MATHEMATICS

Paper 0580/12
Paper 12 (Core)

Key Messages

Read the question carefully and answer precisely what is being asked.

General Comments

The vast majority of candidates showed a thorough understanding of all the questions. Marks were usually lost through carelessness and not absorbing just what was being asked in the question. Also weakness in performing the four rules on directed numbers meant that some candidates lost marks when they knew how to do questions involving negative numbers. Candidates should always, after completing a question, read the question again and check that they have a sensible and realistic answer to what was being asked.

Comments on Specific Questions

Question 1

A large number in words needs careful reading and checking. Although most candidates gained the mark, the number of zeros in the middle was seen as none or two. Just a few candidates interpreted it as two separate numbers, 71 000 and 72.

Answer: 71 072

Question 2

Many candidates do not understand rotational symmetry so this very straightforward question was not answered very well. Answers of 0, 1 and 4 were quite common.

Answer: 8

Question 3

Some candidates did not observe that the reflex angle was required even though this was also marked clearly by the arc. Most did attempt measuring the correct angle but there were some poor and inaccurate readings of the protractor. An angle of 328° was seen a number of times. Also some gave the full circle angle of 360°.

Answer: 332°

Question 4

There were very few incorrect responses to this question apart from the least able candidates. Some clearly did not understand how to find a fraction of a number, producing quite a variety of responses, including decimals or numbers much greater than 153.

Answer: 68

Question 5

Most candidates realised that the two values in the question had to be multiplied although a significan number divided, leading to an answer of 125.6. The correct answer was an exact number and the mark lost by quite a few for responses of 191 or 191.3 without the full answer in the working space.

Answer: 191.27

Question 6

(a) It was very rare to see an incorrect response but some candidates gave a decimal.

(b) Again this question was very straightforward and only a few did not know what a fraction was. There were a few responses of $\frac{0.73}{100}$.

Answers: **(a)** $\frac{9}{11}$ **(b)** $\frac{73}{100}$

Question 7

(a) Quite a number of less able candidates clearly did not know the basic probability of an event not occurring. This resulted in a variety of responses with, occasionally, probabilities both the same as the question and greater than 1.

(b) Some candidates lost the mark for $\frac{144}{200}$ when the question asked for the number of days. Also this was a common case of misreading the question and finding 0.28×200.

Answers: **(a)** 0.28 **(b)** 144

Question 8

(a) Nearly all candidates gained this mark but a few gave diameter and some had no idea of the names for the lines associated with circles.

(b) Many candidates did not know the name in this part and a variety of incorrect responses were offered. Tangent was the most common incorrect answer.

Answers: **(a)** Radius **(b)** Chord

Question 9

(a) This question was not well answered and appeared more challenging when not related to a diagram. Some multiplied or used a mixture of subtraction and division. However, the main problem was not being able to handle directed number addition. A common incorrect answer was (4, –2).

(b) In contrast this part was well answered with the vast majority of responses correct. There were just a few who lost the mark by putting in a line between the components. Others did not multiply to give a single vector and incorrect multiplication was seen a few times.

Answers: **(a)** (8, –12) **(b)** $\begin{pmatrix} 24 \\ -28 \end{pmatrix}$

Question 10

Many candidates clearly did not know the difference between factors and multiples so this question wa well answered. Many performed the division by the factors method and then gave an answer of a comm factor of the two numbers. There were not very many who showed the first few multiples of each number in order to find the lowest common one. Those that did do this always got the correct answer. A common multiple of the numbers that was not the lowest was quite rare.

Answer: 96

Question 11

This substitution question was very well answered but, possibly as the radius was 7, there were many who chose to use $\frac{22}{7}$ for π, which could only gain the method mark. Also the use of 3.14 is not sufficient accuracy. Since a calculator is essential for these questions, candidates would be advised to use the π key.

Answer: 1230

Question 12

This straightforward simple interest question was well answered but a significant minority did not read the question carefully enough as they added $760 to their correct answer. Some used compound interest and a few divided by 100 twice to give 1.026.

Answer: 102.6

Question 13

(a) (i) This should be a well known result and it was answered very well. However, there were quite a number who gave zero or just the letter x.

(a) (ii) Nearly all candidates knew the rule for multiplication of indices but some multiplied or subtracted the indices.

(b) Although the majority of candidates gave a correct answer to this two-stage equation, quite a number found it challenging. Leaving the answer as 8 was quite common but subtracting 5 from 40 was seen a number of times. A significant number of candidates gave no response.

Answers: **(a)(i)** 1 **(ii)** m^7 **(b)** 2

Question 14

There were very few incorrect answers to this standard ratio question. Some candidates did not involve the $1000 in the solution and a few just divided 1000 by 8, 7 and 5.

Answer: 400, 350, 250

Question 15

(a) Most responses were correct but some candidates chose one of the other pairs of angles to be equal. The equal sides are clearly marked so it should be absolutely clear which angles are equal. Answers of 44° and 92° were seen quite often.

(b) (i) The topic of polygons is often not answered well but many candidates found the correct answer. Quite a number, however, did not know the simple relationship between an exterior angle and the number of sides.

(b) (ii) Most candidates knew the term for a polygon with five sides but some gave hexagon, octagon or other names which were not even polygons.

Answers: **(a)** 68 **(b)(i)** 15 **(ii)** Pentagon

Question 16

This fractions question was well answered with the vast majority gaining full marks. Only a few candidate didn't show sufficient working for all the marks. A few incorrectly changed the mixed number to an imprope fraction but most errors occurred from those who chose the equal denominator method. It was common in these responses to see the common denominator (most often 18) being left in at the final stage instead of being cancelled. Those who used the traditional method of inverting the second fraction and multiplying almost always gained full marks, though just a few inverted the first fraction or both.

Answer: $3\frac{1}{3}$ or $\frac{10}{3}$

Question 17

All parts of this question were answered well. Some candidates gave 6 as the square number. The usual confusion between multiples and factors was evident in some responses in parts **(c)** and **(d)** and a few candidates gave numbers not from the given list.

Answers: **(a)** 47 **(b)** 36 **(c)** 14 **(d)** 130

Question 18

(a) This simultaneous equations question only needed addition of the equations to eliminate *y* but many multiplied to eliminate *x*. Most candidates gained a correct full answer, but errors in the manipulation of directed numbers meant marks were lost. Just a few used a substitution method which was not really suitable with these coefficients and some less able candidates lacked the skill to tackle the topic.

(b) Nearly all candidates attempted taking out two factors, and the vast majority did so successfully. However, some did not write the correct number inside the brackets and *p* was occasionally included in the last term inside the bracket.

Answers: **(a)** $x = 6.5$, $y = 2.5$ **(b)** $7p(2p + 3q)$

Question 19

(a) Most candidates gained the first mark but many were confused about the expression involving three more cars. $6c$ and $2c \times 3$ were common incorrect responses for Baasim.

(b) Most candidates showed a correct addition of their expressions in part **(a)** and only a few didn't include *c* from Idris. However, many did not simplify the expression while others made further errors with the algebraic addition.

Answers: **(a)** $2c$, $2c + 3$ **(b)** $5c + 3$

Question 20

(a) This question was not well answered with many candidates not applying the bold unit, **minutes**, in the stem. Also many did not correctly apply the formula connecting distance, time and speed. Answers of 0.93, 1.07 and 210 were often seen, while 210 sometimes became 2.10 in order that it could fit on the graph.

(b) Some candidates clearly did not understand how to draw a travel graph, but the vast majority made at least some progress, even if part **(a)** was incorrect. Certainly those who did get part **(a)** correct almost always gained the 3 marks for the graph. The follow through did allow many to gain marks as they clearly understood how to represent the data graphically.

Answer: **(a)** 3.5

Question 21

(a) This transformation question was not very well answered. Although most candidates gave the correct transformation in both parts, many gave no line or an incorrect line for part **(i)**. Again in part **(ii)** the centre or the angle was often missed. Many responses gave too much of a description and some of these lost the marks since they indicated two transformations when the question specified a single transformation.

(b) Many candidates did not make their enlargement attempt the same shape as shape *A*. Usually this was still one square wide. Of those who did have the correct shape, most did not use the correct given centre and just assumed it was from the origin.

Answers: **(a)(i)** Reflection $x = 3$ **(ii)** Rotation 180° about (0, 0)

MATHEMATICS

Paper 0580/22
Paper 22 (Extended)

Key Messages

To succeed in this paper candidates need to have completed full syllabus coverage, apply correct methods, remember all necessary formulae, show all necessary working clearly and use a suitable level of accuracy.

General Comments

Candidates do not always work to an appropriate degree of accuracy. In some cases premature rounding leads to incorrect final answers. In other cases the final answer is not rounded to the correct level of accuracy. Methods are usually shown well but some candidates did not show their working. This was a particular issue in those questions which specify that working must be shown.

There was no evidence of candidates having insufficient time as almost all candidates were able to complete the question paper and to demonstrate their knowledge and understanding. There were occasional omissions which appeared to be due to difficulty with the questions rather than lack of time.

Candidates need to be encouraged to read the question carefully before responding. They should also refer back to check that their answer is sensible. For example when finding the number of sides of a polygon the answer must be an integer.

Comments on Specific Questions

Question 1

Most candidates gave the correct answer of 'negative' with no extra description. The most frequently seen incorrect response was 'inverse proportion'.

Answer: Negative

Question 2

The majority of candidates attempted this question by use of prime factorisation and were able to write 24 and 32 as products of prime numbers. Many were unsure what to do next. A common error was to try to find the highest common factor and the answers 8 and 2 were often seen. Occasionally a larger common multiple, e.g. 192, was given as the answer. Only a small number of candidates listed the multiples of both 24 and 32 in order to find a common multiple.

Answer: 96

Question 3

This question combines calculation of a volume from mixed units with conversion to litres. The first part was generally well done with most candidates correctly converting either 53 cm into m or the other lengths into cm. Conversion to litres caused more problems with many unsure what conversion factor to use and whether to multiply or divide. Those who converted all the lengths into centimetres were generally more successful. Very few candidates scored zero on this question.

Answer: 572.4

Question 4

This was one of the best answered questions on the paper with incorrect answers rarely seen. Any er tended to be as a result of careless omission of a letter rather than a lack of understanding. A mark for p factorisation was awarded occasionally. Very few candidates scored zero.

Answer: $7p(2p + 3q)$

Question 5

Most candidates scored at least one mark in this question. A small number of candidates did not understand the idea of the *n*th term and gave −5 as the answer. The most successful were those who used the formula $a + (n - 1)d$ to find the *n*th term. Sometimes marks were lost due to sign errors, the most common having $d = 5$ and consequently the most common incorrect answer was $8 + 5n$. Another, equally successful, method was to multiply the common difference by *n* and add the 'zero term'.

Answer: $18 - 5n$

Question 6

Incorrect answers were not often seen in part **(a)** although there was occasional inaccuracy in the radius. A small number of candidates seemed not to be properly equipped and did not use a pair of compasses to draw their arc.

In part **(b)** most shaded the correct region. A common error was to include the triangle *ANC* in the shaded area or to bisect angle *B* to create a region.

Question 7

This question was very well answered with most calculating the angle correctly. Of those who did not reach the correct value, many were able to show either the 90° angle subtended by the diameter or the other 53° angle, frequently showing these on the diagram. Common errors were to assume a right-angle between the chord and the diameter or to assume that one of the triangles was isosceles.

Answer: 37

Question 8

Part **(a)** was nearly always correct. There were occasional incorrect answers where the candidate used 360° as the sum of angles in a triangle or assumed that one of the other angles was also 44°, leading to an incorrect answer of 92°. There were also some who made arithmetic slips and did not earn the mark.

Part **(b)** was generally well answered. There were a few answers obtained by multiplication, e.g. from 360×24, rather than dividing, which led to answers which were far too large. Candidates are advised to think of the common sense of their answers. The most successful method was to use the exterior angles and the equation $\frac{360}{n} = 24$. Candidates who attempted to use a formula involving interior angles tended to make more errors, either by setting up an incorrect equation or by making errors in the more complex algebraic manipulation that was required.

Answer: **(a)** 68 **(b)** 15

Question 9

This was one of the best answered questions on the paper with very few incorrect answers seen. There were very occasional arithmetic slips but these were rare. The only, extremely uncommon, incorrect method was to divide 1000 by 8, 7 and 5 respectively.

Answer: 400, 350, 250

Question 10

Part **(a)** was answered well by most candidates. The most common errors were to give an expression as $3x + 8$ instead of an equation, or to use multiplication instead of addition leading to $x + 4x + 4x = 26$. Other commonly seen incorrect answers were $x + 4x = 26$ and $3x + 16 = 26$.

The correct answer was usually given in part **(b)**, in some cases after an incorrect equation in part **(a)**. Those whose answer to part **(a)** was incorrect were still able to score a mark for a correct algebraic method. Candidates are advised to check their answer by looking back and confirming that their answer fits the criteria in the question. This would have helped many but it was very rare to see. Some who did this were able to correct their answers to parts **(a)** and **(b)** accordingly.

Answer: **(a)** $x + x + 4 + x + 4 = 26$ **(b)** 6

Question 11

This was generally well answered and the majority of candidates were able to successfully find the correct pair of values. The most common error was inconsistent addition and subtraction when eliminating a variable by equating coefficients. Arithmetic errors were also quite common. A few candidates used the substitution method but for many of these the subsequent algebraic manipulation caused problems, especially where algebraic fractions were involved.

Answer: $x = 6$, $y = \frac{1}{4}$

Question 12

Candidates who used $50\,000 \times 0.97^4$ as the method were the most successful. Those who used the less efficient method of repeatedly finding 3% and then subtracting tended to lose track of the number of years or to make arithmetic errors. The unrounded answer, 44 264 was quite common as some forgot to round to the nearest 100, or were unable to do so. The special case mark for an increasing population was quite often awarded. Candidates need to ensure that they read the question more carefully. The two most common incorrect answers were 44 000, from finding 12%, or 43 700, which is from working equivalent to $50\,000 - (50\,000 \times 1.03^4 - 50\,000)$.

Answer: 44 300

Question 13

This question on variation was well answered by the majority of candidates. Common errors seen were to use inverse proportion rather than direct, or to have x directly proportional to y, y^3 or the square root of y. Another common error was to write y directly proportional to the cube root of x.

Answer: 12

Question 14

This was one of the best discriminators on the paper. The most common incorrect starting points were to use the gradients 3, –3 or $\frac{1}{3}$. Another common incorrect method was to use $m_1 + m_2 = -1$ instead of $m_1 \times m_2 = -1$. Most were able to use their gradient in either $4 = 7m + c$ or $y - 4 = m(x - 7)$ to find an intercept. This question was one where premature rounding was often seen. It was common to see the gradient $-\frac{1}{3}$ rounded to −0.3 or the intercept rounded to 6.3, neither of which earned the accuracy marks. A significant number of candidates seemed not to know where to start with this question or attempted a sketch approach. Occasionally candidates forgot to write 'y =' in their final answer.

Answer: $3y + x = 19$

Question 15

In part **(a)**, the majority of candidates demonstrated an understanding of how to square a matrix, altho this was sometimes spoilt by arithmetic errors. A small minority of candidates tried squaring the individua elements of the matrix.

Part **(b)** was also answered well by most candidates. In this part arithmetic slips and incorrect signs in the adjoint were the most common cause of error.

Answer: **(a)** $\begin{pmatrix} 76 & 30 \\ 40 & 16 \end{pmatrix}$ **(b)** $\frac{1}{4}\begin{pmatrix} 2 & -3 \\ -4 & 8 \end{pmatrix}$

Question 16

This was a generally well answered question with incorrect final answers rarely seen. The most common reason for marks not being awarded was for working not being shown. The instructions on the question paper were to not use a calculator and to show all of the steps in the working. Common errors were to take the reciprocal of the wrong fraction or to attempt to work in decimals.

Answer: $\frac{10}{3}$ or $3\frac{1}{3}$

Question 17

In both parts of this question many candidates did not give their vector expressions in the simplest form. Part **(a)** was often correct but in quite a few cases candidates did not appreciate that direction is important and **a** – **b** was often given as the final answer.

In part **(b)** most candidates managed to score at least one mark for stating a correct route from *O* to *M*. The ratio caused problems for many, with use of fifths instead of eighths being quite common, or with $\overrightarrow{XM}$ being written as $\frac{3}{8}(\mathbf{x} - \mathbf{y})$ instead of $\frac{3}{8}(\mathbf{y} - \mathbf{x})$.

Answers: **(a) b − a (b)** $\frac{5}{8}\mathbf{x} + \frac{3}{8}\mathbf{y}$

Question 18

While some candidates scored four marks the most common marks were three or one, with premature rounding being the main cause of candidates scoring three marks. This usually resulted from rounding the length of *AC* to 23.4 in the working. The majority of the candidates used the most efficient method involving the tangent ratio but many opted to find *AF* and to use the sine ratio, or the cosine rule. Those who gained one mark usually found the length of *AC* but were unsure what to do next. Some found it difficult to relate the two-dimensional diagram to the three-dimensional situation.

Answer: 14.4

Question 19

This was often well answered, with the correct answer commonly seen. The two most common errors were to decimalise 2 hours and 18 minutes as 2.18 hours or to find the mean of the two separate speeds, leading to the incorrect answer of 97.8, rather than use the total distance divided by the total time. Some candidates worked in metres per second and converted back to kilometres per hour at the end using the conversion factor $\frac{18}{5}$. This was often unsuccessful as in many cases the candidate was unsure whether to multiply or divide by this factor.

Answer: 95

Question 20

Part **(a)** was well answered by the majority of candidates. The most commonly seen incorrect answer 57°, with candidates often explaining their error by describing the angles at *V* and *Y* as angles in the sa segment.

Part **(b)** was also well answered by the majority. The most common errors were to calculate *QC* instead of *AC* or to add an extra 7.2 on to *AC* to give 18 as the final answer. A few used an additive method instead of ratio, adding the difference between *BC* and *PQ* on to *AQ*, which gives a final answer of 11.4.

Answers: **(a)** 35 **(b)** 10.8

Question 21

Part **(a)** was well answered, with most candidates demonstrating a good basic understanding of index notation. For part **(a)(i)** the most commonly seen incorrect answers were 0 or x and in part **(a)(ii)** the most common error was m^{12}. Part **(a)(iii)** caused a few more difficulties for candidates; $8p^2$, $(8p)^2$, $2p$ and $\frac{8}{3}p^2$ were some of the incorrect answers seen.

Most candidates scored at least one mark in part **(b)** by recognising 3^5. Quite a few put $3^5 = 3^2$ and gave a final answer of 5. Others left their answer as $\frac{1}{2.5}$ and did not earn the final mark. Many able candidates successfully used logarithms to solve the equation, even though they are not on the syllabus.

Answers: **(a)(i)** 1 **(ii)** m^7 **(iii)** $2p^2$ **(b)** 0.4

Question 22

Part **(a)** was mostly well answered but the single most common error was to put $(-2)^2 = -4$. Almost all realised that it was a composite function with only a very small number writing $f(x) \times g(x)$.

In part **(b)** also, most candidates found the correct composite function $(5x - 3)^2$ but many lost the final mark by incorrectly expanding the expression, or by setting it equal to 0. Common incorrect terms in the expansion were $5x^2$, $+ 30x$ or -9.

Part **(c)** was very well answered. A few candidates started by subtracting 3 which gives the incorrect answer $\frac{x-3}{5}$ and a very small number treated it as a reciprocal and gave $\frac{1}{5x-3}$ as their answer.

Answers: **(a)** 17 **(b)** $25x^2 - 30x + 9$ or $(5x - 3)^2$ **(c)** $\frac{x+3}{5}$

MATHEMATICS

Paper 0580/32
Paper 32 (Core)

Key Messages

To succeed in this paper candidates need to have completed full syllabus coverage, remember necessary formulae, show all working clearly and use a suitable level of accuracy. Particular attention to mathematical terms and definitions would help a candidate to answer questions from the required perspective.

General Comments

This paper gave all candidates an opportunity to demonstrate their knowledge and application of mathematics. Most candidates completed the paper making an attempt at most questions. The standard of presentation and amount of working shown was generally good. Working was considered essential in questions **1(a)(iv)**, **1(b)**, **2(c)**, **4(d)**, **6(e)(i)**, **6(f)**, and useful in questions **1(a)(iii)**, **2(b)(iii)**, **2(b)(iv)**, **2(d)**, **4(e)**, **6(c)**, **6(e)(ii)** and **9(b)**. Centres should continue to encourage candidates to show formulae used, substitutions made and calculations performed. Attention should be made to the degree of accuracy required, and candidates should be encouraged to avoid premature rounding in workings. If a question asks for a particular degree of accuracy, the accuracy mark is lost if this is not done. If the question does not ask for a particular degree of accuracy and the answer is not exact then the answer should be given to three significant figures. In questions involving money, if the answer is an exact amount then this should be given, i.e. $237.25, not $237.3 or $237. Candidates should also be encouraged to read questions again to ensure the answers they give are in the required format and answer the question set.

Comments on Specific Questions

Question 1

All candidates were able to attempt all or part of this question as it offered a wide range of questions on various areas of mathematics and numeracy involving pie charts, ratio, percentages, and interpretation of a table to perform a cost calculation.

(a) (i) This part was correctly answered by the vast majority of candidates, with 40% the only common error.

(ii) The use of a fraction seemed to cause problems for a small number of candidates. The common methods used were $\frac{35}{100} + \frac{15}{100} = \frac{50}{100} = \frac{1}{2}$, or $\frac{98}{280} + \frac{42}{280} = \frac{140}{280} = \frac{1}{2}$. A variety of other fractions were seen with common errors of $\frac{7}{20}$, $\frac{3}{20}$, $\frac{50}{280}$ and $\frac{50}{360}$.

(iii) The majority of candidates were able to write down the required ratio correctly either starting from 32:12 or 80:30 although a small number were unable to give their ratio in its simplest form.

(iv) The majority of candidates were able to correctly calculate the two percentages and perform the necessary subtraction. However a significant number used 360 and in fact compared the two angles with the other common error being 35 – 12 = 23.

(v) The table was generally successfully completed although the second statement seemed to cause more problems.

(vi) Candidates generally found it more difficult to give a correct mathematical reason for w percentage sold had decreased. Common errors included statements about the other co social comments about price and popularity.

(b) In a question requiring a number of calculations it is essential to set out the working clearly. This was generally answered well although for a small number of candidates it was difficult to follow their reasoning and calculations. A good number of candidates were able to score full marks with the most common method being to find the cost of the two dresses separately and then add to obtain the total cost. The most common error was to use an incorrect value of 4.3 for the length of silk required to make the short dress. Other common errors were the use of 160 and 176, and the time of six hours only applied once.

Answers: **(a)(i)** Violet **(ii)** $\frac{50}{100}$ **(iii)** 8:3 **(iv)** 68 **(v)** True, False, True **(b)** 237.25

Question 2

This question tested the candidate's knowledge of statistical averages and also bounds, probability, calculation of "best value" and percentages.

(a) Many candidates found this part on bounds to be challenging with few correct answers seen. Common errors included 65 and 75, 5 and 70, 69.5 and 70.5.

(b) The majority of candidates were able to state the correct statistical value asked for in this part although a small number mixed up their definitions and gave incorrect values. Common errors included 23, 20, and 23–20 for the range; 22, 5 and 21 for the mode; 20 for the median; 125.5 (from $\frac{251}{2}$), 251, and omission of one of the twelve terms when calculating the total for the mean; $\frac{45}{251}$, $\frac{2}{12}$, $\frac{1}{12}$, and 45 for the probability.

(c) Again in a question requiring a number of calculations it is essential to set out the working clearly. This was generally answered well although again for a small number of candidates it was difficult to follow their reasoning and calculations. A good number of candidates were able to score full marks with the most common method being to find the three values in \$/kg. The other common method was to find the values in kg/\$ although this result was often misinterpreted. A small number found the cost for 20 kg of each bag. A less successful and incomplete method was to find the relative cost of bags B and C as compared to bag A. A common and incorrect method was to multiply the two values of cost and weight together for each bag.

(d) This part was generally answered well. The common method used was to find 35% and then subtract although those candidates who calculated 65% were more successful and less likely to lose the accuracy mark. The common error was \$0.84 from just finding 35%.

Answers: **(a)** 67.5, 72.5 **(b)(i)** 3 **(ii)** 20 **(iii)** 21 **(iv)** 20.9 **(v)** $\frac{3}{12}$ **(c)** Bag B **(d)** 1.56

Question 3

This question tested the candidate's ability to draw and use a scatter diagram and a conversion graph and was generally answered well.

(a) (i) The scatter diagram was successfully completed by the majority of candidates although common errors included the incorrect interpretation of the axes, incorrect use of the scales, and the mis-plotting of at least one of the points.

(ii) The correct type of correlation was generally given.

(iii) Generally candidates were able to draw an acceptable line of best fit with only a small number simply joining the points in a "zig-zag" fashion.

(iv) Particularly on a follow through basis, candidates were generally able to use their line t estimate the missing score, although again common errors included the incorrect interpre the axes, and incorrect use of the scales.

(b) (i) The majority of candidates were able to use the given conversion graph and give a value within th accepted limits.

(ii) Candidates found the conversion in this part rather more challenging. The common methods used were to use the identities of 50kg = 110 Pounds (from the graph) or 50 Pounds = 23kg (from **part (i)**).

Answers: **(a)(ii)** positive **(iv)** 74 **(b)(i)** 22 < ans ⩽ 23 **(ii)** 590 ⩽ ans ⩽ 620

Question 4

This question on bearings, scale drawings, and calculation of time given distance and speed, with a common theme running through the question, proved challenging for a number of candidates, although it proved a good discriminator with the full range of marks being seen.

(a) The majority of candidates were able to convert their correctly measured distance using the given scale.

(b) Those candidates who were familiar with the term bearing were usually able to measure the angle correctly. However many candidates appeared to struggle to find the correct bearing and were either measuring the incorrect bearing from *G* to *D* to give 60˚, or the incorrect angle to give 30°, 120° or 300°.

(c) This part, which required the positioning of Foxhill, was generally done well. The common error was in using the incorrect bearing as outlined above.

(d) Candidates generally used the correct formula of time= distance/speed although few fully correct answers were seen. The common errors were not correctly converting 1.555 hours to 1 hr 33 min, prematurely rounding their answer to 1.6 or 1.5 hours leading to inaccurate answers of 1 hour 30 minutes or 1 hour 36 minutes, and giving answers of 1 hour 55 or 56 minutes.

(e) The required conversion of 54 km/h to m/s proved difficult for many candidates and the full method involving the correct use of 1000, 60 and 60 was rarely seen or applied, with the omission of one or more of these operations being the common error. A small number of candidates used the conversion factor of $\frac{5}{18}$ although an equal number incorrectly used $\frac{18}{5}$.

Answers: **(a)** 126 **(b)** 240 **(d)** 1 hour 33 min **(e)** 15

Question 5

This question gave candidates the opportunity to demonstrate their ability to calculate missing values, to draw a quadratic curve and to interpret and use this curve. Candidates continue to improve at plotting points but many found the drawing of a smooth curve challenging.

(a) (i) The table was generally answered well with the majority of candidates giving four correct values although common errors with the negative sign were seen.

(ii) The graph was generally plotted very well, although a number of candidates found it difficult to draw a correct smooth curve, with a few making the error of joining points with straight lines.

(b) (i) Few candidates were able to write down the correct co-ordinates for the lowest part of their graph with many not appreciating that the symmetry of the graph gave the *x* co-ordinate as –0.5. Common errors included (–1,–4), and (0,–4).

(ii) Few candidates were able to correctly write down the equation of the line of symmetry of the graph and may have found that drawing the line on their graph would have helped in its identification. Common errors included $x = –1$, $x = 0$, $x = 0.5$, $y = –0.5$ and –0.5.

(c) Those candidates who knew how to use their graph to solve the given equation were gen to give two correct values. A common error was to read off the intercept values thereby solv $x^2 + x - 4 = 0$. Few candidates attempted to solve the equation algebraically and even fewer w successful.

(d) Those candidates who understood the $y = mx + c$ form for a straight line were generally able to write down the correct equation of the given line or at least the correct value of either m or c. However a significant number found this part difficult and seemed unfamiliar with the form $y = mx + c$.

(e) Candidates were generally able to find the area of the given triangle although a number read off the measurements incorrectly while a significant number did not use the correct formula.

Answers: **(a)(i)** 8, 2, –4, 2 **(b)(i)** (–0.5,k) where $-4.5 \leqslant k < -4$ **(ii)** $x = -0.5$ **(c)** $-1.8 \leqslant x \leqslant -1.4$, $0.4 \leqslant x \leqslant 0.8$ **(d)(i)** $2x - 3$ **(e)** 9

Question 6

This question on shape and space, involving nets, volume, surface area, Pythagoras' theorem, trigonometry and circles proved a good discriminator and the full range of marks was seen.

(a) A good variety of correct nets were seen although a significant number of candidates appeared unfamiliar with the concept of a net. A small number did not appreciate that two of the sides were given whilst a small number attempted to draw a three-dimensional diagram.

(b) A good variety of correct whole number solutions to this part were seen although common errors included 20,20,20; 60,60,60; 4,4,4; and use of 3.91.

(c) The calculation of the total surface area of a given cube proved more challenging with the minority of candidates able to use the correct formula and method of $6 \times 2 \times 2$. Common errors included $2 \times 2 \times 2$, $2 \times 2 \times 12$, and using their values from part **(b)**. Again the minority were able to give the correct units with common errors being cm, cm^3 and a small but significant number omitting any units.

(d) The conversion of units from cm^2 to mm^2 proved challenging for many candidates with common errors of 9, 90, 9000, 81, 0.9 and 0.81.

(e) (i) The majority of candidates recognised the required application of Pythagoras' theorem and most were able to do so correctly. However a significant number lost the accuracy mark by giving their answer from $\sqrt{57}$ as 7.5. The common error was 13.6 (from $\sqrt{185}$).

(ii) The majority of candidates recognised the required trigonometrical application and most were able to do so correctly with the majority using the cosine ratio. The equally valid uses of the sine ratio and the tangent ratio were also seen. However a significant number lost the accuracy mark by giving their answer of 43° or using a premature approximation within their calculation.

(f) The majority of candidates recognised the required application of the formula for the area of a circle and most were able to do so correctly gaining the method marks. However, a significant number lost the accuracy mark by either using a premature approximation within their calculation or the use of 3.14 for π. Other common errors included use of $r = 13$, use of $2\pi r$, use of 11^2, and just finding the area of one circle.

Answers: **(b)** correct set of dimensions **(c)** 24 cm^2 **(d)** 900 **(e)(i)** 7.55 **(e)(ii)** 43.3 **(f)** 120

Question 7

This question tested the candidates' ability to construct an angle bisector, a locus, the interpretation of a diagram and the construction of two triangles. The required construction arcs and lines were clearly shown by the majority of candidates and the standard of drawings was generally good.

(a) (i) The construction of the bisector of a given angle was generally done well although common errors included the bisection of different angles, the bisector of *DC* or *BC*, and the drawing of the diagonal line *AC*.

(ii) The drawing of the required locus was again generally done well although common errors included inaccurate arcs, incomplete arcs, arcs drawn from *C*, and horizontal and/or vertical lines from *DC* and/or *DA*.

(iii) The interpretation of the resultant diagram was less well done with few correct regions seen.

(b) Only the more able candidates appreciated that two different triangles could be drawn with the given conditions. Few candidates appeared to draw and use an arc of radius 5 cm to draw the line *XZ* and the use of a good length arc may have helped candidates to see the two possible triangles. One very common error was to draw one triangle with the angle *XYZ* of 40° and the other triangle with the length of *XZ* being 5 cm. The majority of candidates were, however, able to score one or two of the available marks for drawing an angle of 40° and/or a length of 5 cm.

Question 8

This question tested the candidates' ability to continue a pattern and to use sequences and was generally answered well.

(a) The completion of the table by continuing the pattern generated by the first three given rows proved challenging for many candidates although the majority were able to score two marks by correctly completing the first two rows. The extension of the pattern to give an algebraic rule in row four was rarely done successfully, with a significant number either giving numeric answers or no response.

(b) (i) The vast majority of candidates were able to correctly write down the next term in the given sequence.

(ii) Many candidates were able to give a correct expression for the *n*th term of the sequence, although $n + 4$ was still a common error.

(iii) This part was generally answered well although a small number of candidates extended the sequence to obtain the answer rather than using the *n*th term.

(iv) This part on the interpretation of the sequence was not answered as well, with a number of candidates unable to justify their answer with a valid reason. The most successful valid reasoning involved the use of the terms of 235 and 239, or the use of $n = 59.5$. Common errors and invalid reasons included "is not in the sequence", "does not fit the rule", "237 is not divisible by 4", "is not adding 4", and the use of odd, even, prime or square numbers.

Answers: **(a)** 4^2, 4×5, 8^2, 4×9, 101^2, 99^2, $(n + 1)^2$, $(n - 1)^2$ **(b)(i)** 23 **(ii)** $4n - 1$ **(iii)** 227 **(iv)** No with valid reason

Question 9

All candidates were able to attempt all or part of this question as it offered a wide range of questions on various areas of mathematics and numeracy involving use of calculator, cube root, standard form, percentage reduction, powers, primes and irrational numbers.

(a) (i) The calculation of the cube root of 68921 was largely successful although common errors of 262.5 (square root) and 22 973.6 (÷ 3) were seen.

(ii) Although a small number of candidates did not appear to understand the expression "s form" this part was again answered well although common errors included 6.8×10^4, 6.89 68921×10^0 and 68.921×10^3.

(iii) The writing of 68 921 correct to two significant figures was generally done well although common errors included 70 000, 68 000, 68 921.00, 689.21 and 68 900.

(b) Many candidates were able to give a correct value of 8% for the given percentage reduction, although common errors included 92%, and incorrect methods using $\frac{7724}{88826}$ or $\frac{96550}{88826}$ were seen.

(c) (i) (ii) The first two parts of this question on indices were generally answered well by the majority of candidates although common errors of –25, –0.04, $\frac{1}{5}$, $\frac{1}{5}^2$ (part **(i)**) and 25, 2.24, 5.0176, 4.84 (part **(ii)**) were seen.

(iii) Most candidates were able to explain why 6 is not a prime number although this was not always clearly expressed and a number confused factors with multiples.

(iv) Most candidates found it difficult to explain the term "irrational number" although a good number were able to give an example which by itself was insufficient for the mark to be awarded. Common errors included "not rational", "a decimal number", " a negative number", " recurring decimals", "improper fractions" and "long decimals".

Answers: **(a)(i)** 41 **(ii)** 6.8921×10^4 **(iii)** 69 000 **(b)** 8% **(c)(i)** $\frac{1}{25}$ or 0.04 **(ii)** 5 **(iii)** has more than 2 factors **(iv)** a non-terminating and non-recurring decimal, or cannot be written as a fraction

MATHEMATICS

Paper 0580/42
Paper 42 (Extended)

Key Messages

To achieve well in this paper, candidates need to be familiar with all aspects of the extended syllabus. The recall and application of formulae and mathematical facts in varying situations is required as well as the application to problem solving and unstructured questions.

Work should be clearly and concisely expressed with answers written to an appropriate level of accuracy. Candidates need to be aware that in drawing graphs, linear functions should be ruled and curves should be drawn freehand with a sharp pencil.

General Comments

This paper proved to be accessible to the vast majority of candidates. Almost all candidates were able to attempt all of the questions. Well-structured answers with clear methods were shown in very many cases and the presentation of work was generally very good.

The questions/parts of questions on arithmetic (percentages, currency, simple volume), drawing and interpreting graphs, manipulative algebra, sine rule and cosine rule, simple probability, transformations and calculating an estimate of the mean were generally well attempted. The questions involving sets and Venn diagrams, area and scale, verifying a given algebraic result, harder combined probabilities, volume of a cone given the sector net, inequalities and regions, and generalising quadratic sequences proved to be the more challenging aspects.

Candidates appeared to have sufficient time to complete the paper and omissions were due to difficulty with the questions rather than lack of time. The use of at least three significant figure accuracy unless specified was noted by some candidates, but quite a number of candidates approximated to two or three significant figures in their working and this resulted in loss of marks, particularly on **Questions 5** and **8**. A few candidates only showed a partial method and in those cases it should be noted that method marks will not be implied from figures that are correct to two significant figures only. Candidates should be encouraged to use all the figures in their calculator and correct to the required accuracy at the end of the calculation.

Comments on Specific Questions

Question 1

(a) Almost all candidates were able to show the correct calculation for the tax paid. Those that lost marks usually showed an incomplete method such as 1.5% of 450 000.

(b) The majority of candidates coped well with the reverse percentage and earned all three marks. Most errors involved calculating a percentage of the 6750, such as $87\frac{1}{2}$% and $12\frac{1}{2}$%, sometimes adding or subtracting the result. Some incorrectly associated the 6750 with $12\frac{1}{2}$% and sometimes 125%.

(c) The majority of candidates displayed a good understanding of upper bounds and succeeded in obtaining the correct answer. Two common errors were seen: rounding the correct answer, usually to three significant figures, and multiplying 21 by 17 and then finding the upper bound of this answer. A few candidates treated the upper bounds of the dimensions as 21.05 and 17.05.

(d) Many candidates didn't appreciate that the scale of the plan needed to be squared in o calculate the area of the kitchen and incorrect multiplication by 200 was often seen. Even was understood, a significant number struggled to convert their answer to square metres. Consequently, only a minority achieved full marks on this part of the question.

(e) The vast majority of candidates earned both marks. Any loss of marks was usually due to slips with the arithmetic or the occasional calculation involving surface area.

(f) Most candidates had a good understanding of currency exchange and many of these earned all three marks. Loss of marks was usually the result of not giving the final answer to the nearest euro.

Answers: **(a)** $\frac{1.5}{100} \times 450000$ **(b)** 6000 **(c)** 376.25 **(d)** 22.4 **(e)** 5184 **(f)** 9023

Question 2

(a) (i) Few candidates earned all three marks. Common errors included repeating digits in different subsets of the Venn diagram, omitting one or more numbers (usually 8 and 10), placing a number in the wrong subset (usually 1) and occasionally including incorrect numbers such as 11 and 12.

(ii) Only a small minority were able to complete all three statements correctly, with the first statement most often correct. Many were able to list the elements of $A \cap B \cap C$ but most candidates didn't enclose them in set brackets. Using the correct notation and conventions for sets was a weak area for many.

(iii) Many candidates coped well and were able to give a correct number. Common errors usually involved giving the number of elements of a subset of *B* or a list of the elements of set *B* or a subset of *B*.

(b) (i) The notation for subset was not well known and a variety of different answers was seen with $\in$ the most common incorrect answer. Only a minority gave the correct answer.

(ii) Candidates generally fared better in this part and the majority were able to shade the correct subset on the Venn diagram. Most candidates attempted the question and incorrect responses showed no common misunderstanding.

Answers: **(a)(ii)** $\in$, {3}, $\varnothing$ or {} **(iii)** 5 **(b)(i)** $\subset$

Question 3

(a) The vast majority of candidates completed the table correctly with just an occasional slip for a few others.

(b) Only a minority earned all four marks for a correct graph. Marks were almost always lost for the incorrect plotting of one or more of the points with the point at $x = -2.5$ frequently plotted at $y = -1.13$ in error. Only a small minority joined the points with line segments. Candidates should use their knowledge of the shape of different functions as a self-check that the completed curve is the correct shape for a cubic.

(c) Many candidates were able to draw the required line. Most then attempted to find the solutions of the given equation, but inaccuracies in the curve and misinterpretation of the scale caused many to lose at least one mark for their solutions.

(d) Drawing a tangent at $x = -1.75$ proved more of a challenge. Many acceptable tangents were seen but chords and lines that simply crossed the curve were often in evidence. In an attempt to calculate the gradient many candidates drew a right-angled triangle. Some of these were rather small and as many read to the nearest square this resulted in some inaccurate gradients.

Answers: **(a)** 2, 0, –2, 2 **(c)** –2.95 to –2.85, –1, 0.85 to 0.95 **(d)** –1.5 to –1.1

Question 4

(a) This part was answered well with most candidates appreciating that the factorisation involved the 'difference of two squares' method and giving the correct answer. Some used 11*y* but gave a answer $(11y – m)^2$ or (11*y* – *m*)(11*y* – *m*) and a small number used 121*y* and gave an answer of (121*y* + *m*)(121*y* – *m*), for example.

(b) Most identified the common denominator as (3*x* – 5)(*x* – 1) and many went on to give the correct answer. Some made an error in the numerator, such as 4(*x* – 1) = 4*x* – 1, or in omitting brackets and writing 3*x* – 5(*x* + 2) = 3*x* – 5*x* – 10, or an error when collecting terms. Quite a number decided to expand the brackets in the denominator which was not necessary, and whist most did this correctly there were a few that made a sign error. The most common error was the use of incorrect cancelling. For example some gave the correct answer and then cancelled the $3x^2$ term in the numerator with the $3x^2$ term in the denominator. Others made a similar error at an earlier stage such as cancelling the *x* – 1 in the 4(*x* – 1) term with the *x* – 1 in the denominator.

(c) Almost all candidates used the standard formula for the solution of quadratic equations and quoted this correctly. The majority carried out the substitutions correctly, but some errors were made, such as using 7 rather than –7 or not dividing the whole of the numerator by 2 × 3. The requirement to give the answers correct to two decimal places caused difficulties for many, particularly with the negative root, and it was common to see an incorrect answer of either –1.89 or –1.9.

(d) (i) Most used the correct formula for the area of a trapezium. In many cases, candidates did not write down a correct expression for the area as a result of not inserting brackets correctly. It was common to see examples such as $\frac{1}{2}(4x + 6)\, x + 1$ or $\frac{1}{2}(x + 4) + (3x + 2)(x + 1) = 15$. In many cases this was followed by a correct expression and the necessary algebraic steps to give the required equation. A small number of candidates used the area of the rectangle added to the area of the triangle. The algebra is more complicated when using this method so there were more errors made, but a few did score full marks.

(ii) This part was answered very well with most earning full marks. The majority used factorisation but there were a substantial number who used the standard formula. Occasionally, candidates made a sign error when factorising or when using the formula.

(iii) Those that had the correct answers to part **(d)(ii)** almost always selected the positive root followed by the correct value for the length of *AB*. A small number did not use substitution giving the answer as 3*x* + 2.

Answers: **(a)** (11*y* + *m*)(11*y* – *m*) **(b)** $\frac{3x^2+5x-14}{(3x-5)(x-1)}$ **(c)** –1.90 and 1.23 **(d)(ii)** 1.5 and –4 **(iii)** 6.5

Question 5

(a) Almost all candidates quoted $A = \frac{1}{2}ab\sin C$ for the area of the triangle and made the correct substitutions. A very small number calculated the height using 5.4 × sin62° and then used $A = \frac{1}{2}bh$ to find the area. Having written down a correct numerical expression for the area, some candidates then gave the answer as 38.1, which is the value to one decimal place given in the question. In order to score full marks it is necessary to justify this answer by giving a value to more than one decimal place, such as 38.14.

(b) Most candidates identified the sine rule as being the method required to find the value of an angle as a first step. However, there were some who incorrectly assumed that the triangle was right-angled and so used either Pythagoras' theorem or right-angled triangle trigonometry as an incorrect first step. There were also a small number who used the cosine rule incorrectly. Substitution into the sine rule was virtually always correct and, although a small number left the value of the third angle as their final answer, the vast majority then calculated the value of *x* by using the fact that the three angles of the triangle add up to 180°. There were some who gave an answer that was outside of the acceptable range; for example 95.7. This occurred as a result of not using a sufficient number of figures in some part of the calculation, or of rounding the final answer on the calculator incorrectly.

(c) Most candidates attempted to calculate angle *APB* and then use this angle in the cosine rule to find *AB*. Many correctly gave angle *APB* as 83˚ but some gave it as 146˚ or 151˚ for example. These candidates were given credit for using the cosine rule with an incorrect angle although, in the more unusual incorrect values of the angle *APB*, they were expected to identify the angle used as angle *APB* before using it in the cosine rule. There were some candidates who quoted the version of the cosine rule with Cosine *A* as the subject and so, after substituting, had to transpose the formula which in some cases was not done correctly. It is preferable to quote the appropriate version of the cosine rule depending on whether a side or an angle is being calculated.

Answers: **(b)** 95.6 **(c)** 286

Question 6

(a) Virtually all candidates answered this correctly.

(b) This part was also answered well. Some candidates gave the answer as a fraction, such as $\frac{80}{1}$ or $\frac{80}{300}$.

(c) (i) There was a mixed response to this part. Most wrote down $\frac{5}{15}\times\frac{4}{15}$ for the probability of the first card having a square drawn on it and the second card having a circle drawn on it, but a large number did not consider the probability of the first card having a circle drawn on it and the second card having a square drawn on it. It was therefore very common to see a final answer of $\frac{20}{225}$ or $\frac{4}{45}$. A small number of candidates wrote down an incorrect first step such as $\frac{5}{15}+\frac{4}{15}$.

(ii) As in part **(c)(i)** there was a mixed response. Many either wrote down the probability that the first card does not have a circle on it, or worked it out from the probability that the first card either has a square on it or a triangle on it as $\frac{5}{15}\times\frac{4}{15}$. This was often given as the final answer although there was quite a good number of candidates that did both cards do not have a circle drawn on them and so correctly gave $\frac{11}{15}\times\frac{11}{15}=\frac{121}{225}$ as the answer. A common misunderstanding was to give the probability that the first card has a circle on it as $\frac{4}{15}$ and then give an answer of $1-\left(\frac{4}{15}\right)^2=\frac{209}{225}$.

(d)(i) There were two methods frequently used which lead to a correct answer in this part. The most common was the one in which each type of card is considered separately, which gives a total of four pairs of products which are then added. Most wrote down the correct products and scored full marks but, as in the earlier parts, some considered only one of the two possibilities and so only gave two of the products. Similarly, the shorter method, which combines types of card and so gives two pairs of products, was well done, but with some only giving one product. For either method there were candidates who made an error in one of the products and quite a number did not consider that this part was 'without replacement' and so gave all the denominators as 15. A small number omitted this part.

(ii) In this part there were three methods seen regularly. The most common was the one in type of card is considered separately, which gives a total of six pairs of products, which a added. Some only wrote down three of the products. A significant number used a method th involved finding the probability that the two cards have the same shapes on them and then subtracting this from 1. Most candidates using this method gave the correct answer to earn full marks. A smaller number used the shorter direct method involving three products. A slightly larger number than in part **(d)(i)** gave all the denominators as 15 and also a slightly larger number omitted this part.

Answers: **(a)** $\frac{4}{15}$ **(b)** 80 **(c)(i)** $\frac{40}{225}$ **(ii)** $\frac{121}{225}$ **(d)(i)** $\frac{108}{210}$ **(ii)** $\frac{148}{210}$

Question 7

(a)(i) Most candidates recognised the rotation and accurately described the required elements for the rotation. The direction was sometimes incorrect and a few confused reflection with rotation. There were a small number giving two transformations in both parts **(a)(i)** and **(ii)**, for which no marks are awarded.

(ii) A significant number of candidates described the transformation as ‘a negative enlargement with scale factor 2’ rather than the required ‘enlargement with scale factor –2’. The centre of this transformation was usually stated correctly by those who attempted it, although a few gave the origin as the centre.

(b) The translation was usually drawn correctly. Those who made errors usually earned one mark for a translation of 2 units to the right or 1 unit upwards. A few omitted the ‘pole’ on the flag.

(c) Again this question was often answered correctly. Those who made errors usually earned a mark for a reflection in the line $y = 1$ or in a vertical line other than $x = 1$.

(d) The more able candidates worked out the product $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix}$ in order to see what happened to the co-ordinates of the general point, and then accurately described the reflection. Less able candidates again confused reflection with rotation and others gave the line of reflection as the y-axis. There were several candidates that gave contradictory information, e.g. reflection in the x-axis ($x = 0$).

Answers: **(a)(i)** Rotation, (0,0), 90° [anticlockwise] oe, **(ii)** Enlargement, (– 2,1), –2 **(d)** reflection, x-axis

Question 8

(a)(i) Many candidates answered this well and were able to set up and solve a correct equation involving the unknown angle. By far the most common error was to use 68 as the arc length instead of subtracting 48 to get 20. Some candidates used the formula for the area of the sector instead of the fraction of the circumference.

(ii) Those candidates who realised that the arc length of 20 cm became the circumference of the base of the cone usually earned at least five marks. Accuracy was often lost by approximating both the radius of the base and height of the cone to three significant figures within the method before the final calculation. Many candidates used 24 as the vertical instead of the slant height and consequently did not see the necessity to use Pythagoras’s theorem.

(b) This was answered very well. The only common error was to use 4 as the radius of the quarter circle or 8 as the radius of the semi-circle. Occasionally the area of the square was calculated as 8×4.

Answers: **(a)(i)** 47.7 **(ii)** 252 **(b)** 139

Question 9

(a) This question was often answered correctly. The more common incorrect answer was $144 < h \leqslant 150$. The term modal class was not universally understood.

(b) This question on finding an estimate of the mean was often answered correctly with all the working being clearly shown. A minority of candidates used the interval widths instead of the mid-values. Some made errors with one of the mid-values within an otherwise correct method and gained partial credit.

(c) This part on drawing a histogram was answered well by some. The first block was usually correct, but some candidates were often careless with the other blocks. The vertical line at $h = 144$ was often omitted and the last block was often drawn to the right hand edge of the grid instead of stopping at $h = 170$. Those that were unable to draw accurate blocks could earn one mark by writing down the correct frequency densities.

Answers: **(a)** $140 < h \leqslant 144$ **(b)** 144.875

Question 10

(a) Almost all candidates were able to write down an inequality based on the number of sacks that the cook buys.

(b) Most candidates were able to write down two correct inequalities. The most common error was reversing one or both of the inequality signs or confusing the inclusive inequality sign with the non-inclusive sign. Incorrect inequalities such as $x + y < 6$ and $6y < x$ were seen occasionally.

(c) Almost all candidates attempted to draw the boundary lines of the three inequalities. The line $y = 6$ was almost always correct, as was the line $2x + 5y = 40$, although some candidates were inaccurate in drawing the line through their plotted points. Candidates were slightly less successful with the line $y = x$, almost always because of the different scales on the two axes, and often drew a line at 45° to the x-axis. Many did not appreciate the need to draw some of the boundaries as broken lines which sometimes led to errors in the following part. With three correct boundary lines, a small majority of candidates usually identified the correct region.

(d) This proved to be more challenging and many candidates were unable to make any progress. There were many who simply gave an incorrect numerical answer without any supporting working. Some tested points within their region but not all of these had integer coefficients. A significant number made no attempt at this part of the question.

Answers: **(a)(i)** $4x + 10y < 80$ **(b)** $y > x$ and $y \leqslant 6$ **(d)** 76

Question 11

(a) This question on drawing the next diagram in the sequence was usually answered correctly.

(b) This question on the next terms in the sequence was usually answered correctly.

(c) Most candidates realised that a quadratic expression in n was needed and many stated the correct one. A few gave a linear relationship.

(d) Many of those who used the difference method did not realise that when the second differences are all 1 then the coefficient of n^2 in the required expression must be ½. The more able candidates scored full marks and the less able ones often did not attempt this question.

Answers: **(a)** 30, 10 **(c)** $n(n + 1)$ **(d)** $\frac{1}{2}n(n-1)$