wrongly.

Question 2

Common errors were the use of 7 in (a) and the failure to use 8 in (b). In (a) many found $24 \div 3 \times 4 = 32$.

Question 3

A few candidates did not divide the shape into a triangle and a rectangle, but found $(1.2 + 2) \times 1.5$. Those who did split the area into two parts sometimes did not calculate the area of the triangle correctly. Part (b) also proved difficult – perhaps because of the awkwardness of the true area (3.9 m^2) as against the coverage (20m^2). A variety of approaches were adopted here, but many lost marks because of lack of knowledge that 1000ml = 1 litre. The 'natural' approach of $\frac{3.9}{20} \times 50$ was rarely seen and many candidates tried to get an answer from $\frac{20}{3.9}$ but often failed to divide this into 1000 or divided it into 100.

Question 4

Most candidates found $^{165}/_{6} = 2.75$ correctly, but thereafter understanding of hours and minutes sometimes proved absent. Answers of 2h 75 min and 3h 15 min were common. Better candidates recognised that 60 km/h was equivalent to 1 km in each minute so the total time should be 165 minutes.

Question 5

Part (a) was usually correct, with a few candidates finding just 0.1 + 0.2 or even ½(0.1 + 0.2). Part (b) was usually correct, although a few candidates lost a mark by giving the answer $^{4}/_{20}$ instead of 4. Some candidates divided 20 by 0.2 or vice versa.

Question 6

Part (a) was generally correct. A few candidates went on to solve an equation, obtaining $x = 2$. Others "cancelled" to give $x - 2$. A few weaker candidates gave $10x$ or $-10x$ as their answer. Some candidates found (b) hard, with all the usual algebraic misunderstandings appearing. Some common incorrect first steps were $^{x}/_{4} = 37$ and
$x + 3 = 10 - 4$. Although part (c) was found difficult by most candidates, it was pleasing to see many candidates correctly handling the inequality. Some obtained $x > 1.6$, although some of these then wrote $x = 1.6$ or just 1.6 on the answer line, thereby losing a mark. A minority of candidates wrote correctly that $5x > 8$ but then went on to $x > 3$ presumably from $8 - 5$. A few candidates thought that they were looking for integer values and adopted a trial and error approach, often finishing with $x = 2$. Some candidates solved the inequality as an equation and then left the answer as $x = 1.6$. A few candidates reversed the inequality sign in the first line of working.

Question 7

This question was very well answered. A few candidates obtained 52 but not $\sqrt{52}$. A few did not give enough significant figures in their answer.

Question 8

This question yielded an assortment of answers, with many wholly correct. Some weak candidates gave (i) Increasing, (ii) Steady speed and (iii) Decreasing although some correctly gave Not moving in (ii) with incorrect answers in (i) and (iii).

Question 9

Part (a)(i) was generally correct, but in (a)(ii) some candidates gave 6 (confusing union with intersection) or just even numbers (ie *B*). Some gave the correct numbers but repeated 6, which lost a mark, or gave an extra number, such as 12, or omitted one, usually 10. In (b) answers were normally given in context although 12Y was often omitted in (i). In (ii) some appeared to think *R* was another subject. History was sometimes mentioned in the answer. Concise answers were usually the best.

Question 10

This question was sometimes well done but a few candidates simply gave factor pairs or complete lists of factors. Repeated division was sometimes left without a final statement of the product.

Question 11

Part (a) was well done with only a few candidates using an incomplete structure. Some candidates added their fractions rather than multiplying them in part (b) and a significant minority failed to include the HH route in their calculation in part (c).

Question 12

Part (a) was answered well by most candidates. In part (b) many candidates gave an answer of $14.4 \times 10^{p+q}$ or 1.44×10^{pq} or $1.44 \times 10^{pq+1}$. Some resorted to substituting values for p and q, leaving these values in their answers.

Question 13

Part (a) was well answered, although several candidates rounded one or both answers to only two significant figures. A few candidates failed to substitute correctly into the formula by giving 2 rather than -2 as their first term and/or having 4×1×1 rather than 4×1×(-1) as $4ac$. Some did not extend the division line beyond the square root. A very small number successfully used the completing the square method. There was a sizeable minority who tried incorrect methods involving factorisation, invalid rearrangements or trial & improvement. In part (b) some candidates failed to multiply all of $y + 4$ by 3 in their first line of working. Common mistakes were $2 = 3y + 4$,
$y + 4 = 3 \times 2$ and $y + 4 = {}^{3}/_{2}$.

Question 14

Part (a) was mostly well done. A few candidates followed a correct first line with 6cos32 and some others used an incorrect trig. ratio. A small number of candidates clearly had their calculators in the wrong mode. Most candidates found the missing angle in part (b) and correctly obtained 9.52. A few used one of the two given angles in the formula $\frac{1}{2} \times 3 \times 7 \times \sin C$ and scored no marks. A minority used various methods to find the base length and the height of the triangle and then used 1/2 base × height to find the area. These methods were tedious but often successful. Some candidates used Area = ½ × 3 × 7, perhaps assuming that the top angle was 90°

Question 15

The elimination method was by far the most popular. This method was successful for most candidates but failed when equations were not completely multiplied and/or when candidates used the wrong operation when combining the equations.

Question 16

As usual, those who used area rather than frequency density were much more likely to be successful. Some used the whole bar between 30 and 40 and gave an answer of 200 and others gave an answer of 180 by including the range from 70 to 90. A few used an incorrect method of 120 ÷ 30 × 35 to obtain the answer 140. Some attempted to find the frequency density for 0 – 30 by finding 120 ÷ 30. This showed a serious misunderstanding.

Question 17

Both parts were well answered on the whole. Common incorrect answers in (a) were $x(2x + 5) + 3$, $(2x - 1)(x + 3)$ and $(2x + 1)(x + 3)$. In (b) a few candidates gave incorrect answers such as $(4y - 9)(4y + 9)$, $4(y^2 - 9)$ and $(2y - 3)^2$.

Question 18

In (a) and (b) candidates generally either obtained the correct answer or gave answers that showed no understanding of indices. Many used standard form in (b). In (c) the same applied although there were some candidates who gave $2\sqrt{2}$ as their answer. This gained no marks because although it showed an understanding of surds, it gave no evidence of understanding of indices.

Question 19

Many candidates obtained correct answers for the first two parts and these were usually correctly simplified. In part (b) candidates often failed to say that the equality between the vectors signified that the sides were <u>both</u> parallel <u>and</u> equal. A number gave unsubstantiated statements about *E* being the midpoint of *BC* or that $\overrightarrow{EC} = \mathbf{y}$ or that *AE* is parallel to *DC*.

Question 20

Many candidates appeared to have no knowledge of calculus. Candidates who had met this topic generally answered (a)(i) correctly although a few gave $6x$ alone. Part (a)(ii) was often well answered . The usual mistake was to omit the negative sign from the answer. In part (b) a significant number failed to use differentiation and tried to use either the formula for the gradient of a straight line joining two known points or $y = mx + c$. Others worked correctly. but lost the negative value of x. A few decided that gradient $= y/x = x^3/x = x^2$, and so tried to solve $x^2 = 12$.

Question 21

Parts (a) and (c) were usually answered correctly. In (b) many candidates gave answers such as $x < -3$, $x = 3$ or $x = 0$. In (d) many candidates correctly obtained $^1/_{(x+3)} + 2$ but could not simplify this correctly. Some gave $^1/_{(x+5)}$ as the answer. fg(x) was sometimes interpreted as either f(x) × g(x) or gf(x).

Question 22

Many candidates failed to remove BM from their attempts for the first two answers, giving answers such as $\sin x = {}^{BM}/_1$. In part (b) a very large number of candidates showed poor algebra by "collapsing" a correct statement of the cosine rule to $\cos 2x$. In (c) some competent candidates did not make immediate use of their earlier work, preferring to start all over again with the cosine rule. Of those who obtained a correct first line, a significant minority failed to square $2\sin x$ correctly, obtaining $2(\sin x)^2$.

Statistics

Overall Subject Grade Boundaries

Foundation Tier

Grade	Max. Mark	C	D	E	F	G
Overall subject grade boundaries	100	73	57	42	27	12

Higher Tier

Grade	Max. Mark	A*	A	B	C	D	E
Overall subject grade boundaries	100	80	62	44	27	15	9

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