MATHEMATICS

Paper 0626/01
Paper 1 (Core)

Key message

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

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 due to lack of familiarity with the topic or difficulty with the question rather than lack of time. Stronger candidates were able to attempt all the questions and solutions usually displayed clear methods. However, some candidates provided solutions with little or no working and, as a consequence, did not earn method marks when the solution was incorrect. Centres should encourage candidates to show all working clearly in the space provided in the question paper booklet.

The stronger topics for candidates on this paper included finding fractions of amounts, range, interpreting a calculator display, use of a calculator, simple scale drawing, currency conversion and simple interest.

Weaker topic areas included ordering fractions, decimals and percentages, forming expressions from a problem in words, problem solving with algebra in a geometry context, simplifying expressions with indices, problems with bounds, trigonometry.

Comments on specific questions

Question 1

A straightforward question on finding a fraction of an amount that candidates answered well.

Answer: 462

Question 2

Well answered. Most candidates found the range correctly.

Answer: 16

Question 3

Most were able to interpret the calculator display correctly as £16.99. A few gave £17.00 as the answer.

Answer: 16.99

Question 4

Many successfully identified the primes as 17 and 19. There were a number, however, who gave additional incorrect values such as 15.

Answers: 17, 19

Question 5

This proved difficult for almost all candidates. It was rare to see any working to give part marks here. Those that had an incorrectly ordered list gained a mark if they had three values in the correct order. A common error was to give 8.1% as the largest value and 0.18 as the smallest value.

Answers: 8.1%, 0.3^2, $\frac{1}{8}$, 0.18

Question 6

This was well answered generally. Most were able to complete the calculation accurately and round their answer to three decimal places as required. A few rounded incorrectly and gave answers such as 0.23 or 0.230. Some found the square root of the whole fraction and not just the numerator.

Answer: 0.229

Question 7

The more able candidates answered this well. In **part (a)**, it was common to see two answers such as 16 and 64 or 16 and 27.

Part (b) was answered better than **part (a)**. A few, again, gave two answers such as 5 and 175.

Answers: **(a)** 64 **(b)** 175

Question 8

This was well answered. Most were able to interpret the scale and complete the scale drawing. A few were unable to draw the angle accurately.

Question 9

(a) This was very well answered and most gave an appropriate reason using the correct terminology of angles on a straight line add up to 180°. A few tried to give a numeric justification such as 180 – 38 which is insufficient as a reason.

(b) Very few gave a correct reason here. Most referred incorrectly to opposite angles. A few gave Z angles as a reason which is insufficient.

Answers: **(a)** 142, angles on a straight line add up to 180° **(b)** Alternate angles are equal.

Question 10

Many were successful with this ‘Show that’ question. The best solutions showed 573 – 384 and 5300 – 3200 before calculating the percentage. A few found 9% of 2100 and showed that it was equal to the difference 189 which was also acceptable. Weaker candidates often made incomplete attempts but understood either the number of girls or the number of left-handed female students needed to be found.

Question 11

This was answered quite well. The common error was to multiply by the exchange rate rather than dividing.

Answers: 567.37 or 567.38

Question 12

Both parts of this question were poorly answered

(a) Some obtained a correct unsimplified expression, but very few went on to simplify correctly as required. Most tried to deal with the 37 and the *h* but were unable to set up an expression involving the overtime.

(b) It was very rare to see any candidate set up an expression that involved the basic rate expressions and overtime rate expressions added together. A few arrived at the given expression by incorrect algebra.

Answer: **(a)** 49*h*

Question 13

Most candidates who showed working were able to score some marks on this question for a partially correct method. The main error was in obtaining the correct cost for 0.75 litres of water. Those that obtained the correct cost usually scored all three marks. Others gained credit for subtracting their cost of water from £1.76 and then dividing the answer by 2.

Answer: 0.46

Question 14

This was poorly answered.

Most candidates were unable to set up a correct equation involving the perimeter of the rectangle. Candidates were given credit for attempting to solve their incorrect linear equation and so a number obtained method marks here. The main error was in using two lengths to form the equation rather than considering all four lengths.

Answer: 15.75

Question 15

(a) Many candidates were successful here and scored all 3 marks. Some calculated the simple interest only and not the total amount after three years. Weaker candidates struggled to recall the method to find a percentage of an amount.

(b) This was less well answered than **part (a)** and the common error was to do a simple interest calculation rather than compound interest. Some worked in two stages for each year and made arithmetic errors in the addition.

Answers: **(a)** 1066.40 **(b)** 1910.12

Question 16

(a) This question produced mixed responses. Many drew a correct ruled line, others attempted a freehand line. A common error among some candidates was to draw a dot to dot set of line segments instead of a line of best fit

(b) This was well answered, most were able to give a reasonable estimate of the height.

(c) (i) The best answers referred to Harry reading a value from the graph and then scaling it up to 24 years old or to extending the line of best fit. A number were vague in their reasons and gave answers such as ‘He carried on the pattern.’

(ii) This was quite well answered. Most referred to the fact that growth stops at a certain age or that the scattergraph did not provide data at that age.

Question 17

(a) Most were able to complete the table with the required probability. Some did not realise that the probabilities must sum to 1.

(b) Only a few were successful here and errors appeared to be random and to result from guesswork.

Answers: **(a)** 0.15 **(b)** 48

Question 18

(a) Most gave the correct answer. This was sometimes omitted by weaker candidates.

(b) Fewer were successful here. A common error was to add the indices and give y^2 as the answer.

(c) This was very poorly answered and omitted by many candidates.

Answers: **(a)** m^3 **(b)** y^{-8} **(c)** $\frac{x^5y^4}{7}$

Question 19

(a) Only the strongest candidates answered this well. Others gave answers such as 13.1 to 13.3.

(b) A number calculated the circumference correctly but were unable to give a correct conclusion. Many could not recall the formula for circumference and calculated the area instead.

Answers: **(a)** 13.15, 13.25

Question 20

Most candidates showed little working here so either scored both marks for the two correct values or no marks at all. Method marks were available for attempting two trials with square numbers in working, but very few showed this.

Answers: 1936 and 81

Question 21

A number of candidates were well prepared for this question on expanding a pair of brackets and were able to give the correct answer. It was common however to see an error in the product of one of the terms for which one mark was available.

Answer: $x^2 - 2x - 35$

Question 22

(a) Only the best candidates were able to answer this question involving trigonometry. Some chose the cosine ratio to solve the problem but were unable to complete the method correctly as it required a division by the cosine of 27° and not a product.

(b) A very small number were successful here and this part was omitted by many candidates. A few gained credit for recognition that the shortest distance was the perpendicular from *M* to *LN*.

Answers: **(a)** 95.4 **(b)** 36.8

MATHEMATICS

Paper 0626/02
Paper 02 (Extended)

Key message

Candidates need to have an understanding of mathematical terminology, as there were a number of mathematical words that candidates did not understand. These included irrational, stratified, inversely and asymptote.

Full coverage of the syllabus is required if candidates are to be successful. In particular, there was a general lack of understanding of function notation. These questions are often not difficult once the notation is understood.

General comments

Candidates were generally well prepared for the paper and demonstrated good understanding and knowledge across the range of topics tested. Candidates generally attempted all of the questions and were able to complete the paper within the time. Solutions were well set out and the correct processes chosen and used efficiently.

Whilst some students found the latter questions on the paper particularly challenging, there were a significant number of candidates able to demonstrate a high level of mathematical thinking and excellent problem-solving and algebraic skills in their solutions to these questions.

Comments on specific questions

Question 1

(a) Most candidates completed the table correctly.

(b) Most candidates found the expected number correctly.

Answers: **(a)** 0.15 **(b)** 48

Question 2

(a) Many candidates understood the powers of indices had to be added.

(b) Many candidates multiplied the indices together correctly.

(c) The algebraic fraction was generally simplified correctly. However, a common incomplete answer was $\frac{x^6y^4}{7x}$. Some candidates gave their answer as $0.143x^5y^4$ which was only awarded 1 mark.

Answers: **(a)** m^3 **(b)** y^{-8} **(c)** $\frac{x^5y^4}{7}$

Question 3

A variety of answers were seen including 2π and, for example, $\sqrt{38}$. Some candidates did not understand the word irrational and gave decimal answers such as, for example 6.3.

Answer: Any irrational number between 6 and 7.

Question 4

Candidates who evaluated this in one step generally arrived at the correct answer. Some candidates evaluated the denominator and numerator separately, and because they then did not retain enough decimal places for these, they sometimes gave an inaccurate final answer. However, these candidates could score 1 mark for correct rounding of their answer to 3 decimal places.

Answer: 8.553

Question 5

(a) Candidates showed a good understanding of upper and lower bounds.

(b) Candidates were able to find the circumference of the wheel, but were not always able to explain whether or not the rope would be long enough, and in addition, they were required to compare it to the lower bound.

Answers: **(a)** 13.15 and 13.25 **(b)** 13.19 > 13.15

Question 6

(a) Most candidates handled the 3 different conversions required within this question very well. There was no specific order that the calculations needed to be completed in and candidates were frequently able to score at least one of the three method marks available. Some candidates were able to complete the question efficiently using only one calculation, whereas other candidates were equally successful using a step by step approach.

(b) A variety of answers were seen to this, with most candidates being aware that cars usually travel faster than 16.8 km/h. Other less common but equally valid comments also scored the mark.

Answers: **(a)** 16.8 **(b)** A valid comment

Question 7

It was pleasing to see so many candidates complete this question with ease and a wide variety of systematic approaches were demonstrated. Candidates who left their answers as 44^2 and 9^2 were also awarded the mark.

Answers: 1936 and 81

Question 8

(a) Most candidates used trigonometry correctly.

(b) Candidates understood that the shortest distance required them to drop a perpendicular line from *M* to *LN*. This was often shown clearly on the diagram. The correct distance was then frequently obtained.

Answers: **(a)** 95.4 **(b)** 38.6

Question 9

Whilst many candidates recognised this as a reverse percentage question, the most common error was to simply increase the 34kg by 15%.

Answer: 40

Question 10

Candidates often struggled to realise that the ratio of the volumes would give them the cube of the scale factor. Frequently, *h* was incorrectly found by multiplying 19.8 by $\frac{1500}{2592}$.

Answer : 16.5

Question 11

Candidates demonstrated a good understanding of stratified sampling and most calculated the answer as 8.75. To score full marks, this needed to be rounded to a whole number. Common errors included only considering year 11 students or only considering girls, rather than all of the students.

Answer : 9

Question 12

(a) Candidates understood the process, but common errors included omitting to cube *t* or not using inverse proportionality. From a correct formula, the correct answer was usually obtained.

(b) As in **part (a)**, a correct formula usually led to the correct answer.

Answer: **(a)** 3.2 **(b)** 10

Question 13

(a) The majority of candidates drew clear sketches of the graph.

(b) Only a minority of candidates were able to write down the equations of the asymptotes, and it was clear that most did not understand the term 'asymptote'.

Answer: **(b)** $x = 0$ $y = 0$

Question 14

(a) Candidates that understood the notation $\mathrm{ff}(x)$ usually obtained the correct answer.
Some found $\mathrm{ff}(x)$ algebraically first and then substituted in $x = 5$, whereas others found $\mathrm{f}(5) = 13$ and then $\mathrm{f}(13)$.

(b) Not all candidates understood the notation $\mathrm{f}^{-1}(x)$. The question was attempted with various degrees of success. Some made errors with the rearrangement and others forgot to transpose the letters. Some of the most able candidates were able to give the correct answer with no working.

(c) Candidates who understood the notation were often able to write the correct answer straight down. Other candidates produced a lot of working which did not help them progress.

Answer: **(a)** 37 **(b)** $\frac{x+2}{3}$ **(c)** x

Question 15

This question was straightforward for those who understood the concept. A common wrong answer was $y = -3x$.

Answer: $y = 3x$

Question 16

Candidates demonstrated clear mathematical problem-solving skills in their solutions to this problem. Some used Pythagoras' theorem whilst others used $\frac{1}{2}ab\sin C$. After finding the length of one side, most remembered to multiply by 3 for the perimeter.

Answer: 22.8

Question 17

Whilst some candidates had little understanding of vectors, a high level of mathematical thinking and good knowledge of vectors was frequently seen in solutions to this problem. Candidates used notation clearly and their chosen route from *M* to *N* was often clearly expressed. Candidates were expected to collect like terms together for the final mark.

Answer: $-\frac{1}{2}\mathbf{a} + \frac{1}{6}\mathbf{b} + \frac{1}{3}\mathbf{c}$

Question 18

This last question required excellent algebraic skills and awareness that the quadratic formula or completing the square was necessary. Whilst the weaker students often found the first step difficult, others could not work out how they could get the different powers of *x* to combine to be the single subject of a formula. There were however a number of students who produced faultless rearrangements of the formula.

Answer: $x = k \pm \sqrt{k^2 - kt}$

MATHEMATICS

Paper 0626/03
Paper 3 (Core)

Key messages

In order to do well in this examination, candidates need to give clear and logical answers to questions, with sufficient method being shown so that marks can be awarded. Omission of working is not recommended for any question that requires more than one step in its solution. Candidates who present their work in an 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 or pair of equations to see if the result expected is produced. Candidates also need to make sure that they read each question carefully and pay careful attention to key words and phrases.

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 strong arithmetic skills. This was highlighted in **Questions 3**, **4**, **5(b)(i)**, **11** and **14** in this examination. The most challenging arithmetic question seemed to be **Question 11** where candidates were working with directed numbers and needed to consider the order of operations. The questions that candidates found the least difficult were **Questions 4**, **7**, **8**, **9** and **16**.

There were several questions which involved candidates making some type of comment to either describe an assumption or an error in a solution or to justify a solution. For example, in **Question 5(b)(ii)**, candidates were expected to consider their solutions and indicate any assumption they needed to make. Many candidates found this quite challenging and did not seem to realise that information they were given in a question was not something they needed to assume.

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

Comments on specific questions

Question 1

Approximately half the candidates answered this question correctly. There were more no responses than expected for a question of this type, where a list of values to choose from is given. Some candidates were clearly guessing. It is unclear as to whether the word integer was unknown or whether the integer was not identified because it was negative. The square root of 5 was most common wrong answer.

Answer: –3

Question 2

A fair number of candidates earned both marks for this question, stating a correct fraction and cancelling down. A small number of candidates gave the fraction $\frac{8}{100}$ and then forgot to cancel down. A fair number of candidates gave the fraction $\frac{80}{100}$ and many did write this in its lowest terms. Other candidates gave an answer of $\frac{4}{5}$ without showing any other working. It is likely these candidates thought that the fraction was

$\frac{80}{100}$ but no credit could be given as the initial unsimplified form had not been shown. The answer $\frac{1}{8}$ was very common. Candidates who gave this answer omitted to recall the definition of a percentage as a value out of 100. Some candidates tried to cancel fractions that were already in their lowest terms.

Answer: $\frac{2}{25}$

Question 3

Most candidates applied a correct method and indicated clearly what that method was. A good number of candidates presented their work neatly and calculated the total accurately. Candidates whose presentation was more haphazard and less complete often made arithmetic errors. It was common to see £6.39, for example. Estimating the answer using 3 + 3 + 1.50 may have helped these candidates. Other candidates giving the answer 6.39 showed no working and therefore were not awarded the method mark.

Answer: £7.39

Question 4

This question was well answered with a good proportion of candidates applying the correct method to find the mean. A small number of candidates found the median or made arithmetic slips when summing the numbers given.

Answer: 11

Question 5

(a) Candidates were asked for a number of hours. This question was fairly well answered. Some candidates did not read the question carefully enough and gave their answer in hours and minutes. A common wrong answer was 3.30 hours.

(b)(i) A good number of candidates determined that the pictogram represented a total of 30 hours and carried out the correct calculation. Most of these arrived at the correct answer. Some excellent arithmetic was seen. Those candidates who misinterpreted the key of the pictogram often realised that they should attempt to total the number of hours and gained some credit for trying to divide 390 by that. Again, many answers were given without any method having been shown which meant that method marks could not be awarded when answers were incorrect.

(b)(ii) Candidates needed to comment on what they had assumed when answering **part (b)(i)**. A small number of candidates understood what they were being asked and gave a sensible answer such as 'The hourly rate is the same for each hour'. Some good answers were seen and there was clear evidence of an understanding of the limitations of what they had calculated. Other candidates described the method they had used to answer **part (b)(i)** or the answer they had found.

Answers: **(a)** 3.5 hours **(b)** £13 per hour

Question 6

A good number of correct answers were seen and most candidates chose either Credit City or Every. Those choosing Every had not fully compared the information in the table with the information they were given about Mary's requirements.

Answer: Credit City

Question 7

(a) This part of the question was very well answered – almost all candidates understood what was needed and entered the correct values.

(b) Some very good answers were given to this question. Some candidates correctly cancelled their fraction to lowest terms, though this was not in fact required. Weaker candidates realised that 2 was of significance but often gave this as the answer rather than appreciating it was the numerator of the fraction required. Some candidates were using words such as *unlikely* to describe the probability rather than giving the value required.

Answers: **(a)** **(b)** $\frac{2}{16}$

4	5	6	7	8
3	4	5	6	7
2	3	4	5	6
1	2	3	4	5
+	1	2	3	4

Question 8

(a) Most candidates used a pair of compasses to draw a neat and accurate circle. A few freehand attempts were seen and candidates need to be aware that they are expected to be able to use compasses when a question requires them to draw an accurate circle.

(b) A very high proportion of candidates plotted the point *Q* correctly. Those who did not tended to reverse the co-ordinates.

(c) It was clear that almost all candidates understood what a diameter was and were able to solve the problem and write down the correct co-ordinates. Those candidates who reversed the co-ordinates in **part (b)** usually plotted *Q* at (3, 6) and then gave the reversed co-ordinates (6, 3) as their answer. This double error was not credited.

Answers: **(a)** Circle, centre *P*, radius 3 cm **(c)** (6, 3)

Question 9

Almost all candidates gave the correct answer. Very occasionally, the answer 0.4 was given.

Answer: 0.6

Question 10

A high proportion of candidates opted for the mode. Very often candidates gave the reason that this represented the 'most common' as their justification and this was acceptable. Occasionally, the reason given was not always sufficiently clear for the mark to be awarded or was not quite correct. Some candidates suggested the mode would indicate how many of each model were sold, which is not the case. Other candidates suggested the mean was the most suitable as it was the easiest to calculate. These candidates would have done better had they realised that the data being considered was categorical not numerical and therefore the mode was the only possible average available.

Answer: Mode with valid supporting comment

Question 11

(a) About half of the candidates offered the correct solution. The remaining candidates generally gave the answer as –1.

(b) This was very well answered with most candidates giving the correct value. Those who did not mostly found 32 ÷ 4 incorrectly rather than making a sign error.

(c) A good number of candidates realised the need to apply a correct order of operations in this calculation and did so correctly. Some of these candidates found 4.5 correctly and then made an arithmetic slip in subtracting it from 8. Commonly 4.5 was given as the answer by these candidates. Many candidates did not observe that the operations needed to be carried out in the correct order. These candidates tended to give their final answer as 7.5.

Answers: **(a)** 11 **(b)** –4 **(c)** 3.5

Question 12

(a) A good number of correct answers were seen with candidates who recalled that taking a bearing **from** *A* meant positioning their protractor at point *A* and measuring clockwise from north, doing so accurately. About half of candidates gave an acute answer and marked the angle they were measuring as the bearing of *A* from *B* in the anti-clockwise direction.

(b) Again, those who recalled that a bearing is measured in a clockwise direction usually gave a reasonable explanation of why the bearing of *B* from *C* was not 095°. Candidates who measured the incorrect angle in **part (a)** usually suggested that it was not 095° because it was 085°.

Answers: **(a)** 130°

Question 13

(a) A high proportion of candidates recognised the net given as that of a pyramid, with some candidates even observing that it was, in fact, a square-based pyramid. The most common incorrect answer seen was *triangular prism*.

(b) Many candidates stated the calculation $3 \times 3 \times 3$ and then gave the correct answer. On a few occasions, candidates made the error $3 \times 3 = 6$ and then gave $6 \times 3 = 18$. These candidates were able to earn a method mark whereas candidates who just gave their answer as 18 or 9, without stating 3^3 first could not be credited with any marks. Weaker candidates tended to give an answer of 12, having worked out the perimeter of a 3 by 3 square. These candidates may have done better if they had attempted to sketch a simple cube and mark on the dimensions.

Answers: **(a)** Pyramid **(b)** 27

Question 14

Many candidates answered this question very well. Some well-presented, easy to follow and accurate solutions were seen. Almost all candidates generally managed to find $\frac{3}{8}$ of 640 without difficulty. A fair number then misinterpreted the question and went on to find $\frac{1}{5}$ of 240, giving the value they found from that calculation as their answer.

Answer: £80

Question 15

Candidates found this question quite challenging. Those who drew diagrams of triangles or rectangles were often most successful. Those drawing rectangles simply doubled the given area and from that point it was easy to see that 9 was the required answer. The answer 4.5 was very common with candidates forgetting to halve the 10 before dividing. Some gave the general formula for the area of a triangle. Some of these candidates did not substitute the values given into their formula and, on many occasions carried out an incorrect sequence of operations, for example $(45 \div 10) \div 2$.

Answer: 9 cm

Question 16

(a) Good candidates described the error in the solution, often indicating that Sean had not used a common denominator. Comments such as *He cannot just subtract the top and the bottom* were not sufficient to score. Other candidates appreciated that the correct process was to find the Lowest Common Multiple. Some of these candidates omitted to say of what values the LCM should be taken. This was necessary. Giving the correct answer in this part was not sufficient as this did not explain Sean's error. Some candidates seemed confused between subtraction of and division by a fraction; these candidates tended to suggest *He should have flipped the second fraction*.

(b) A good number of correct answers were offered. Some arithmetic slips were seen in finding the LCM. Weaker candidates suggested that Sean's solution was correct or did not attempt a solution.

Answers: **(b)** $\frac{19}{72}$

Question 17

In this question, candidates needed to convert a recipe for 4 people to 6 people and convert Imperial to metric units. A few candidates did manage to do both and usually earned 3 or 4 marks. Many candidates did one or other of the necessary processes and generally earned 1 of the 4 marks available. A good number of candidates stated their units and most candidates attempted to answer this question.

Answer: 720 g, 180 g, 1800 ml

Question 18

Candidates found this question challenging. Candidates who rounded all 3 values correct to 1 significant figure were often unable to evaluate the calculation formed. Commonly, answers of 2 or $\frac{20}{3}$ were given or the answer had a place value error, for example 0.6. Many candidates rounded 0.333 and 2.98 correctly but did not round 58.6 at all. Some candidates made no attempt to answer. Others rounded 0.333 to 0 and gave their answer as 0. These candidates needed to check the reasonableness of their answer.

Answer: 6

Question 19

(a) Only the better candidates understood what was needed to answer this question successfully, with the geometry skills needed to answer this question being beyond many candidates. Some candidates did find a value for angle x and realised that angle y was half of that value. Other candidates were measuring angles from the diagram. It is important that candidates understand the significance of the comment NOT TO SCALE alongside any diagram. Those few candidates who attempted to find the exterior angle of the hexagon often did not know what to do with what they had found.

(b) Many candidates were able to explain, using the fact that *BE* was the hypotenuse of a right-angled triangle, why *BE* was longer than *AE*. Some candidates tried to justify the statement given by suggesting that it was longer because it was slanting or diagonal.

Answers: **(a)** 120, 60

Question 20

(a) A small number of candidates solved this inequality successfully. Most candidates tried to solve an equation and gave the answer as a single numerical value.

(b) As this part of the question depended on the answer to **part (a)** being an inequality, very few candidates answered this part successfully. About half of those candidates who had an inequality as their answer to part **(a)** were able to represent it successfully on the answer line given.

Answer: **(a)** $x > -4$

Question 21

Many candidates earned 1 or 2 marks for this question. Often answers were not given in standard form. Many answers of 3×10^4 or 3×10^{-2} were also seen. Only a few candidates made little or no progress. Amongst these, answers such as 3^{-4} were offered.

Answer: 3×10^{-4}

Question 22

Many candidates showed some evidence of understanding what was meant by a reciprocal and a fair number of candidates gave a fully correct solution. Many candidates only attempted to complete one of the two necessary steps. Often candidates tried to reciprocate the 2 and the $\frac{1}{4}$ separately and the answer $4\frac{1}{2}$ was not uncommon. Other candidates converted the mixed number to an improper fraction correctly but seemed to think that was the answer to the question and so did not complete the solution. A few candidates converted the fraction to a decimal form but made no real progress with this approach.

Answer: $\frac{4}{9}$

Question 23

(a) Some good solutions were seen to this question. Often candidates found the value of 10^6 as 1 million and then realised that this was 1000×1000. Weak candidates halved both the 10 and the power of 6 and the answer of 5^3 was seen more than once. Some candidates divided 1 million by 2 rather than square rooting it.

(b) About a quarter of candidates understood what was needed and arrived at the correct answer. Other candidates tended to offer solutions such as 25^{-1} or -25.

Answers: **(a)** 1000 **(b)** $\frac{1}{5}$

Question 24

Candidates found this question challenging. A reasonable number of good, neat and clear solutions were seen. A few solutions had a first correct step. Many candidates did not understand what was needed and often *x* and *y* were simply interchanged in the formula.

Answer: $x = \frac{y+z}{w}$

Question 25

About a quarter of candidates used their compasses and accurately constructed the required perpendicular bisector. Some candidates drew attempts at the bisector with no arcs and often these were not sufficiently accurate to be rewarded. Many candidates did not seem to understand the term perpendicular bisector and therefore were unable to offer any solution.

Question 26

Some candidates did find the correct equation. Successful methods were substituting (0, 5) into $y = mx + c$ to find *c* and then using (3, –1) to find *m* or making a sketch of the points given and determining values from that. Some good candidates omitted to take into account that the gradient of the line was negative and several answers of $y = 2x + 5$ were seen. A reasonable number of candidates realised that the value of *c* was 5 but were unable to find a gradient.

Answer: $y = -2x + 5$

Question 27

(a) Many candidates gave a fully correct solution to the calculation. Occasional arithmetic errors were seen and often these were sign errors. A small number of candidates attempted to work out the difference of two fractions, having drawn a fraction bar between the components of each vector.

(b) Candidates who understood that the key to the solution was to first find the value of *b* were almost always successful in completing the solution. Candidates who were successful used formal algebra, setting up at least one equation and solving or used trials to find a correct pair of values. Some candidates corrected sign errors by, very sensibly, checking that their solutions satisfied the given relationship. Other candidates would have benefitted from undertaking such a check. Those candidates who thought that they were working with fractions in **part (a)** tended to repeat that error in this part.

Answers: **(a)** $\begin{pmatrix} 17 \\ -6 \end{pmatrix}$ **(b)** $a = \frac{1}{2}$, $b = 4$

Question 28

Candidates used a variety of methods, with varying success. Candidates who chose the method of substitution often struggled with the algebraic fraction or fractions they had formed. Candidates who used the method of elimination were usually more successful. Trial and improvement was seen but rarely successful and is not recommended as a method for solving simultaneous equations as the solutions are often not integer values. Some candidates would have benefitted greatly from checking their solutions as arithmetic slips were sometimes made.

Answers: $x = 4$, $y = -3$

Question 29

Some very neat and accurate solutions were seen to this problem. A reasonable number of candidates understood the requirement to draw a pair of accurate circles and shade the left hand crescent formed by their intersection. Some candidates shaded the left hand section of the smaller circle whilst other candidates only drew the smaller circle and did not attempt the larger arc. Many candidates did not try this question. It is not clear if this was because of a lack of knowledge of the topic or a lack of equipment with which to draw.

Question 30

(a) Better candidates looked for, and found, the correct common factors and were usually successful. A small number of candidates tried to combine the terms in some way. Candidates suggesting the answer to be $5y(x - 4^2)$ had misunderstood the meaning of the power of *y*.

(b) (i) Only the very best candidates were successful with this factorisation using the difference of two squares. It was clear that some candidates did not recognise the pattern that was being presented and $w(w - 1)$ was fairly common.

(ii) A very few candidates were successful in this part. Those who used the difference of two squares in **part (b)(i)** usually saw the pattern but did not always find the correct value. Some candidates would have benefited from estimating the answer as the values given as answers were often of totally incorrect magnitude.

Answers: **(a)** $5y(x - 20y)$ **(b)(i)** $(w - 1)(w + 1)$ **(b)(ii)** 9800

Question 31

Candidates who attempted this question made some reasonable attempts to factorise. Sometimes the signs were reversed and candidates who did this may have recovered from their error if they had checked that their values satisfied the given equation.

Answers: $x = -6$, $y = 8$

MATHEMATICS

Paper 0626/04
Paper 4 (Extended)

Key messages

- Full coverage of the Extended syllabus is needed to access the whole paper.
- Clear, logical steps in working out need to be shown in order to access method marks, 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.
- Questions need to be answered fully, and a check made to ensure the requirements of the question have been met, by re-reading the question before moving on to the next question.

General comments

Many candidates were well prepared for this examination paper. There was evidence of fuller coverage of the syllabus needed 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 marks in the event of minor errors and a final incorrect 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 significant number of candidates, which more detailed and clearer steps in working out would likely reduce.

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

In this estimation question, estimation of the denominator was handled very well, and the square root of 9 was written down as 3 in most cases. Marks were lost due to rounding only two of the figures to 1 significant figure rather than all three. A common error was to incorrectly round 0.45 to 0 or 1. Rounding 59 to 6, or leaving it as 59 was another error commonly seen. Squaring 0.5 by some candidates gave an incorrect 2.5, rather than the 0.25 required.

Candidates attempting the actual calculation rather than an estimation might suspect they are doing too much work for 2 marks, and re-reading the question carefully should point them in the direction of rounding the values first.

Answer: 5

Question 2

Some candidates answered this reciprocal question well. Many stopped after the first step of converting the mixed number to an improper fraction, and gave this as the final answer. Others converted the mixed number to the decimal 2.25 and gave this as the final answer.

Introducing a power of –1 might help those candidates that understood how to find the reciprocal, as it would remind them to continue to the second step of the solution, if the omission of the final step was an unintentional slip.

Answer: $\frac{4}{9}$

Question 3

This perpendicular bisector construction question was extremely well answered. Most candidates produced the correct line within tolerance, with good construction arcs. Some candidates would be advised to work to a bigger scale, to ensure that the intersections are far apart enough to ensure a good line within tolerance. Proficiency with compasses could be improved by some candidates.

Question 4

(a) This indices question involving a square root was well answered. Many gave a final answer of 10^3 which needed a further step to evaluate this to 1000 for full marks. Errors involving a factor of 10 too many or too few were seen, which appeared to have been slips rather than a misunderstanding.

(b) This indices question was extremely well answered, with correct answers of $\frac{1}{5}$, 0.2 and 5^{-1} seen.

(c) Those candidates following the rules for order of operations were generally successful in this question, barring a few arithmetic errors seen. The most common error was to split the bracket and attempt to find the cube root of each term separately.

Answers: **(a)** 1000 **(b)** $\frac{1}{5}$ **(c)** 3

Question 5

This question on finding the linear equation through two points was extremely well answered. Arithmetic errors resulted in the loss of marks by some candidates, but it was encouraging to see that many worked out the gradient with clear, logical steps, thus reducing the likelihood of arithmetic errors. Very few candidates were unable to make some progress and gain marks. Other errors included using a gradient of positive 2; and some candidates were able to identify the *y*-intercept as $c = 5$, but unable to find the gradient.

Answer: $y = -2x + 5$

Question 6

(a) This vector arithmetic question was extremely well answered, with the most common errors arising from arithmetic slips. A small number of candidates carried out the calculation in the incorrect order, or thought they were dealing with fractions.

(b) This was a more challenging vector question, which was very well answered. Candidates mostly used algebra to arrive at the answers, with many showing clear working out. Those candidates finding *b* first often arrived at the correct answer for *a* too, whilst more convoluted methods had a greater tendency to make arithmetic slips.

Answers: **(a)** $\begin{pmatrix} 17 \\ -6 \end{pmatrix}$ **(b)** $\frac{1}{2}$, 4

Question 7

This simultaneous equation question was extremely well answered. The elimination method was more popular than the substitution method, but equally successful. Arithmetic slips were the main errors seen, and some candidates had difficulty in dealing with algebraic fractions when using the substitution method. Candidates would benefit from checking their values if time allows.

Answer: $x = 4$, $y = –3$

Question 8

On both parts of this loci question, candidates would benefit from re-checking the setting of their compasses to ensure the required measurement has been set correctly, and then check by measurement of the radius of their arcs. It is evident that some candidates would have benefitted from increasing their proficiency in the use of their compasses.

(a) Most candidates knew that the locus of points from point *A* was a circle, and correctly constructed this.

(b) Many candidates gained both marks for this part. Common errors included inaccuracy in setting radius, and identifying the incorrect area, which often came from drawing a vertical line between the two intersections of the arcs.

Question 9

(a) An almost universally well answered question on common factors, with both the numerical and algebraic factor successfully taken outside of a bracket. Division by the common factor was seen, and very rarely there was evidence that the candidate was unaware of the process of factorisation.

(b) (i) This difference of two squares question was correctly answered by many candidates.

(ii) Most candidates successful in **part (b)(i)** gained full marks in this question. The expectation was to substitute 99 into their factorisation and thus arrive at a simple calculation 98 × 100. Some candidates gave their final answer as (99 – 1)(99 + 1) and did not make the link to arrive at 9800. Other errors included long multiplication of 99 x 99 with arithmetic slips, and substituting $\sqrt{99}$ or 33 rather than 99 into their factorisation from **part (b)(i)**.

Answers: **(a)** $5y(x – 4y)$ **(b)(i)** $(w – 1)(w + 1)$ **(ii)** 9800

Question 10

This question on solving a quadratic equation was generally well answered. Most candidates factorised successfully and arrived at the correct solutions. Only a few candidates chose the incorrect factors of –48. Some candidates used the quadratic formula correctly, but those going down this route often made errors in the substitution or arithmetic slips in the calculation.

Answer: –6, 8

Question 11

Many candidates chose to convert the mixed numbers to improper fractions, rather than calculating $43 - 41 = 2$ and working with the fractions $\frac{3}{5} - \frac{5}{6}$ and the various alternative methods down this route for dealing with the fact that this would result in a negative fraction. This common alternative of working with improper fractions increased the likelihood of arithmetic errors when dealing with lengthy calculations, and marks were lost by a significant number of candidates due to errors.

The instruction to give their answer as a mixed number was either missed or misunderstood by some candidates who gave their answer as an improper fraction.

Answer: $1\frac{23}{30}$

Question 12

This rearranging formula question was straightforward and exceptionally well answered. Candidates are advised to write the complete formula out on the answer line, as many omitted the *x* =.

Answer: $x = \frac{y+z}{w}$

Question 13

Many candidates knew that this was an equation of a circle with centre (0, 0) and correctly drew this. Fewer candidates correctly labelled the axis intersections. A significant number of candidates gave a quadratic or linear graph.

Question 14

(a) This histogram question proved a challenging question, with few correct answers seen. Most candidates treated the histogram as a bar chart, and labelled the vertical axis with the number of candidates rather than frequency density – there were no part marks for this approach, so most students gained no marks.

(b) (i) Candidates who treated this as a histogram generally answered this part correctly. Candidates needed to treat the area as representing the frequency in order to gain marks in this part.

(ii) Some candidates realised that the frequency representing $\frac{4}{5}$ of the area between 20 and 25 was required and gained some credit, despite gaining no marks in previous parts. Many candidates attempted lengthy incorrect calculations which gained no marks with few candidates arriving at a correct answer.

Answer: **(b)(i)** 25 **(ii)** 68

Question 15

This matrix transformations question proved challenging for many candidates.

(a) Many candidates correctly stated the transformation was a reflection. Some were able to correctly identify the line of reflection. Many candidates gave angles and centres of rotation following a statement of reflection, which seemed to indicate a confusion between reflection and rotation. Common errors included giving the transformation as rotation or enlargement.

(b) (i) This matrix transformation question was answered correctly by a small number of candidates.

Answers: **(a)** Reflection in $y = -x$ **(b)** $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$

Question 16

(a) This simplification of a surd question was very well answered.

(b) Candidates that understood the term 'rationalise the denominator' were generaly able to gain full marks. Many candidates did not rationalise the denominator.

Answers: **(a)** $5\sqrt{3}$

Question 17

(a) This question involving exact values of trigonometric ratios was answered well by some candidates. Sin30 was given as an answer by a significant number of candidates, which required a further step to 'work out the value', as required in the question. Some candidates who were able to write down the exact values then made errors in handling the surds. Many candidates gave no evidence that the values were known.

(b) This trigonometric equation was attempted by many candidates. Very few gained both values, and some candidates gave extra values within the range. Many candidates realised 45° was an answer. Correct sketches of the sine curve generally led to candidates gaining the second correct value of 135°, of which there were few seen.

Answers: **(a)** $\frac{1}{2}$ **(b)** 45° and 135°

Question 18

(a) This matrix multiplication question was very well answered, with many candidates losing a mark due to arithmetic slips rather than an incorrect method applied.

(b) (i) This inverse matrix question was well attempted by many candidates. Errors were seen commonly due to the incorrect rearrangement of the matrix elements, or incorrect calculation of the determinant.

(ii) This part proved challenging for many candidates. Some candidates successfully wrote down the identity matrix, whilst many made no attempt, or an incorrect attempt.

Answers: **(a)** $\begin{pmatrix} 12 & -19 \\ -16 & 17 \end{pmatrix}$ **(b)(i)** $\begin{pmatrix} 0.1 & -0.3 \\ 0.2 & 0.4 \end{pmatrix}$ **(ii)** $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

Question 19

This circle geometry question was extremely well answered. A thorough understanding of the isosceles triangles within a circle was evident. The preferred method was to work with 'tangent meets radius', then isosceles triangle *OML* to find *b*, and use 'angle at centre is twice angle at circumference' to find *a*. Less popular was the route using the alternate segment theorem. Errors made were mainly due to arithmetic slips rather than method. Some candidates had assumed symmetry of the diagram through *OM*, which was not the case.

Answer: $a = 24$, $b = 32$

Question 20

(a) (i) This probability question was answered with varying degrees of success. Many candidates realised that it was a 'without replacement' type of question. Tree diagrams were used with varying degrees of success. Common errors included using a denominator of 10 in all three probabilities to be multiplied; using 0.6 for all three fractions; and addition of three fractions rather than multiplication.

(ii) Few candidates made the link to 1 – part (a)(i). Those candidates with lengthy calculations to arrive at an answer ought to have noticed that it was only worth 1 mark, and perhaps consider a different approach.

(b) (i) Many candidates correctly answered this question. There was evidence that some candidates had not understood the event described, so were unable to provide a meaningful attempt. A common error was to add two fractions, rather than multiply.

(ii) Many candidates attempted this but few candidates arrived at the correct expression. Greater success would have been achieved if they had considered how the expression varied with increasing values of *n*, beginning with $n = 1, 2, 3$, etc., rather than writing down an expression with no pattern established. Of those candidates that understood the pattern, there were many that incorrectly expressed it in terms of n, and commonly wrote down $(n - 1)$ as a multiplier rather than a power.

Answers: **(a)(i)** $\frac{1}{6}$ **(ii)** $\frac{5}{6}$ **(b)(i)** $\frac{5}{36}$ **(ii)** $\left(\frac{5}{6}\right)^{n-1} \times \frac{1}{6}$

Question 21

This cubic expansion was very well answered, with some candidates clearly understanding the method, and losing marks due to making arithmetic slips. Better setting out of working would benefit some candidates, in order that partial marks can be awarded in cases of arithmetic slips. Some candidates arrived at the correct answer, and then continued on to an incorrect answer, through incorrect attempts to factorise, or miscopying their working. A few candidates only partially expanded the brackets, leaving the answer written as a quadratic factor and linear factor.

Answer: $x^3 + 2x^2 - 9x - 18$

Question 22

Many candidates were able to differentiate the function correctly, with few errors made in the two term derivative. Errors following this step were usually from arithmetic slips or candidates not sure what to do after differentiating. Many candidates made little or no attempt. This question elicited a wide variety of incorrect methods too, with a significant number of candidates not differentiating the function at all, but trying to substitute into f(x).

Answer: $a = 2$, $b = 54$

MATHEMATICS

Paper 0626/05
Paper 5 (Core)

Key messages

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

General comments

The question paper included a range of questions: some routine tasks, some set in familiar contexts and others that required application of a range of skills in contexts that were less familiar. In general, candidates performed well on the more routine questions but were less proficient when they needed to identify the mathematics required.

In many cases, candidates showed insufficient method which meant that part marks could not be awarded if the final answer was not correct. When candidates are required to show a result it is important to set out steps logically and include all relevant working.

It was evident that a number of candidates were unfamiliar with stem and leaf diagrams and similar triangles.

Comments on specific questions

Question 1

(a) Most candidates answered this part correctly.

(b) (i) Many correct answers were seen in this part. Some candidates were unable to convert 575 g to kilograms.

(ii) Candidates who had reached an answer less than £20 in **part (i)** usually calculated the correct change.

(c) Good responses to this question involved candidates calculating the cost per egg for each pack and this usually led to identifying that the pack of 10 was better value. Some candidates worked out the cost of two packs of six eggs, for example, and compared this cost with the cost of a pack of 10 which was not an acceptable strategy. Only methods involving comparison of the same numbers of eggs were acceptable.

(d) Many candidates were able to calculate the reduced price of a cake. A small number of candidates just calculated 25% of the cost rather than reducing the price by 25%.

Answers: **(a)** £8.26 **(b)(i)** £3.91 **(ii)** £16.09 **(c)** Pack of 10 with 0.289 and 0.295 **(d)** £2.85

Question 2

(a) (i) Most candidates read the time correctly from the timetable.

(ii) Most candidates calculated the correct length of time for the journey.

(b) Most candidates identified which train would be needed and found the correct departure time.

(c) Many candidates were able to work out that the time taken was 1 hour 15 minutes, which some correctly converted to 75 minutes. Although many candidates knew that speed is calculated by dividing distance by time, few were able to convert the time to 1.25 hours and use this to calculate the speed correctly. It was common to see division by either 75 or by 1.15.

(d) This question required candidates to show the given saving. However, few candidates showed a clear set of correct calculations leading to the required result. Many could correctly calculate the cost of an adult ticket using the railcard. The calculation of 35% of £48 was found to be much more challenging. It was common to see candidates attempting 35% of £24 from a misinterpretation of the railcard price for a child's ticket. Some clearly set out and well annotated correct solutions were seen.

Answers: **(a)(i)** 10 15 **(ii)** 47 minutes **(b)** 12 05 **(c)** 52 mph

Question 3

Many candidates were able to use the given information to calculate the costs correctly using each plan and make the correct decision about which plan should be chosen. Many candidates clearly labelled their calculations Plan A and Plan B. A small number of candidates worked out the number of kilowatt hours used each day and compared these costs which was also acceptable. Some candidates were confused about the daily charge for Plan B and this was sometimes only added once for the whole 90 days or was omitted completely.

Answer: Plan B with £109.23 and £122.88

Question 4

(a) (i) Most candidates could correctly find the output from the function machine.

(ii) Many candidates correctly reversed the function machine. Common errors were to calculate 12.7 + 4.8 ÷ 2.5 rather than (12.7 + 4.8) ÷ 2.5 or to calculate (12.7 – 4.8) × 2.5.

(b) Candidates found this problem more challenging and many did not attempt it. Those that did attempt it often identified that $q = 5$ but did not know how to find the value of p. Some candidates showed correct algebraic working although many appeared to reach the correct result using a trial and improvement approach.

Answers: **(a)(i)** 5.2 **(ii)** 7 **(b)** $p = 3.5$, $q = 5$

Question 5

(a) (i) Candidates completed the frequency graph correctly. Some did not use a ruler to draw the bars.

(ii) Many candidates found the correct values of 13 and 67 to use in their answer and a correct fraction was usually given. Some answers were given as ratios which is not acceptable for probability.

(b) (i) Most candidates were able to work out that the sector angle for cars was 200° and they often also calculated that 8° represented one person. Not all candidates could then combine this information to calculate the number of people who travelled by car.

(ii) Few candidates were able to give an acceptable reason in this part and those reasons that were accepted were usually related to not all employees answering the question in the original survey. Very few candidates were able to identify that the responses to this survey might not be representative of the new company.

(c) (i) Many candidates were unfamiliar with stem and leaf diagrams. However, some successfully identified the highest number in the diagram.

(ii) Fewer candidates were able to find the mode from the stem and leaf diagram and this part was often omitted.

(iii) Very few candidates were able to find the median and most attempts involved writing out a list of numbers, often omitting the stems, rather than finding the middle pair in the stem and leaf diagram. Some candidates found the mean rather than the median.

Answers: **(a)(ii)** $\frac{13}{67}$ **(b) (i)** 25 **(c)(i)** 58 **(ii)** 27 **(iii)** 32.5

Question 6

(a) Many candidates divided 16.5 in the ratio 2 : 9 correctly. The common error was to multiply 16.5 by 2 and by 9.

(b) Many good answers to this part were seen with candidates able to identify that one quarter of the mix is cement or that if one third was cement the ratio would be 1 : 2.

(c) This part of the question was more challenging and many candidates were not able to make any attempt. Those candidates who identified that 22.6 kg was 2 parts from the ratio usually reached the correct answer. Common errors were to treat 22.6 kg as either 1 part or 7 parts.

Answers: **(a)** cement 3 kg, sand 13.5 kg **(c)** 79.1 kg

Question 7

(a) (i) Many candidates were able to explain that he should have added 2 to both sides rather than subtracting in his first step.

(ii) Candidates often reached the correct answer.

(b) (i) Candidates who attempted this part usually expanded at least one of the brackets correctly. A common error was to write –21 rather than +21.

(ii) Although a number of correct answers to this part were seen, it was clear that many candidates did not relate this part to the expansion they had done in the previous part and they did the working again in this part. Some correct answers were reached using a trial and improvement approach rather than solving algebraically.

Answers: **(a)(ii)** 2.2 **(b)(i)** $8x - 36 - 3x + 21$ **(ii)** 3

Question 8

(a) Many candidates were unsure what was required in this part of the question although those that attempted it usually showed enough to be given credit. They were required to add the expressions for the thinking distance and braking distance given in the information at the top of the page to show that this was the same as the given formula.

(b) Many candidates were able to substitute 45 into the given formula; however, not all could correctly evaluate the result.

(c) This part was found to be very challenging as it required a combination of two formulas to be used. Some correctly substituted 210 into the braking distance formula but then were uncertain how to proceed. Again some candidates were unable to evaluate the stopping distance once they had correctly substituted the speed into the formula.

Answers: **(b)** 146.25 feet **(c)** 275 feet

Question 9

(a) Many candidates identified that the transformation was a rotation. Complete descriptions were seldom seen with either the centre or the direction or both omitted.

(b) Correct reflections were often seen, although reflections in $x = 3.5$ were also common.

(c) Candidates were unfamiliar with enlargements with a fractional scale factor and two times enlargements were common. Those that used the scale factor $\frac{1}{2}$ were often unable to use the given centre of enlargement and rays from this point were rarely seen.

Answers: **(a)** Rotation, centre (2, 5), 90° clockwise

Question 10

(a) Many candidates were able to calculate the percentage increase correctly.

(b) In this part, many candidates identified the calculation required and started by finding the difference between the two populations. A common error was to divide by the new population rather than by the original population.

(c) Not all candidates were familiar with standard form, but those who were generally gave the correct answer.

(d) There were several stages required in this part and many candidates calculated the difference correctly. They were not always able to round this to three significant figures or to write it in standard form. It was common to see the numbers written out in full for the subtraction suggesting that candidates were not able to enter numbers into their calculator in standard form which would have been a more efficient method.

Answers: **(a)** 75 400 **(b)** 13.7% **(c)** 1.073×10^6 **(d)** 1.22×10^9

Question 11

(a) Some candidates identified that the diameter of the circle was 9 cm, but they were not always able to use this to calculate the area of the circle correctly. Some used either 9 or 3 as the radius and others used the circumference formula.

(b) (i) Very few candidates were able to write an expression for the areas of the square and the circle so could not then show the ratio of $4 : \pi$.

(ii) Very few candidates could answer this part and those who did generally calculated the radius of the circle using the area formula and used this to find the area of the square rather than using the ratio found in the previous part.

Answers: **(a)** 63.6 cm^2 **(b)(ii)** 22.5 cm^2

Question 12

(a) Many candidates were unfamiliar with similar triangles. Some did find the scale factor of 1.25 but very few were able to use this to find the missing length.

(b) Some candidates were able to access this challenging problem which involved the use of Pythagoras's theorem or trigonometry and similar triangles. Clear and correct method was seen in some cases leading to the correct answer, although some candidates were able to calculate the length of *AQ* and then make no further progress.

Answers: **(a)** 7.5 cm **(b)** 31.25 cm

Question 13

(a) (i) Most candidates were able to find the next term of the sequence.

(ii) Some candidates were able to find a correct expression for the *n*th term of the sequence. Common incorrect answers were $n + 6$ and $7n + 6$.

(b) Candidates who started by creating the equation $3n^2 + 2 = 110$ were often able to reach $n = 6$. They did not always then identify that they needed to substitute 7 into the expression for the *n*th term to find the required answer, and often an answer of 116 was seen. It was also common to see 110 substituted as the value of *n* in the expression as a starting point. Many candidates omitted this part.

Answers: **(a)(i)** 31 **(ii)** $6n + 1$ **(b)** 149

MATHEMATICS

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 ensure that all working is shown, especially in 'Show that' questions.

General comments:

All questions except the last one 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, which is essential on the longer problem solving type questions. A small error on questions of this type with no working shown will lead to a significant loss of possible marks. When candidates are required to show a result it is important that they show a detailed method showing every step of their working.

Some questions required an explanation; when answering this type of question, candidates must relate their answer to the information given or found in the question rather than give vague responses or responses with a lack of detail.

Comments on specific questions:

Question 1

(a) Most candidates successfully found the mean. A small number just added the five different numbers of chocolates and divided by 5.

(b) Most candidates gave a sensible answer either justifying or rejecting the claim.

Answers: **(a)** 30.6

Question 2

(a) Most candidates found the correct acceleration. An infrequent error was to divide the time by the speed.

(b) The method of calculating the distance from a speed-time graph was well understood with most candidates finding the correct answer.

Answers: **(a)** 1.5 m/s^2 **(b)** 252 m

Question 3

(a) (i) The fact that the masses of the planet were given in standard form did not deter candidates from using the correct method to find the mass of Mercury as a percentage of the mass of Mars, with most giving a correct response.

(ii) A few candidates were put off by the wording of this question and multiplied by 8.7 instead of dividing, but many found the correct answer.

(b) There were three stages to this question and some candidates only completed two, either forgetting to multiply by three quarters or one thousand. A few divided the masses of the two planets rather than multiplying. Nearly all candidates were adept at using their calculators to perform operations in standard form. There was a fair proportion of correct responses.

Answers: **(a)(i)** 51.6% **(ii)** 7.36×10^{22} kg **(b)** 9×10^{56}

Question 4

Candidates were generally aware of the overall principles involved when working through this question. Most found the area of the trapezium successfully, but there were errors finding the area of the circle with some using the diameter rather than the radius in the formula. Most then went on successfully to find the number of bags needed for their area. Few found the amount of grass seed left over successfully.

Answers: 13 bags with 668 g left over

Question 5

(a) Most candidates knew how to find the inter-quartile range and carried out this process correctly.

(b) There was some problem solving required to find the highest mark and the quartiles in this question and, as a result, many scored part marks on this question. Nearly all plotted the median correctly and many found the correct highest mark.

(c) Generally candidates did not know what was required of them on this question. They compared the results of the two classes by comparing, for instance, the two medians but they did not then go on to give a reason for this comparison by interpreting their result in the context of the question.

Answers: **(a)** 17

Question 6

(a) Candidates generally knew how to compute compound and simple interest correctly and many obtained full marks. Candidates need to be aware that on questions of this nature where they are asked to show a result, they must give a clear step by step method showing all their working to achieve the required result.

(b) Many candidates did not know how to proceed on this question, although there were some good responses. Some candidates tried to use an algebraic method but did not have the necessary skills to complete their attempt.

Answers: **(b)** 37

Question 7

(a) (i) Although there were candidates who were able to mark and label an external angle, some were confused as to what was required.

(ii) Some candidates tried to use some sort of formula to answer this question but were not able to apply it to find the number of sides of the polygon. Candidates who thought the problem through from first principles were often more successful.

(b) (i) Some candidates were able to identify an error in the proof.

(ii) Although most candidates attempted this, many were confused as how to proceed and few gained both the available marks.

Answers: **(a)(ii)** 30 sides **(b)(i)** Reflection symmetry not a valid reason or RHS not a valid

Question 8

(a) There was a good understanding of how to draw the graph of this linear equation with many candidates gaining both marks.

(b) (i) Most candidates attempted this question and many successfully drew the line of $y = 3$. Some candidates did not realise that $y = 3$ needed to be a dashed line as $y = 3$ was not included. Most candidates who had drawn their linear lines correctly identified the correct region.

(ii) There were a few fair attempts to identify the integer co-ordinates in their region. Some included points with y co-ordinate 3, forgetting that $y < 3$.

Answers: **(b)(ii)** (1, 1), (1, 2), (2, 2)

Question 9

Candidates were well versed in using algebra in questions of this type to find the correct value of x. Some candidates stopped at this point, not knowing how to proceed. Those that did carry on usually made a fair attempt showing that the quadrilateral was cyclic, although some did not give the full geometrical reason of opposite angles in a cyclic quadrilateral adding up to 180°or equivalent.

Question 10

(a) (i) Responses to this were mixed with candidates having some idea as to how to fill in the Venn Diagram but not giving a fully correct answer; consequently, one mark only was often awarded.

(ii) Most candidates answered this correctly.

(iii) Many candidates did not understand how to apply this case of conditional probability. An answer of $\frac{12}{80}$ was a common error.

(b) Most candidates attempted to fill in these Venn Diagrams with three sets. There were many correct responses.

Answers: **(a)(ii)** 61 **(iii)** $\frac{12}{38}$

Question 11

(a) This question was answered well with many candidates showing a good understanding of how to add these algebraic fractions.

(b) There were many good attempts at this question. Most candidates successfully wrote down and simplified an algebraic expression for the area of the shape. Some then had problems in manipulating this expression to give an answer in the required form. There were several fully correct responses with just a few candidates losing a mark from not showing all the required stages in their response.

(c) Candidates showed a good understanding of powers involving negative numbers and fractions with many finding the correct answer.

Answers: **(a)** $\frac{17x+12}{5(x+1)}$ **(b)** $6(2x+y)(2x-y)$ **(c)** –4

Question 12

(a) Some candidates tried to solve this problem using geometrical reasoning and were, inevitably, unsuccessful in this. There were many who appreciated that the cosine rule was needed and, of these, many were able to find the correct response, Common errors were to misapply the rule or to use an incorrect value for angle *PQR*.

(b) There were very few fully correct responses to this question. Some candidates were able to find further angles using the sine rule, but were unable to identify which angle was required to be found to calculate the bearing of *P* from *Q*.

Answers: **(a)** 15.3 **(b)** 296

Question 13

This question was found to be very difficult for nearly all candidates, who could not connect the information given in the question with the problems posed in the questions.

(a) Few related the equation of the quadratic in its completed square form to finding the minimum point of the curve. There were a few candidates who successfully gave the x co-ordinate in terms of p and r and were awarded a mark for this.

(b) Again this part of the question was found to be challenging. A few candidates used their x co-ordinate from **part (a)** to successfully write down an acceptable equation.

(c) Very few candidates were able to relate the information given in the question to giving a sensible answer.

(d) As candidates were asked to do something specific, many candidates did attempt this part of the question and many scored part marks. Few gave a fully correct response as they did not realise the implications of using the negative value when finding a square root.

(e) There were very few correct responses for this part.

(f) There were very few correct responses for this part.

(g) (i) There were very few correct responses for this part.

(ii) There were some reasonable attempts at this part of the question with a few correct answers.

Answers: **(a)** $(c, -d)$ **(b)** $x = c$ or $x = \frac{p+r}{2}$ **(c)** $(x-p)(x-r)$ **(f)** pr **(g) (ii)** 9