MATHEMATICS

Paper 0626/01
Paper 1 (Core)

Key messages

To achieve well in this paper, candidates need to be familiar with all aspects of the core syllabus including the recall and application of formulae and mathematical facts. Candidates are required to interpret situations mathematically to problem solve with unstructured questions and to reason mathematically.

Work should be clearly and concisely expressed with answers written to an appropriate accuracy.

Candidates should be aware that it is inappropriate to leave an answer as a multiple of π or as a surd in a practical situation unless requested to do so.

Candidates should show full working with their answers to ensure that method marks are considered where answers are incorrect.

General comments

Candidates appeared to have sufficient time to complete the paper and any omissions were mostly due to lack of familiarity with the topic or difficulty with the question rather than lack of time. There was a range of marks and stronger candidates were able to attempt all the questions and their solutions usually displayed clear methods. However, some less able candidates provided solutions with little or no working and as a consequence did not earn method marks when the solution was incorrect.

The stronger topics for candidates on this paper included the language of number, finding fractions of amounts and converting fractions to percentages, solving simple equations, order of operations, using a calculator, simple angle calculations, brackets and factorising.

The weaker topic areas included reasoning with indices, areas of compound shapes, reasoning with averages, trigonometry and application of simultaneous equations.

Comments on specific questions

Question 1

(a) Almost all candidates gave the correct answer from the list for a multiple of 13.

(b) Most correctly gave the square number, a few gave 48 or 50.

(c) Most gave the correct answer, a few gave 51 as the prime number.

Answers: **(a)** 52 **(b)** 49 **(c)** 47

Question 2

(a) This was well answered; a few misinterpreted the fraction and found $\frac{8}{3}$ of 56.

(b) This was also well answered. A few left their answers as a decimal, some gave an answer of 24.

Answers: **(a)** 21 **(b)** 37.5

Question 3

(a) Almost all candidates were able to solve this two-step equation correctly. A few made a numeric error within an otherwise correct method.

(b) The majority were successful, a few divided 40 by 7.

Answers: **(a)** 2.8 **(b)** 280

Question 4

(a) This was well answered. A few candidates subtracted before multiplying and others gave an answer of –4.8.

(b) This was well answered. The common error was to give an answer of 7.83.

(c) This was answered correctly by a minority of candidates. The main error was in rounding the answer to three significant figures. Some were unable to calculate the unrounded answer correctly using their calculator and used a step-by-step method instead of the direct entry using the square root and fraction key.

Answers: **(a)** 4.8 **(b)** 7.84 **(c)** 2.96

Question 5

The majority of candidates were successful in scoring all three marks. Those that made errors usually did so in working out the hourly overtime payment but they were usually able to gain some credit for calculating the pay for a normal week as part of their calculation.

Answer: £490

Question 6

(a) Both parts were well answered. A few candidates did not give a geometric reason but simply showed 180 – 76 in their reasoning. Using appropriate mathematical language is required when giving reasons such as this.

(b) This was less well answered. Some gave the same answer as part **(a)**. The reasoning part was poorly answered. Some referred to parallel lines without giving the required term of corresponding angles.

Answers: **(a)(i)** 104° **(ii)** angles on a straight line add up to 180°
(b)(i) 76° **(ii)** corresponding angles

Question 7

(a) Most candidates were able to expand the bracket correctly. Some gave answers of $3x - x$ or $3x^2$ or $3x$.

(b) Most were able to factorise correctly. A few gave answers of $39x$.

Answers: **(a)** $3x - x^2$ **(b)** $3(6x + 7)$

Question 8

(a) This part was very well answered.

(b) Candidates struggled with the second condition here and although many gave values that satisfied the first condition such as 8 and 2 or 4 and 3, only a few considered that the base had to be less than the index.

Answers: **(a)** 8 **(b)** 2 and 6

Question 9

This was quite well answered. Many candidates were able to use the ratio correctly in this context and calculate the correct amount.

Answer: 87.50

Question 10

(a) A number chose the correct graph. The common error was to choose graph D.

(b) This was less well answered than part **(a)**. The common error was to choose graph F, A or E.

Answers: **(a)** graph B **(b)** graph C

Question 11

There were very few correct answers to the area of the rhombus. A number gained partial credit for calculating a relevant area, e.g. one of the triangles. Some did not recall how to find the area of a triangle when doing this. Some others saw the right angle and attempted Pythagoras' theorem which was not relevant to this question.

Answer: 60

Question 12

(a) Although many understood that to calculate the speed, the distance needed to be divided by the time, dealing with the time in minutes proved the issue and correct answers in km/h were rare.

(b) Very few candidates were able to give a valid assumption about the distance or the time. Most referred to keeping a constant speed in some way.

Answer: **(a)** 12.5

Question 13

This was reasonably well answered. Many referred to the fact that the sample might not be representative in some way or that the sample size was too small.

Question 14

Most found the error interval difficult and gave responses such as 20 and 22 or 10.5 and 10.5. This appears to be a topic that candidates are less familiar with at this level.

Answer: 20.5 and 21.5

Question 15

This question required candidates to form a strategy to find the shaded area. More able candidates recalled the formula for the area of a circle and used this appropriately by subtracting the area of the two quadrants from the square. Others could not recall the correct formula for the area of a circle or used an incorrect radius when substituting. Some could only work out the area of the square and then abandoned the calculation.

Answer: 547

Question 16

As this was a 'show that' question, each stage of the working needed to be shown. A few considered using Pythagoras' theorem and were often able to state a correct first stage of $6^2 + 2.5^2 = 6.5^2$. To earn full marks it was necessary to show evaluation of the squares or to complete the 'left hand' calculation using a square root. Very few managed to do this. The vast majority did not consider using Pythagoras' theorem at all and did not make any progress here.

Question 17

(a) This part was found difficult by candidates. The majority stated that the numbers of members were different in the two clubs rather than referring to the effect on the mean of the extreme value of 69 lengths in the Dolphin Swim Club.

(b) More were successful here in finding the median for the Dolphin Swim Club and then making a general comment based on the medians, e.g. on average, Dolphin Swim Club swam more lengths. Some decided to calculate the means despite the information provided in part **(a)**.

Question 18

(a) The explanations usually fell short here by omitting to explain that the tangent was perpendicular to the radius and was therefore the shortest distance to the tangent. Many omitted this part or simply repeated information in the question.

(b) (i) Very few considered trigonometry as the method here and of those that did a number wrote $6 \times \sin 34$ instead of $6 \div \sin 34$.

(ii) A follow-through mark was available for those who subtracted 6 from their answer to part **(b)(i)**, and this mark was earned by some who had answered part **(b)(i)** incorrectly.

Answers: **(b)(i)** 10.7 **(ii)** 4.7

Question 19

(a) There were very mixed answers to the tree diagram. A number of candidates completed the tree correctly. A significant number did not appreciate that each pair of branches should add to 1 and some struggled to interpret the information about the different probabilities for the evening bus based on what had happened with the morning bus.

(b) A minority realised that the probabilities on the branches should be multiplied. Many added the two probabilities, some added all of the late probabilities others chose a wrong 'route' from the tree.

Answers: **(a)** 0.8, 0.6, 0.4, 0.1, 0.9 **(b)** 0.12

Question 20

This question proved challenging to almost all the candidates but there were some that correctly solved the simultaneous equations and found the correct intersection. A few tried to rearrange one of the equations often with an error. Other simply gave an answer from no working. A mark was available for answers of x and y that satisfied one of the original equations and some did earn this mark. This was omitted by many candidates.

Answer: (2.4, 3.4)

MATHEMATICS

Paper 0626/02
Paper 2 (Extended)

Key messages

The syllabus covers a wide range of topics and there were occasional topics with which some candidates were unfamiliar. This includes mathematical words that a number of candidates did not understand, such as ‘stratified’ and ‘asymptote’. There was little understanding of set notation. Other areas where candidates were less confident were Statistics, understanding the limitations of surveys (**Question 1**) and the appropriateness of particular averages and their comparisons (**Question 6**).

General comments

Candidates were generally well prepared for the earliest part of the paper and many scored highly on these questions, demonstrating good understanding and knowledge across the range of these topics. The latter part of the paper became more challenging but there were nevertheless some excellent solutions and a high level of mathematical ability shown by a number of candidates. In particular, there were some neat algebraic solutions shown to the simultaneous equation question with surds. Candidates generally attempted all of the questions and were able to complete the paper within the time. Candidates who found particular questions challenging generally maintained a positive approach and gained credit on other topics later in the paper. Solutions were well set out and many candidates gained a considerable number of method marks because their mathematical presentation was clear.

Comments on specific questions

Question 1

Many candidates gave valid reasons such as recognising that the sample size was too small or that standing outside a health store may be biased. Reasons not considered to be valid included reasons stating that the people might be ill, female, old or similar and reasons talking about what customers may or may not have bought.

Answer: valid explanation

Question 2

Candidates did very well on this bounds question with most giving both bounds correctly. The most common error was with the upper bound where 21.4 was seen instead of 21.5. In addition, some candidates tried to write error intervals and thus included inequality signs in their answers.

Answers: 20.5, 21.5

Question 3

The majority of candidates scored well on this question. Most used the correct formula for the area of the circle and realised they needed to take the area equivalent to half a circle from 900. Most candidates retained the accuracy throughout the question, so that only a minority lost marks for premature rounding at an early stage. A few candidates used the formula for the circumference.

Answer: 547

Question 4

Candidates completed some very clearly presented and mathematically clear solutions to prove that angle x was indeed a right angle. A variety of approaches were chosen but the most popular was to show that the three sides satisfied Pythagoras' theorem. A number of candidates used the cosine rule to show that the angle x was 90°. Occasionally candidates using this method stopped at $\cos x = 0$ and a further line stating $x = 90°$ was required.

Question 5

Most candidates answered this question well, completely factorising the expression. Some candidates only partially factorised the expression and a few divided the expression by one or both of the factors.

Answer: $3a(a-7b)$

Question 6

(a) A number of candidates recognised that the member who swam 69 lengths was an outlier and that this high number of lengths would distort the mean. Wrong answers included comparisons of the number of members or comparisons of the ranges.

(b) Many candidates correctly worked out the median for the Dolphins as 32. For the second mark they were required to state that the Sharks swam more lengths. A purely numerical comparison or statement regarding the median without context was not enough. Unfortunately, some candidates decided to compare the means even though the previous part said that the mean should not be used to compare the clubs.

Answers: **(a)** valid explanation **(b)** 32 and a valid comparison

Question 7

(a) Candidates needed to know that the shortest distance from a line to a point is the perpendicular from that line to the point. Reasons explaining that either the radius is perpendicular to the tangent or that the angle at *A* is 90° were awarded the mark.

(b) (i) This question was answered well with the majority of candidates showing they could select and rearrange a trigonometry ratio correctly. Most candidates gave a final answer within tolerance. Candidates should be careful not to prematurely round within calculations as those candidates who used $\sin 34 = 0.559$ gave an inaccurate final answer of 10.733 …

(ii) Most candidates found *BC* correctly from their *OB*.

Answers: **(a)** valid explanation **(b)(i)** 10.7 **(ii)** 4.7

Question 8

(a) Most candidates completed the tree diagram correctly. The most common error was to place the 0.1 and 0.9 probabilities the wrong way round.

(b) Candidates often correctly selected the 0.2 and 0.6 probabilities. However, candidates were frequently unclear as to whether to multiply or add these probabilities and as a consequence $0.2 + 0.6 = 0.8$ was a common wrong answer.

Answers: **(a)** 0.8 and 0.6, 0.4, 0.1, 0.9 **(b)** 0.12

Question 9

The question was answered well with most candidates demonstrating understanding of the correct order in which to rearrange the letters.

Answer: $t = sp - r$

Question 10

Most candidates were able to calculate the answer accurately. Errors that occurred came primarily from those candidates who rounded the fraction $18\frac{26}{27}$ before taking the cube root. In addition, some candidates only gave an answer correct to two significant figures.

Answer: $2\frac{2}{3}$

Question 11

(a) Most candidates showed good understanding that the multiplier 0.85 represented a 15 percent decrease.

(b) The majority of candidates correctly used $t = 18$ in the formula for P, the population. Candidates who did not give a whole number of people in their final answer could not gain full credit.

(c) Again, most candidates answered this question well. The most common errors came from candidates giving the year 2005 rather than the number 5 and those that misread the 20 000 as 2000.

Answers: **(a)** No, a 15% decrease **(b)** 2320 **(c)** 5

Question 12

Very few candidates were successful in their answers to this question and it was clear that many of them were not familiar with the language associated with sets.

(a) Few candidates recognised the symbol as meaning ‘is an element of’. Whilst many did not give an answer, it was not uncommon for candidates to think it was either a $\leqslant$ symbol or that there were 50 numbers in B.

(b) Many candidates did not attempt this part. Candidates who attempted this part were often successful. The most common slip was to give extra numbers, for example, 4 and 16, with candidates overlooking the fact that set B required numbers to be $\geqslant 10$.

(c) It was rare to see the correct answer. Candidates needed not only to understand the symbol for ‘union’ but also to understand that n required the number of elements in $B \cup C$ rather than a list of all the elements.

Answers: **(a)** 50 is an element of B **(b)** 16 **(c)** 43

Question 13

Most candidates had a clear understanding of stratified sampling and, in addition, nearly always rounded their answer to a whole number of year 9 boys. The most common error seen was an answer of 10 from simply dividing 100 by 10, the number of groups.

Answer: 8

Question 14

This question was answered very well with candidates taking care to find the correct arc length and remembering to add on the two radii. There were a few candidates who wrongly used the area of the circle or who used 8 as the diameter of the circle and a few who omitted to add on the radii.

Answer: 33.5

Question 15

A number of candidates demonstrated some excellent algebraic skills in solving these simultaneous equations and giving their answers in exact form as required. The majority of candidates attempted to multiply one or other of the equations by $\sqrt{2}$ and others were also successful in rearranging one of the equations to make either *x* or *y* the subject and using substitution. Those who used an approximation for $\sqrt{2}$ of 1.41, or better, frequently found the decimals difficult to deal with and rarely gained credit. Others struggled from the start with the surds and did not make progress.

Answer: $x = 6$, $y = -4\sqrt{2}$

Question 16

(a) The most successful candidates were those who expanded the brackets and equated the coefficients.

Some candidates were able to see without expansion that $c = 3$ but could get no further. A common error was to find $(x - 5)$ correctly but then to give the incorrect answer of $b = -5$.

(b) Whilst some candidates completed this part with ease, it was clear that many did not know how to relate this part to the previous part. It was not uncommon to see candidates restarting and attempting either to complete the square or to use the quadratic formula on $3x^2 + ax - 10 = 0$. These candidates were rarely successful.

Answers: **(a)** $a = -13$, $b = 5$, $c = 3$ **(b)** $x = \textit{their } b$, $x = \textit{their } \frac{-2}{c}$

Question 17

Only a few candidates were completely successful at this question. These recognised that the line $y = x + 3$ should be drawn, and they were able to read their solutions accurately from the graph. Some candidates had the correct idea but were unsure as to which of the lines $y = \pm x \pm 3$ they should be drawing. A few candidates attempted to draw $y = x^3 - 2x^2 - 6x + 3$ but they were often inaccurate in their calculations or plotting of their *y* values.

Answer: answers rounding to –1.9, 0.4 or 0.5, 3.5

Question 18

There were some excellent answers to this question with a number of candidates demonstrating their ability to solve three-dimensional problems involving both trigonometry and Pythagoras. Most of these candidates retained the accuracy of their calculations and gave final answers of at least the three significant figure accuracy required. However, some candidates could not visualise the triangle involved, and they were not aware that the length *PT* was not 8 cm. In addition, a significant number of candidates over-complicated the question by using the cosine rule with three (often incorrect) lengths and were more often than not unaware of the right angle drawn on the diagram at *T*.

Answer: 64.8

Question 19

Only a few candidates were able to demonstrate a clear knowledge of the shape of an exponential curve, where it cut the *y*-axis and the *x*-axis as the asymptote. In addition, a small number of candidates worked out co-ordinates along the curve, although this was not the intention, and plotted a correctly shaped exponential graph. These generally went through a labelled point, (0,1), as required. Other candidates drew various incorrect graphs such as linear and quadratic. Only a minority could give the equation of the asymptote.

Answer: $y = 5^x$ drawn, (0,1), $y = 0$

Question 20

(a) Many candidates were able to demonstrate proficiency in using their calculators to write down the second to fifth iterations accurately to six decimal places. There were, however, a number of candidates who did not give a response to this question and others who did not enter the calculation correctly into their calculator and therefore the operations were not completed in the correct order.

(b) The few candidates who answered this question often gave excellent explanations. Candidates either needed to explain that the last two values are the same to three decimal places or that the answer lies between the x_4 and x_5 values because the sequence is alternating above and below the exact solution.

Answers: **(a)** 0.679348, 0.670105, 0.671227, 0.671092 **(b)** valid explanation

MATHEMATICS

Paper 0626/03
Paper 3 (Core)

Key messages

To do well in this examination, candidates need to show sufficient method so that marks can be awarded, particularly when answers are incorrect. Missing out or running together method steps is not recommended for any question that requires more than one step in its solution. Candidates also need to make sure that they read each question carefully and take note of key words and phrases. Rereading a question is also a sensible strategy as sometimes solutions offered are incomplete. Candidates who present their work in a neat and orderly way seem less likely to make simple errors such as misreading their own writing. For a non-calculator paper in particular, it is useful if candidates check their answers either by assessing how reasonable they are or by using simple estimation strategies. Also, when solving equations or inequalities, it can be useful to check the answer by substituting it into the original equation to see if the result expected is produced.

General comments

A good number of candidates were clearly well prepared for this examination paper. The use of a calculator was not allowed and many candidates showed good arithmetic skills. This was highlighted particularly in **Questions 4**, **5**, **6**, **8**, **10**, **11** and **14** in this examination. The most challenging question was the final question on loci. Candidates generally found the initial questions to be accessible.

All candidates seemed to have sufficient time to answer those questions that were within their capability.

Comments on specific questions

Question 1

Most candidates found this to be an accessible start to the paper. A good proportion of candidates were able to earn two or three marks. A few candidates wrote the probabilities represented by each arrow, rather than the letter. This was acceptable but did introduce an unnecessary possibility of making an error. The most common wrong answer for part **(a)(i)** seemed to be C. In part **(a)(ii)**, weaker candidates tended to write one of the odd numbers on the spinner as their answer, misinterpreting what was asked for. The majority of candidates seemed to be able to identify the correct answer to part **(b)**.

Answers: **(a)(i)** B **(ii)** D **(b)** certain

Question 2

Again, a good number of candidates were able to earn at least three of the four marks available for this question.

(a) Weaker candidates commonly offered the wrong answers *C* or *G* or *D*. A few candidates offered more than one answer, even though the question clearly indicated only one shape was incorrect.

(b) Almost all candidates were able to identify shape *C* as being the kite.

(c) Again, this was well answered with almost all candidates choosing shape *A*. Those who were incorrect tended to choose *E* or *F* or *C*.

(d) Many candidates were able to recall the meaning of the word congruent and made the correct selection.

Answers: **(a)** *B* **(b)** *C* **(c)** *A* **(d)** *E* and *F*

Question 3

(a) This was almost universally correct.

(b) Acceptable comments were based on time of day, length of time for which the survey was carried out or survey size. Many candidates were able to produce answers that were sufficiently valid. Very weak candidates did not base their comments on Ravi's survey but made comments such as 'people travel on buses so there will always be a lot more of them' or that 'it will be the same bus not lots of buses because they keep using the same route'.

Answer: **(a)** Car 23, Motorbike 9

Question 4

Candidates clearly had a good understanding of directed number. Many scored very well on this question, earning all three marks available.

(a) This was almost universally correct.

(b) Again, very well answered by almost all candidates. Occasionally candidates added the values rather than subtracting them.

(c) Again, almost universally correct.

Answers: **(a)** −5, −3, −1, 0, 2 **(b)** 7 **(c)** −4

Question 5

(a) Candidates using build-up methods to find either 50 percent of 12 or 10 percent of 12 as a starting point were often the most successful in this question. Good candidates were accurate with their method and took care with their arithmetic, earning both marks. Weaker candidates were often able to start correctly but made slips in calculating 5 percent of 12. Some candidates were able to state 0.45×12, for example, but few of these made any further progress. Whilst a perfectly valid method, as this was a non-calculator paper, this calculation was beyond the capabilities of many candidates. A few candidates stated an answer that may have come from an attempt at a correct method but, as the answer was incorrect and no method had been seen, no marks could be awarded.

(b) Good candidates formed the fraction $\frac{28}{40}$, saw that this was equivalent to $\frac{7}{10}$ and were able to state the correct answer easily. This was the most efficient method of solution. A few candidates used build-up approaches, often successfully if they were sufficiently careful with their arithmetic. Some candidates misinterpreted the question and found the percentage of the gift that Jordan had left, rather than the percentage he had spent on his shirt. Weaker candidates tended to give the answer 12, this being the number of pounds he had left after buying the shirt, again misinterpreting what was required, or attempted to find 40 percent of £28.

Answers: **(a)** £5.40 **(b)** 70%

Question 6

(a) A good number of correct answers were seen, with $\frac{7}{10}$ the most common. Some candidates converted to percentages, often correctly, and these tended to give a correct answer of $\frac{3}{4}$. Several candidates gave the answer $\frac{3.5}{5}$. This was an unacceptable form. Many candidates found the level of thinking beyond them and offered nothing of any value.

(b) A good number of candidates identified the most efficient method of solution as writing the given fractions with a common denominator of 21, leading to the acceptable answer $\frac{13}{21}$. A few candidates converted both given fractions to decimals or percentages and some were able to state a correct answer, such as $\frac{3}{5}$ on the basis of this work. Other candidates seemed to reason that, as $\frac{2}{3} = 0.666...$, an answer of $0.6 = \frac{3}{5}$ had a good chance of being correct, which indeed it was. Candidates who attempted similar reasoning with $\frac{4}{7}$ and gave the common wrong answer $\frac{5}{7}$ were less fortunate. A few candidates tried to find the sum or difference of the given fractions, misinterpreting what was needed. Weaker candidates either gave the answer $\frac{1}{2}$ or made no response.

Question 7

(a) This part of the question was very well answered – almost all candidates took a sufficiently accurate measurement from the diagram and understood how to use the given scale.

(b) Again, this was well answered, with the large majority of candidates using their protractor correctly and reading the scale accurately. Candidates offering incorrect answers either used the wrong scale, measuring from south, and offered the answer 55°, or measured from east and gave the answer 35°. Weaker candidates gave a distance measurement such as 6 or 1.5.

Answers: **(a)** 1.5 km **(b)** 125°

Question 8

(a) (i) A very high proportion of candidates were able to state 2.5 and add 4.5 correctly. Those choosing to write 2.5 as a decimal, rather than mixing decimals and fractions were most successful. Some candidates gave the answer 6.5 without writing anything down. These candidates may have done better if they had worked out the answer on the page rather than attempting it mentally. Weaker candidates either carried out a wrong order of operations or used the inverse operations or were unable to divide 5 by 2 successfully. For example, 2 remainder 1 became 2.1 or 3.

(ii) Here, candidates needed to carry out the inverse operations in the correct order. Many candidates were able to do so. A few candidates reversed the order but did not use inverse operations whilst other candidates used inverse operations but did not reverse the order. Weaker candidates often used 6 as the input.

(b) Candidates found this part to be quite challenging and only good candidates were able to offer a correct solution. Some candidates identified 4 and 8 correctly but omitted to include an operation with each value. The most common wrong answer was ×4, +2. Some candidates thought that algebraic expressions were required. Other candidates attempted to change the subject of the formula, misinterpreting what was needed.

Answers: **(a)(i)** 7 **(ii)** 3 **(b)** +2, ×4 or ×4, +8

Question 9

(a) A good number of candidates were able to find the correct answer. A few arithmetic slips were seen, with some candidates unable to find 7×9 correctly. A few candidates, having found the value of each bracket to be 7 and 9, added instead of multiplying. Other candidates tried to multiply out $(8 - 1)(4 + 5)$ making the task much harder than it should have been. The weakest candidates offered answers that were algebraic expressions in g and/or h.

(b)(i) The many candidates who gave explanations based on calculations were usually successful. The simplest way to earn the mark was to suggest that $2x^2$ should be 18 not 36, for example. Some excellent explanations were offered. Those who were using words only were often insufficiently clear to be credited. Some candidates suggested 'she did not follow BIDMAS' or 'she should have done the indices first'. These candidates clearly had some idea about what the issue was but did not support their comment with any clarifying evidence, such as a calculation, and could not be credited for such general statements. Some candidates did not think that Mhairi had made an error or that the error was elsewhere in the calculation.

(b)(ii) Many candidates who had identified Mhairi's error correctly were able to find the correct answer here. Some candidates whose answer to part **(b)(i)** simply lacked clarity were also able to find the correct answer. Other candidates combined unlike terms and/or made sign errors in their solution. Weaker candidates simply repeated Mhairi's calculation and gave the answer 43.

Answers: **(a)** 63 **(b)(ii)** 25

Question 10

Very few candidates gave fully correct solutions to this question. A few candidates made place value errors, but were otherwise correct in their calculation. Many candidates correctly found there to be 120 boxes of tea bags in the carton and gave that as their answer. These candidates may have done better if they had reread the question as they had forgotten that they were given information about the number of tea bags in each box. Many other candidates were unable to make much progress beyond stating 5, 6 and 4. Some candidates did not spot that finding $5 \times 6 \times 4$ was the most efficient way to find the number of boxes in the carton and much multiplication of the given values was attempted, sometimes successfully. Weaker candidates occasionally took the largest of these values, 6, and multiplied that by 80. Some candidates found 162 000 and 1350 but made no attempt at the division that should have followed. Presentation of solutions was varied with some solutions being quite difficult to follow.

Answer: 9600

Question 11

A reasonable number of candidates scored full marks for a neat and accurate solution. A good number of candidates scored two marks for an answer that satisfied two of the conditions, often these two were the mode being 2 and the median 5.5. Some candidates earned one mark, often for a solution that had a mode of 2. Several candidates made no attempt to answer.

Answer: 2, 2, 9, 11

Question 12

Candidates who made good use of the grid provided often chose the correct transformation. Candidates who did not use the grid often made no attempt to answer either part of the question.

(a) Better candidates answered this question well. Some candidates may have scored full marks if they had described the line as the x-axis, as a few incorrectly stated the equation to be $x = 0$. The most common incorrect answer was a rotation of 180°. Some candidates would have done better if they had used correct language, as expected, since phrases such as 'it has flipped over' were unacceptable. A few candidates contradicted themselves, stating an acceptable transformation but also stating an incorrect transformation.

(b) Only the best candidates were able to describe fully the single transformation required. Some candidates were able to identify the translation but not the vector. Other candidates would have done better if they had used correct language, as expected, since phrases such as 'it has moved' were unacceptable. Whilst '3 right and 1 down' was acceptable as an alternative to the vector notation, descriptions such as '3 across and 1 down' were not.

Answers: **(a)** Reflection in *x*-axis **(b)** Translation by $\begin{pmatrix} 3 \\ -1 \end{pmatrix}$

Question 13

(a) A high proportion of candidates successfully showed the stated result to be true. Candidates who were incorrect often tried to find 'patterns' in the numerator and denominator instead of attempting the sum on the left hand side. Candidates converting to decimals were inaccurate and could not be credited. Some candidates wrote only $\frac{2}{6}+\frac{1}{6}=\frac{1}{2}$ and lost the second mark as the $\frac{3}{6}$ was essential, the answer having been given.

(b) Only good candidates made any real progress with this part. The simplest method of solution was to find $\frac{1}{6}-\frac{1}{10}$ or to convert the statement as it was given into $\frac{6}{60}+F=\frac{10}{60}$. Candidates who chose one of these methods were usually successful. Some candidates found a correct fraction such as $\frac{4}{60}$ but forgot to simplify it to a unit fraction. Candidates choosing to convert to decimals were, again, inaccurate and were not credited. Many candidates wrote unsupported, incorrect fractions.

(c) (i) This part was almost universally correct. Among the few who did not earn the mark, some candidates made no attempt at an answer and others gave the numerator as 1.

(ii) Very few candidates were able to make the connection between the answer to part **(c)(i)** and the answer to this part. Some candidates stated a sum that totalled $\frac{1}{3}$ but the components of the sum were not unit fractions. A common incorrect answer was $\frac{1}{6}+\frac{1}{6}$. Candidates offering this answer had omitted to take note of the key word 'different'.

Answers: **(b)** $\frac{1}{15}$ **(c)(i)** 4 **(c)(ii)** $\frac{1}{4}+\frac{1}{12}$

Question 14

Good candidates deduced that the total sum needed to be divided by $3 + 2 \times 4$ and were able to carry out the division correctly to earn all three marks available. Some candidates used algebraic notation and produced very neat solutions. A few candidates attempted to divide by something greater than 5 and so earned a method mark. The majority of candidates attempted to divide 2475 by 5 and were not credited.

Answer: £225

Question 15

(a) Candidates were more successful in this part. The question required accurate application of a simple method with which most seemed familiar. Repeated division and factor trees were equally popular. Candidates who made errors sometimes divided by 2 as a first step, introducing decimals. Other candidates gave their answer as a list of prime factors, rather than a product. Weaker candidates did not seem sure where to start and often listed prime numbers or products in the hope of making 231, without success, or made no attempt to answer.

(b) A reasonable number of candidates understood the need to find the LCM of 75 and 100 and were successful in finding 300. Many of these candidates had read the question carefully and converted the 300 seconds to minutes correctly. Some clear and neat responses were seen. Candidates who converted the 75 and 100 into minutes and seconds made the calculations more difficult. Although some candidates still managed to find the correct answer using this approach, many made errors and lost accuracy. Some candidates were able to find a common multiple of 75 and 100, although not the lowest.

Answers: **(a)** $3 \times 7 \times 11$ **(b)** 5 minutes

Question 16

Good candidates earned at least two marks for this question. Candidates who wrote $\frac{\cancel{16}^{\,4}}{3} \times \frac{7}{\cancel{4}_{\,1}} = \frac{28}{3}$ found the correct mixed number quite easily. Some candidates were able to find a correct improper fraction but either were unable to simplify it or forgot to convert it to a mixed number, or both. Other candidates wrote $\frac{16}{3} \times \frac{7}{4} = \frac{64}{12} \times \frac{21}{12}$ introducing unnecessarily complicated multiplication as a result. Often these candidates were able to find 64×21 but left their denominator as 12. Some candidates were not able to convert the mixed numbers to improper fractions. These tended to offer fractions with denominators of 1 and 3 or $\frac{1}{16} \times \frac{3}{7}$. Weaker candidates often multiplied the integer parts and the fractions and then, for example, multiply the answers they found to arrive at $\frac{5}{4}$. These did occasionally earn a mark for being able to convert their improper fraction into a mixed number.

Answer: $9\frac{1}{3}$

Question 17

The most efficient way to arrive at the correct answer was to divide 360 by 12. Many candidates were able to do this correctly. A few candidates misremembered the angle sum of the exterior angles as being 180. Some candidates made arithmetic errors after a correct method had been stated. Candidates who attempted to use the interior angle often became confused and made little progress.

Answer: 30

Question 18

This question was well answered with many candidates understanding the correct method was to find $\frac{11}{50}$ of 300 and evaluating this correctly. A few candidates found 6 correctly but then gave the answer $\frac{6}{11}$. Other candidates tried to divide 300 by 11 and gave the answer 27 following that.

Answer: 66

Question 19

Candidates rarely checked their solutions to this question by substituting the values they found back into the original equation. This may have prevented some candidates from losing marks.

(a) Candidates found this question to be challenging, with only the best making any real progress and earning two or three marks. Commonly, candidates made an order of operations error and found $7 - 2$ then attempted to work with $5(x - 3) = 6x + 1$. Some were successful with this. Other candidates treated the left hand side as if it were $(7 - 2)(x - 3)$ with the same outcome. A few candidates earned the second method mark for collecting terms but often the equation that remained was simpler than the original would have been and the final method mark could not be awarded.

(b) Again, this was only well attempted by the best candidates who showed a correct factorisation and stated correct values from it. Other candidates earned a mark for finding one correct value, sometimes by inspection or through trials. A few candidates used the quadratic formula and some thought that they were solving $x^2 - 4 = 0$ and used the difference of two squares. Another commonly seen incorrect attempt to factorise was $(x - 4)(x + 4)$.

Answers: **(a)** 1.5 **(b)** 0, 4

Question 20

(a)(i) A good number of candidates knew this rule and gave the correct answer. The common incorrect answers were 0 and 10.

(ii) Candidates found this more challenging. A few correct answers were seen. Some candidates understood that this power meant take the square root and wrote the answer $\sqrt{64}$ which was insufficient. Many candidates gave the answer 32. Some confused the fractional form with the reciprocal and gave $\frac{1}{64^2}$.

(iii) A good number of candidates simplified to 12^2 earning one mark and some of these evaluated this correctly as 144, earning both marks. Some candidates gave the answer 1^2 or 1^8, misunderstanding the notation. The candidates who tried to find the value of 12^5 and 12^3 and divide 248 832 by1728 were generally unsuccessful.

(b) Many candidates understood that Harry was incorrect and some of these were able to state a valid reason to justify their decision. Stating that x^{-2} was $\frac{1}{x^2}$ was the simplest way to do this. Some candidates thought Harry was wrong as '$x^{-1} = -x$ and $x^{-2} = -x^2$'. A few candidates thought that Harry was correct and said that 'x^{-1} and x^{-2} were the same but doubled'.

Answers: **(a)(i)** 1 **(ii)** 8 **(iii)** 144

Question 21

Candidates found this quite challenging with only a small number of candidates earning at least one mark. These usually kept the values in standard form and added 4.2 and 7.5 giving 11.7×10^{-5}. Some then went on to write the answer correctly in standard form and earn two marks. A commonly seen incorrect answer was 1.17×10^{-10}. Candidates who attempted to convert to decimals often made place value errors. Although the correct decimal was found on occasion, it was rarely converted correctly into standard form.

Answer: 1.17×10^{-4}

Question 22

Some reasonable attempts were made at this question with a reasonable number of candidates gaining full marks. Some candidates earned a mark for multiplying out one or other of the pairs of brackets, often the second pair. A few candidates made slips when writing down the powers of their terms and did not fully correct their error, so that a 'correct' answer was found. No recovery was allowed in these cases as the answer had been given. Some candidates earned both method marks but were unable to collect terms correctly and complete the solution.

Question 23

A few candidates were able to find the correct equation and state it in the correct form.

Some candidates were able to find the gradient as $\frac{1}{2}$ or find the y-intercept as -1. A common wrong value for the gradient was 2 and a common wrong value for the y-intercept was 2, this being the root. Some candidates found the right equation but then continued to try to do something spurious with it. Other candidates were clearly confusing the two parameters as $y = -1x + 2$ was seen several times. Several candidates omitted the x from the equation.

Answer: $y = \frac{1}{2}x - 1$

Question 24

Candidates found this question very challenging. Only the very best candidates interpreted the question correctly and used their compasses and accurately constructed the required perpendicular bisector and angle bisector earning four or five marks. A small number of candidates were able to draw one of the two loci correctly, usually the angle bisector. Most candidates made completely invalid attempts although, on occasion, compasses were used to create them.

MATHEMATICS (9 TO 1)

Paper 0626/04
Paper 4 (Extended)

Key messages

- Full coverage of the Extended syllabus is needed to access the entire paper.
- Clear, logical steps in working out need to be shown for partial credit to be awarded when final answers are incorrect through minor errors.
- For the requirements of the question to be fully understood, careful attention to the key words and phrases in the question is needed.
- It is advisable to re-read the question after a response has been written, before moving on to the next question, to ensure the requirements of the question have been fully met.

General comments

Many candidates were well prepared for this examination paper. A fuller coverage of the syllabus was required by some.

Good responses were exemplified by clear and logical steps in the working out. Those with minimal or missing steps were more likely to lose method marks in the event of minor errors and an incorrect final answer. Those with illogical or confusing steps, or untidy writing, were also more likely to lose marks, often as a result of losing their way through their solution, or misreading their own writing.

This is a non-calculator examination, and arithmetic skills were generally good, although slips were evident from a small number of candidates.

Candidates should be advised to consider the number of marks available in the question when deciding on a method to adopt, in order to ensure they have understood the requirements of the question.

Comments on specific questions

Question 1

(a) This question on converting a number in standard form to an ordinary number was answered correctly by the vast majority of candidates. Errors generally arose from a misunderstanding of standard form notation. The mark was lost in some cases when the answer was given with two decimal points in it – candidates would be advised to rewrite the answer cleanly in these cases. Other errors included rounding or truncating the answer to 1 or 2 significant figures.

(b) This calculation involving a number in standard form was answered fairly well, although candidates would be advised to ensure correct notation is used in intermediate working. A common error was to give the answer as an ordinary number, rather than in standard form. Arithmetic slips were seen, with loss of zeros resulting in an incorrect answer, or 2×3 worked out as 5. A number of candidates understood 2×10^6 to be 20^6, which with the incorrect working that followed and conversion back to standard form often resulted in a correct final answer, but as it was from incorrect working it did not gain any marks.

Answers: **(a)** 0.00625 **(b)** 6×10^4

Question 2

(a) This question on breaking down a number into its prime factors was answered well. Errors were usually arithmetic slips rather than from a lack of understanding of what to do. Some answers were not broken down far enough, with only a product of a pair of factors given.

(b) This lowest common multiple question in a problem-solving context was very well answered by the majority of candidates. Many chose to approach it with a list of multiples in seconds. Conversion to minutes was then correctly done by most. Other approaches included giving 12×25 as the LCM of 3×25 and 4×25, and some candidates used prime factors to find the LCM. The most common error seen was to convert both to minutes and add them together, and another error included arithmetic slips when listing the multiples.

Answers: **(a)** $3 \times 7 \times 11$ **(b)** 5

Question 3

This product of mixed number fractions question was answered competently by many candidates. Arithmetic slips in cancelling down a correct improper fraction were fairly common, and incorrect methods were seen in a significant number of scripts, which went down the route of multiplying the whole numbers and fractions separately.

Answer: $9\frac{1}{3}$

Question 4

This angles of a polygon question was a very straightforward two marks for those dividing 360 by 12. Of those using a combination of interior angle and exterior angle facts, fewer were successful at completing the more complex calculation to find the number of sides. Errors in remembering correctly the sum of the exterior angles, and also sum of exterior plus interior, with confusion between 180° and 360° were often seen.

Answer: 30

Question 5

This question on relative frequency was answered very well by most candidates. Some candidates arrived at their answer by mixing up 50 and 300 in the calculation – candidates would be advised to check that an answer is sensible for the context of the question, so an answer for relative frequency should lie between 0 and 1.

Answer: 66

Question 6

(a) Many candidates solved this equation correctly, with enough steps shown in their working to deal with this multi-step solution. Errors occurred when order of operation rules were not followed, for example carrying out $7 - 2$ and multiplying the bracket by 5, or when sign slips were made in expanding the bracket.

(b) Many candidates answered this correctly, although a significant number of candidates mistakenly took this two term quadratic equation to be a difference of two squares factorisation, rather than a common factor of x.

Answers: **(a)** 1.5 **(b)** 0, 4

Question 7

(a) (i) This index of zero question was answered correctly by most candidates, with common incorrect answers of 10 and 0 seen.

(ii) Most candidates realised that a power of $\frac{1}{2}$ required a square root, with a common incorrect answer of 32 seen.

(ii) Few candidates gained two marks, with many leaving the answer as 12^2, rather than evaluating it fully.

(b) Many candidates realised that the statement was incorrect and gave the correct expression for x^{-2}, although some incorrectly stated that it ought to have been $\frac{x}{2}$. A number of candidates thought that the statement was correct, or didn't attempt the question.

Answers: **(a)(i)** 1 **(ii)** 8 **(iii)** 144

Question 8

(a) Most candidates were able to successfully solve the n^{th} term expression equated to –88. Only a small number of candidates did not know how to proceed with this question. A common error was to substitute –88 as *n*. There were very few arithmetic slips.

(b) Few candidates gave the correct answer. A small number of candidates realised it was a cubic expression and made an attempt. Many candidates were working with differences, and did not arrive at an algebraic expression at all.

Answers: **(a)** 19 **(b)** $3n^3$

Question 9

This equation of a straight line question was answered well by most candidates, with just a small number of candidates incorrectly giving the gradient as 2.

Answer: $y = \frac{1}{2}x - 1$

Question 10

This construction of loci question was interpreted well by some candidates and the constructions were executed with good accuracy. Some candidates were able to arrive at just one correct construction, and so were not able to identify the correct region. Many candidates did not interpret the information into either of the correct constructions.

Question 11

Many candidates were successful in this estimation question. Some missed the instruction to round each number to 1 significant figure, or incorrectly rounded some of the numbers. Arithmetic slips accounted for some of the errors seen in this question.

Answer: 30

Question 12

(a) A few candidates successfully answered this recurring decimal question. Many seemed to know how to do the question, and gained the method mark, but missing out crucial steps lost the final mark. Many candidates either left this question blank, or incorrectly attempted it.

(b) Many candidates successfully answered this simplification of surds question. The two most common errors seen came from mis-manipulation of surds. The first of these common errors was to combine the sum under the same square root and then simplify $\sqrt{125}$. The second common error came from taking out 16 and 9 from under the square root without applying the square root.

Answers: **(b)** $7\sqrt{5}$

Question 13

(a) This question on expansion of brackets to a quadratic expression was answered fairly well. Arithmetic errors were common, with sign slips being the most common type.

(b) This question on simplification of two algebraic fractions was executed well by many candidates. Common errors from those that were able to find a common denominator included sign slips and leaving the numerator as $5 - 7$. A significant number of candidates were seemingly unaware of the method of finding a common denominator, and either did not attempt the question, or incorrectly subtracted terms across the two fractions, including the denominator.

Answers: **(a)** $-2x^2 + 11x - 5$ **(b)** $\dfrac{19-16x}{(3x-2)(x+1)}$

Question 14

(a) Few candidates were able to correctly give all three aspects of this rotation. After identifying a rotation about (0, 0), some went on to give a second transformation, rather than giving one single transformation. Other errors included co-ordinates incorrect, and in some cases reversed; direction reversed; and more commonly, an aspect was missing or not fully described.

(b) Many candidates successfully drew the image of the transformation of the triangle. Some candidates were able to do this without any working, and others used matrix multiplication to arrive at the co-ordinates. Common errors included a reflection in the *x*-axis instead of the *y*-axis, and translation by the vector $\begin{pmatrix}-1\\1\end{pmatrix}$.

Answers: **(a)** rotation, 90° anti-clockwise, centre (2, –1)

Question 15

This histogram question was successfully completed by a minority of candidates. Most candidates were able to construct a chart with the correct bar widths, but many candidates used the frequency as the vertical axis or used the reciprocal of the frequency density as the height of the bars.

Question 16

This proof of congruent triangles was attempted by most candidates, with some candidates providing a clear and full proof. Many candidates did not give evidence of an understanding of proof. The most common loss of marks was from giving a reason as parallel lines, rather than the angle relationship of alternate angles. Another error seen was giving angles $ACB = DFE$ as a direct alternate angle relationship rather than the two-step reasoning needed.

Question 17

(a) This equation of a circle question was correctly answered by a minority of candidates. Many candidates substituted the point into the equation of the circle with no mention of centre of circle or radius. This approach did not lead anywhere. Some candidates used trial of other values of x and y in the equation to give 25.

(b) Many candidates did not attempt this part, or only addressed limited elements of the reasoning required. Whilst the significance of the product of gradients being –1 was often understood, this on its own did not gain credit. Few candidates verified the point lay on the line. Many candidates rearranged the line, even if the gradient was not explicitly identified. Few candidates attempted the gradient of the radius.

Answers: **(a)** $p = -4$, $q = -3$, $r = 5$

Question 18

(a) (i) This inverse proportion question was fully answered by many candidates. Common errors included trying to work with the proportionality sign and not using a constant of proportionality; working with direct proportion instead of inverse; rearranging incorrectly to find k.

(ii) Those candidates arriving at a formula in the previous part were often able to arrive at the correct answer. Some candidates without a formula in the previous part arrived at a correct answer in this part by finding the formula here before progressing to answer this part.

(b) Many candidates were able to give the answer without any working. Common wrong answers were $\sqrt[3]{2}$ and 4 (from mistakenly taking the relationship as square root instead of cube root).

Answers: **(a)(i)** $y = \frac{40}{x}$ **(ii)** 64 **(b)** 8

Question 19

This probability question was generally answered well by those candidates with a correct Venn diagram, with the correct region identified. The most common error was to use a denominator of 15 rather than 10, even when the Venn diagram was correct. Many candidates did not have a correct Venn diagram. Few candidates chose not to use the Venn diagram route.

Answer: $\frac{7}{10}$

Question 20

This vector question was correctly answered by a small proportion of candidates. The most common errors included reversed vectors and omission of **a** or **b** in expressions. Candidates would be advised to express the required vector in terms of a vector sum initially, before finding the component vectors and substituting them into the vector sum.

Answer: $\frac{16}{5}\mathbf{b} - \frac{4}{5}\mathbf{a}$

Question 21

(a) Many candidates were able to provide a good sketch of the cosine curve, with correct intercepts and amplitude. The most common error was to sketch the sine curve, and other errors included sketches that would indicate this had not been either covered or revised.

(b) Those candidates with a correct sketch in the previous part usually gained both marks in this part. Some candidates without a correct sketch demonstrated evidence of covering the trigonometric ratios of the special angles, but did not arrive at the two angles required.

Answers: **(b)** 60 and 300

MATHEMATICS

Paper 0626/05
Paper 5 (Core)

Key messages

To succeed in this paper, candidates need to have covered the entire content of the Core syllabus. They should be able to apply their mathematics to everyday situations and combine mathematical skills in solving problems. Candidates need to set out their work in clear, logical steps.

General comments

The question paper included a range of question types: some problems set in familiar contexts and other questions requiring understanding of mathematical notation and more abstract thinking. In general, candidates were able to access the questions requiring use of number content. Many candidates had difficulty with algebra questions that required them to form algebraic expressions.

Where questions require several steps of working, it is beneficial for the candidate to set these out in an orderly manner and to annotate calculations to indicate what they are doing. Where diagrams were required, candidates generally used the correct equipment and presented their responses clearly.

It was evident that some candidates were unfamiliar with set notation and the necessary angle relationships.

Comments on specific questions

Question 1

(a) Most candidates answered this part correctly, although some used £19 rather than £24 as the price for the 12-year-old.

(b) Many correct calculations were seen in this part, although some candidates did not state their final decision about whether Archie could go on the ride or not. Some candidates converted 4 feet into inches and 4 inches into centimetres and added these values rather than converting 4 feet 4 inches to 54 inches and converting that to centimetres.

(c) Most candidates attempted the correct calculation in this part, but it was common to reach an answer of 144 because they did not allow for two passengers in each row.

Answers: **(a)** £125 **(c)** 288

Question 2

(a) Some accurate and correctly labelled pie charts were produced. It was common to see pie charts produced with no evidence of calculations leading to the angles that were used, which meant that if the angles were incorrect no method marks could be awarded. Some candidates calculated percentages for the sectors which they then converted to angles. Most pie charts had just four sectors although some used the values given in the table as the angles and hence left a fifth unlabelled sector.

(b) In this part, most candidates who identified that they needed to find 54 as a percentage of 240 were able to reach the correct answer. Candidates used the value from the table rather than trying to use the angle measured from their pie chart.

Answers: **(b)** 22.5%

Question 3

(a) Candidates who realised that they needed to find three numbers whose product was 273 often reached a correct answer, usually 13, 7, 3 or 1, 3, 91. Some candidates realised that the answer would relate to a factor of 273 and 91 was often seen but then they did not know how to find the other two values and decimal values or values summing to 273 were sometimes given.

(b) Correct ruled nets were commonly seen. The most common errors were to draw three more 5 by 3 rectangles rather than one 5 by 3 and two 5 by 1 rectangles or to include the two 5 by 1 rectangles but omit the second 5 by 3 rectangle.

(c) Very few candidates realised that this part related to surface area and required them to set up and solve the required equation to find the height. Most took 85 as the volume and divided this by the base area to reach an incorrect height of 4.25 cm.

Answers: **(a)** Correct triple **(c)** 2.5

Question 4

(a) (i) Many candidates were able to use the word formula to show the predicted height was 107 cm. Calculations were usually in stages, $46 + 35 = 81$ and $6.5 \times 4 = 26$ and these two results then added together.

(ii) Many candidates were also able to apply the formula in reverse to calculate the birth height in this part.

(b) (i) The values were often substituted correctly into the given formula and the answer correctly evaluated. Some candidates did not divide by 2 and others did not use the correct order of operations and reached an answer of 338.5.

(ii) Again, correct answers were common in this part, usually resulting from substitution into the second formula and subtracting the two results rather than from looking at the two formulas and identifying that the difference would always be 13.

Answers: **(a)(ii)** 47 **(b)(i)** 166 **(ii)** 13

Question 5

(a) Many candidates were able to find the correct probability in both parts. Probabilities were usually given as fractions, although some gave a decimal answer which was also acceptable. Ratios are not an acceptable form for a probability and when candidates are asked to find a probability a descriptive word such as unlikely is also not acceptable.

(b) Most candidates were able to identify the outlier on the graph, although some selected an incorrect point such as (68, 57).

(c) The correct answer of positive was usually given in this part. Some candidates tried to give a descriptive answer: if this type of answer were required a longer answer line would be given and the question would ask for a link between the age and the time rather than simply asking for the type of correlation.

(d) It was common to see a ruled line of best fit, but this did not always extend across the whole range of the data or sometimes simply joined the first cross on the grid to the last cross or was a line through the origin, which were not acceptable. Most candidates were able to read a correct value for the time from their line.

Answers: **(a)(i)** $\frac{1}{20}$ **(ii)** $\frac{3}{20}$ **(b)** (28, 47) circled **(c)** positive

Question 6

(a) (i) Most candidates gave the correct pair of consecutive numbers.

(ii) Some good explanations were seen in this part identifying that there would be one odd number and one even number and that the sum of these would be odd. Simply identifying that one number was even and one was odd was insufficient as an explanation. A small number of candidates were confused and referred to positive and negative numbers rather than odd and even.

(b) (i) In this part, many candidates identified the three consecutive numbers required.

(ii) Some candidates realised that they were required to add together the three expressions given in the question and simplify the result. Some numerical answers were seen and some incorrectly simplified to n^3 rather than $3n$. A significant proportion of candidates omitted this part.

(iii) As many candidates had been unable to produce a correctly simplified expression in the previous part, few were able to give a correct explanation here. The more able candidates were able to identify that each term in $3n + 3$ was a multiple of 3.

(c) Algebraic answers were rare in this part, despite the lead provided in part **(b)**. Many candidates found four consecutive numbers and showed that the sum of these numbers was not a multiple of four. This was given partial credit but was insufficient to show that this would be true for all sets of four consecutive numbers.

Answers: **(a)(i)** 46, 47 **(b)(i)** 52, 53, 54 **(ii)** $3n + 3$

Question 7

(a) (i) Many candidates were able to complete the table correctly.

(ii) Candidates were often able to continue the patterns to the required 12th terms. Some recognised the white squares were square numbers but were not always able to find the number of grey squares correctly.

(iii) Correct answers in this part were rare. Some candidates identified that the expression for white squares would involve N^2 and some included $4N$ in their expression for grey squares. Expressions such as $N + 4$ were common as well as numerical values. Some candidates omitted this part completely.

(b) (i) Many candidates were confused by this part and attempted to use the diagram to work out the number of slabs for the 6 by 5 pond, rather than simply using it to understand the layout for the slabs. Correct answers were rare because few candidates found the correct number of slabs along each side of the pond.

(ii) As candidates had generally not understood how to work out the number of slabs around the pond in a numerical context in the previous part, they did not know how to use this idea to create an algebraic expression here and very few solutions seen contained any correct terms.

Answers: **(a)(i)** 25 36
24 28 **(ii)** white squares 100, grey squares 44

(iii) white squares $(N-2)^2$, grey squares $4N-4$ **(b)(i)** 48 **(ii)** $4x+4y+4$

Question 8

(a) Correct answers in both parts were common. Some candidates changed to 12-hour clock notation, but where this was used in part **(i)** they were required to include pm in their answer. In part **(ii)** a small proportion of candidates found the time difference using their calculators and gave an incorrect answer of 90 minutes.

(b) (i) Most candidates used the exchange rate correctly to calculate the value in euros.

(ii) Many candidates gained some credit in this question, usually for converting from pounds to euros or vice versa. Some went on and correctly calculated the percentage profit. Common errors were to calculate a percentage profit using the values in different currencies, to find the actual difference rather than the percentage difference or to divide by the incorrect amount in the percentage calculation.

Answers: **(a)(i)** 16 05 **(ii)** 50 **(b)(i)** 550 **(ii)** 30.5

Question 9

(a) (i) Candidates were often able to list some square numbers here, although 1 was often omitted and some did not understand the meaning of the universal set so included values greater than 9.

(ii) Many candidates did not understand the notation and omitted this part or wrote a list of numbers rather than stating the number of elements in *A*.

(iii) It was rare to see a correctly completed Venn diagram. Errors included omitting the numbers that were not in *A* or *B*, not identifying the correct numbers in the intersection and making errors in the square numbers.

(iv) Some candidates understood the notation for intersection and identified the values that followed through correctly from their Venn diagram.

(b) Few candidates recognised the link between the previous part and this part and started by identifying factors of 12. Correct answers were rare, because, in general, they did not understand that a conditional probability was required, and they used a denominator of 12 rather than 6.

Answers: **(a)(i)** 1, 4, 9 **(ii)** 6 **(iv)** 1, 4 **(b)** $\frac{2}{6}$

Question 10

(a) Some candidates started by calculating 360 ÷ 5 to find one of the five angles at the centre. They were then able to find that the angle in the triangle was 144°. Candidates who were able to identify that the triangle was isosceles could calculate the required angle *OEC*. Many candidates were unable to make any progress with the question as they could not use the given information to calculate the angle at the centre of the circle. It was common to see candidates guessing that angle *DOE*, for example, was either 60° or 45°.

(b) Candidates who knew that the angle in a semi-circle is a right angle were able to make some progress in this part, often finding either angle *PRS* or *OQR* or both correctly. Some confusion was seen with this rule, however, where *SPQ* was assumed, incorrectly, to be a right angle. Those candidates who identified that triangle *ORQ* was isosceles were also able to gain some credit for using the equal angles to find a value for angle *ORQ*.

Answers: **(a)** 18 **(b)** 93

Question 11

Some fully correct, clearly set out answers to this question were seen. Many candidates split their work clearly into separate sections dealing with Tommy’s account and Louise’s account and usually some credit was gained.

It was common to see Tommy’s interest calculated correctly, but there was confusion about how to deal with the tax on this amount. The tax was often calculated on the total amount in the account rather than on just the interest. Some correct work for compound interest was seen. Candidates who used the multiplier method using 1.027 and 1.022 for the compound interest calculations were usually more successful than those who calculated 2.7% of 5000, then added it on and repeated for the other two years.

Answer: Louise by £29.67

Question 12

(a) Candidates who were able to quote the formula for the circumference of a circle usually evaluated it correctly and were then able to use the given information to calculate the cost of edging reaching a cost of £194. It was common, however, to see the area formula used in place of circumference in which case they were able to gain partial credit if they showed an attempt to calculate the cost for edging using their 'length' of edging.

(b) (i) Candidates who read the question carefully realised that the area of a section was one third of the total area so reached the correct answer of $\frac{16}{3}$.

(ii) In order to answer this part, candidates needed to set up an equation relating the area of the triangle or trapezium, in terms of *x*, to the area of one section found in the previous part. Few candidates identified that this was the first step, so only the most able candidates were able to gain any credit here.

Answers: **(b)(i)** $\frac{16}{3}$ **(ii)** $\frac{4}{3}$

Question 13

(a) (i) Candidates who understood the term standard form gave the correct answer in this part.

(ii) More errors were seen in this part with the answer of 65.1×10^6 commonly seen.

(iii) Many candidates divided the population by the area to find the population density, however, place value errors often led to answers such as 2.69 or 2690.

(b) In this part, some candidates did not realise that they needed to use the population of the UK given at the start of the question and so tried to work with just the value given in this part. Some correct calculations were seen, but candidates found it difficult to calculate using numbers in standard form and confusion also occurred due to the answer being less than 1%.

Answers: **(a)(i)** 2.42×10^5 **(ii)** 6.51×10^7 **(iii)** 269 **(b)** 0.900

MATHEMATICS (9 TO 1)

Paper 0626/06
Paper 6 (Extended)

Key messages

To succeed in this paper, candidates need to have covered all of the Extended syllabus content. They should be able to apply their mathematics to everyday situations and combine mathematical skills in solving problems.

General comments

All questions were accessible and nearly all of the candidates attempted most of the questions. There was no evidence that candidates were not able to complete the paper because of a lack of time.

Candidates generally showed a detailed method, although it was not always easy to follow. Working needs to be shown in a step-by-step approach rather than random calculations scattered all over the page. This makes it easier for candidates to check their working and enables examiners to award partial credit if the final answer is incorrect.

Comments on specific questions:

Question 1

(a) Nearly all candidates had a clear idea as how to approach this question and obtained the correct response.

(b) Most candidates understood compound interest and used a sensible approach by computing 5640×1.025^{10}. A few did not realise that they would also need to show how much money was in her account after nine years to fully answer the question.

(c) Many candidates knew the technique for reversing a percentage decrease and went on to compute the correct response.

(d) There were few correct responses. Most candidates realised that they needed to divide $372 by something, but often used just 1.46 or 1.465, for which they were awarded a method mark.

Answers: **(a)** 22 **(c)** 459 **(d)** 255.67

Question 2

(a) This was a question where there were many possible routes to reaching a correct conclusion. Many candidates went on to successfully do this or at least make a good attempt. Responses were often difficult to follow; showing working is, of course, always a good thing but linking this working by showing, in words, what the candidate is attempting to find will first clarify to the candidate what they are doing and also enable the examiner to be able to give credit for what they have done.

(b) (i) Most candidates scored some marks on this question, but few gave a correct response. Candidates had difficulty converting from m^2 to cm^2 and many did not give the answer in standard form.

(ii) The majority of candidates gave a satisfactory explanation; some did not mention how the pressure would be affected as asked for in the question.

(c) Many candidates had a clear idea of how to find the mean from a group frequency table and went on to compute the correct response. A few did not use the midpoint from the class interval using an end point instead. A small number did not know how to approach this question.

Answers: **(b)(i)** 9.85×10^3 **(c)** 12.9

Question 3

(a) (i) Nearly all candidates completed the speed-time graph correctly.

(ii) Most candidates found the correct acceleration.

(b) (i) The technique for completing the table and drawing a quadratic speed-time graph was well understood. A few candidates joined their plots with straight lines rather than drawing a smooth curve.

(ii) Very few candidates realised that they need to draw a tangent to the graph to the curve so that they could find the gradient and then go on to estimate the acceleration at this time. Consequently, few scored any marks on this question.

Answers: **(a)(ii)** 1.5 **(b) (ii)** –4

Question 4

(a) Candidates found this part difficult. A common incorrect answer was 55 with candidates not thinking clearly what the table was telling them.

(b) Many candidates drew a satisfactory cumulative frequency diagram, with just the occasional error. A small number did not understand what was required and drew some form of histogram.

(c) (i) Most candidates who drew a cumulative frequency diagram went on to find a correct estimate of the median.

(ii) Finding an estimate for the inter-quartile range was less well understood, but there were a significant number of correct responses.

(iii) There were many correct responses to this question, following on from the candidates' graphs.

Answers: **(a)** 40 **(c)(i)** 15 **(ii)** 7 **(iii)** 16

Question 5

(a) (i) Many candidates understood the principles of functions and went on to compute the correct response.

(ii) Again, many candidates understood how to approach this question. A common incorrect answer was $2x^3 + -2x + 1$, for which they were awarded a method mark.

(b) This was a difficult question. Candidates had been well prepared for this technique and many scored some marks with a few going on to find the correct response.

Answers: **(a)(i)** 0.625 **(ii)** $8x^3 - 2x + 1$ **(b)** 3×9^x

Question 6

(a) Few candidates used the elegant, concise method of finding the square root of the ratio of the area of the two circles. Most attempted to used trigonometry and Pythagoras' theorem, but most were unsure of how to progress and few found the correct response using such a method.

(b) Most candidates attempted to use the formula to find the curved surface area and had some success, but few used a completely correct method to find the required response.

Answer: **(a)** 32

Question 7

(a) A minority of candidates gave the correct response. A common error was to give a response of $2x + y \leqslant 100$.

(b) Many candidates did not draw a line for the boundary of the region that they had given in part **(a)**. Some had difficulty with the statement given in the first line of this part and shaded the wrong side of $y = \frac{1}{2}x$.

(c) There was little evidence that candidates used their graph from part **(b)** to find the greatest profit. Some candidates solved two simultaneous equations which led to an occasional correct response.

Answers: **(a)** $2x + y \geqslant 100$ **(c)** Teen-Art 120, Super-Draw 60

Question 8

(a) Most candidates appreciated that they needed to use the sine or cosine rule for this question. There were some correct responses. Others tried to find *AB* using the cosine rule, but got into difficulties with their method as it led to a quadratic. Most used the appropriate formula to find the area of the triangle, but a few tried to find the perpendicular from *C* to the base *AB*, which usually led to an incorrect response.

(b) Many candidates realised that they should use the cosine rule to attempt this question, but there were a fair number of cases where the candidates did not use the formula correctly. A large minority gave the correct response.

Answers: **(a)** 222 **(b)** 16.5

Question 9

(a) Most candidates attempted this question, although there were many who gave an incorrect response. There were several candidates who were clearly unsure of the concepts involved in differentiation.

(b) (i) Some candidates knew how to approach this differentiation. It was common to see candidates getting the first, more straightforward, part of the expression correct but not the second part.

(ii) There were candidates who knew that they needed to put $\frac{dy}{dx} = 0$ to find the turning point and a few went on to solve the quite difficult equation that resulted from this.

(iii) Some candidates had an idea of how to approach determining whether it was a maximum or a minimum, with a few giving clear accurate responses. There were several methods that showed some idea of the technique but these could be vague and unclear.

(iv) Whilst many candidates appreciated that the product of the gradients had to be –1, most of these candidates gave an answer of –2, rather than finding the gradient of the curve by substituting $x = \frac{1}{2}$ into $\frac{dy}{dx}$.

Answers: **(b)(i)** $8x^3 + \frac{1}{8}$ **(ii)** $-\frac{1}{4}$ **(iv)** $-\frac{8}{9}$

Question 10

(a) Many candidates appeared not to know the technique for finding the determinant of a matrix. Those who knew what they were doing usually obtained the correct response. A significant number of candidates did not attempt this question.

(b) The technique for finding the inverse of a matrix was only understood by a minority of candidates. Those who knew what they were doing usually obtained the correct matrix.

(c) Most candidates attempted this question with varying degrees of success. The majority found the correct response and there were also candidates who obtained a mark for a response with just one error.

(d) Nearly all candidates attempted this question, with the majority showing knowledge of the techniques required to multiply matrices, with most of these candidates finding the correct response.

Answers: **(a)** 40 **(b)** $\begin{pmatrix} \frac{1}{8} & -\frac{3}{16} \\ \frac{1}{16} & \frac{5}{32} \end{pmatrix}$ **(c)** $\begin{pmatrix} -17 & 13 \\ -6 & 18 \end{pmatrix}$ **(d)** $\begin{pmatrix} 16 & 0 \\ 40 & 80 \end{pmatrix}$

Question 11

(a) Most candidates had some idea as to how to approach this question, with the majority obtaining the correct response.

(b) As in part **(a)**, the majority of candidates obtained the correct response.

(c) This was a difficult question involving some tricky algebra. Some candidates could not get going at all, but there many good attempts with a few going on to find the correct solution.

Answers: **(a)** $\frac{30}{x}$ **(b)** $\frac{30}{x-10}$ **(c)** 65.4