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Introduction

The main aim of this booklet is to exemplify standards for those teaching Cambridge IGCSE / IGCSE (9 – 1) Mathematics 0580 / 0980 and to show examples of very good answers.

This booklet contains answers to Specimen Paper 3 (2020), which has been marked by a Cambridge examiner. Each answer is accompanied by a brief commentary explaining its strengths and weaknesses. These examiner comments indicate where and why marks were awarded and how answers could be improved.

The Specimen Paper and mark scheme are available to download from the School Support Hub www.cambridgeinternational.org/support.

2020 Specimen Paper 3

2020 Specimen Paper 3 Mark Scheme

Past exam resources and other teacher support materials are also available on the School Support Hub.

Assessment overview

All candidates take two papers.

Candidates who have studied the Core syllabus content, or who are expected to achieve a grade D (4) or below, should be entered for Paper 1 and Paper 3. These candidates will be eligible for grades C to G (1 to 5).

Candidates who have studied the Extended syllabus content and who are expected to achieve a grade C (5) or above should be entered for Paper 2 and Paper 4. These candidates will be eligible for grades A* to E (3 to 9).

Core candidates take:

Paper 1 (Core)	1 hour 35%
56 marks	
Short-answer questions	
Questions will be based on the Core curriculum	
Externally assessed	

Extended candidates take:

Paper 2 (Extended)	1 hour 30 minutes 35%
70 marks	
Short-answer questions	
Questions will be based on the Extended curriculum	
Externally assessed	

and:

Paper 3 (Core)	2 hours 65%
104 marks	
Structured questions	
Questions will be based on the Core curriculum	
Externally assessed	

and:

Paper 4 (Extended)	2 hours 30 minutes 65%
130 marks	
Structured questions	
Questions will be based on the Extended curriculum	
Externally assessed	

- Candidates should have a scientific calculator for all papers.
- Three significant figures will be required in answers (or one decimal place for answers in degrees) except where otherwise stated.
- Candidates should use the value of π from their calculator or the value of 3.142.

Question 1

Specimen answers

- 1 (a) The table shows part of a bus timetable.

Town Hall	1015	1035	1055	1115
City Gate	1032	1052	1112	1132
Beacon Hill	1058	1118	1138	1158
Kingswood Park	1110	1130	1150	1210

- (i) Yana leaves home at 10:50.
She takes 14 minutes to walk to the bus stop at City Gate.

At what time does she reach the bus stop?

$$1050 + 14 \text{ mins} = 1104$$

..... 1104 [1]

- (ii) She gets on the next bus at City Gate and travels to Kingswood Park.

At what time does this bus arrive at Kingswood Park?

$$1112, 1150$$

..... 1150 [1]

- (iii) Work out how many minutes the bus takes to get from City Gate to Kingswood Park.

$$1112 \text{ to } 1150 = 38 \text{ minutes}$$

..... 38 min [1]

- (b) Ivan walks 1.5 km from his home to Kingswood Park.
He takes 20 minutes.

Work out Ivan's average speed in kilometres per hour.

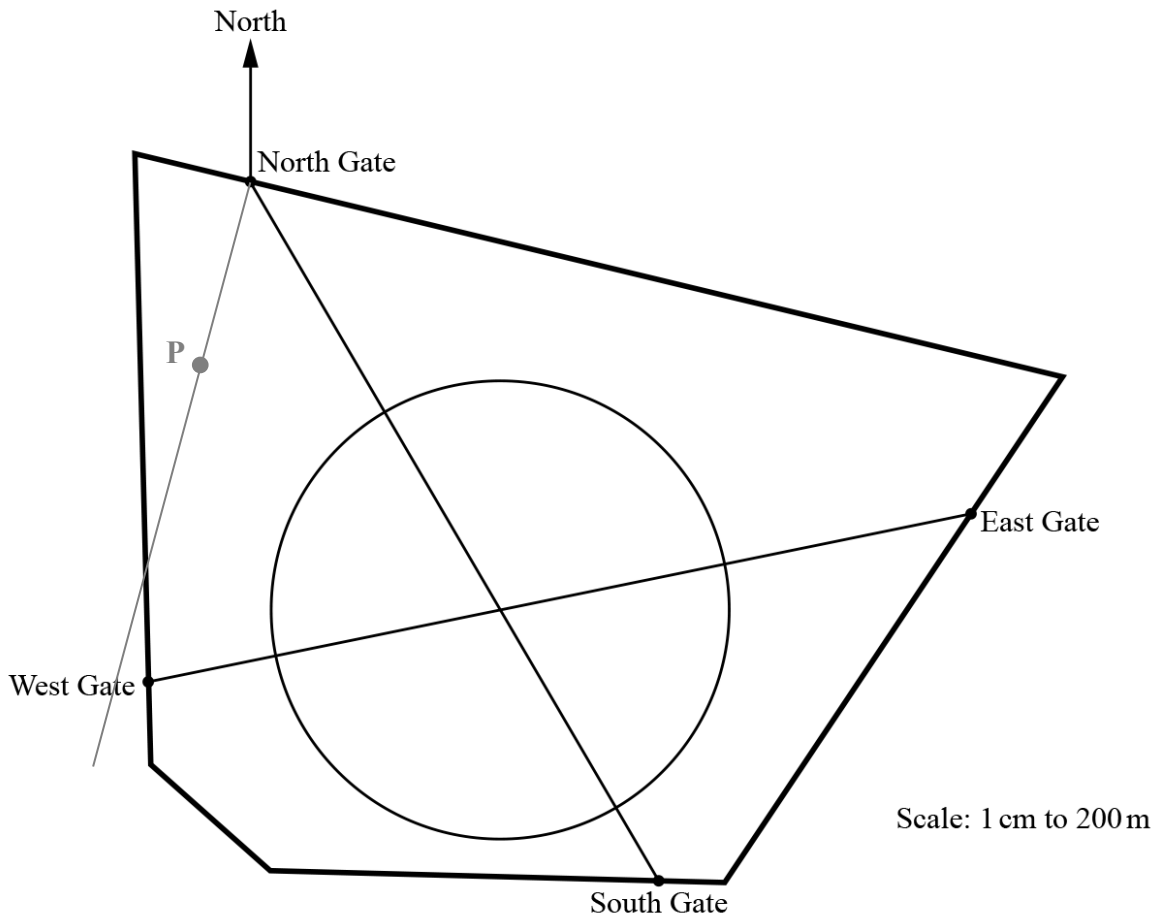
$$20 \text{ mins: } 1.5 \text{ km}$$

$$60 \text{ mins: } 3 \times 1.5 = 4.5 \text{ km}$$

Or
$$S = \frac{D}{T} = \frac{1.5}{20} \times 60 = 4.5$$

..... 4.5 km/h [1]

- (c) The scale drawing shows a map of Kingswood Park.
There are two straight paths and one circular path.
The scale is 1 cm represents 200 m.



- (i) Yana walks along the straight path from East Gate to West Gate.

Work out the distance she walks.
Give your answer in kilometres.

Distance on map = 11 cm

Actual distance = $11 \times 200 = 2200 \text{ m} = 2.2 \text{ km}$

.....2.2..... km [2]

- (ii) Measure the bearing of South Gate from North Gate.

.....150°..... [1]

- (iii) The entrance, P, to a children's play area is 500 metres from North Gate on a bearing of 195° .

Mark the position of P on the map.

P = from North Gate add a line of bearing 195° then add a point (P) on that line, 2.5 cm from the North Gate (200 m = 1 cm; 500 m = 2.5 cm)

[2]

- (iv) Ivan runs once around the circular path.

Calculate the distance Ivan runs.

Diameter is 6 cm so $6 \times 200 = 1200 \text{ m}$

$C = \pi \times 1200 = 3769.91 = 3770 \text{ to } 3 \text{ s.f.}$

.....3770..... m [4]

Examiner comment

Question 1

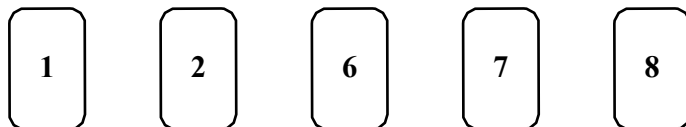
- (a) (i) Many candidates will be able to do this mentally. The important point to remember is that there are 60 minutes in an hour. Use of a calculator can lead to the error of $10.50 + 0.14 = 10.64$. **1/1**
- (ii) Many candidates will be able to do this mentally. There is a follow through from (i). From reading the given timetable candidates need to appreciate that the next bus is at 1112 and therefore arrives at 1150. **1/1**
- (iii) Many candidates will be able to do this mentally. It is worth noting that all of the buses take 38 minutes so a follow through is not necessary. **1/1**
- (b) The standard method is to use the formula $S = \frac{D}{T}$ and candidates need to be aware that the time given is in minutes and the speed is required in km/h and so the conversion of $\times 60$ is required at some stage of the working. As the time of 20 minutes is a convenient factor of 60, the ratio method leading to 3×1.5 is equally valid. **1/1**
- (c) (i) To calculate the distance walked, the distance on the scale drawing first needs to be measured and then converted to the actual distance using the given scale. It is advisable to write down this measured distance. A part mark of 1 is given if 11 (cm) or 2200 (m) is seen. **2/2**
- (ii) Candidates need to use a protractor to measure the bearing and must remember that it is measured from the North line. An initial estimate of the bearing as being between 090 and 180 would be beneficial. **1/1**
- (iii) Candidates need to accurately use both a protractor and ruler to find the position of P. The fact that 195 is between 180 and 270 gives candidates an initial idea of where the bearing will be. The distance of 500 metres needs to be converted (by $\frac{500}{200}$) to the distance of 2.5 cm to be drawn on the scale drawing. It is suggested that the bearing line is drawn first and then the position marked at the required distance. The alternative method of drawing an arc of radius 2.5 cm and then putting in the bearing line is equally valid. The position should then be marked with the letter P, although a clear cross or dot is sufficient. There is a part mark available for either the correct bearing or the correct distance drawn. **2/2**
- (iv) As the path is circular, the required distance is the circumference and candidates need to know and use the correct formula of $C = \pi d$. Hence the diameter needs to be measured on the diagram and then converted to the actual distance in metres (as indicated by the 'm' at the end of the answer line). Substituting into the formula will then give the calculated answer. This should be given to 3 significant figures as explained in the rubric on the front page of the examination paper, although a more accurate answer would not be penalised. The rubric also states that the calculator value, or 3.142, should be used for π : the use of 3.14 or $\frac{22}{7}$ will lose the final accuracy mark. B part marks are available for the measurement of 6 (cm), and the conversion to 1200 (m). A Method mark is available for the correct use of $C = \pi d$ with their diameter. **4/4**

Total mark awarded = 13 out of 13

Question 2

Specimen answers

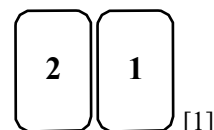
- 2 (a) The diagram shows five number cards.



Put two cards side by side to show

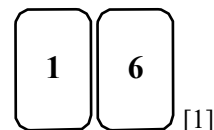
- (i) a two-digit number that is a multiple of 7,

Multiples are: 14, no; 21, yes



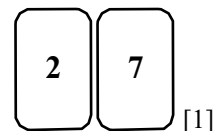
- (ii) a two-digit square number,

Square numbers are: 16, yes



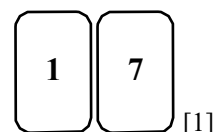
- (iii) a two-digit cube number,

Cube numbers are: 27, yes; 64, no



- (iv) a two-digit prime number.

Prime numbers are: 11, no; 13, no; 17, yes



- (b) Insert one pair of brackets into this statement to make it correct.

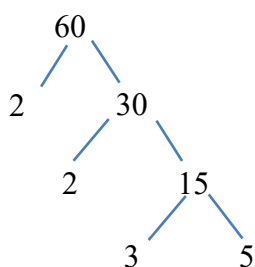
$$7 \times 5 - 2 + 3 = 42$$

$$7 \times (5 - 2 + 3) = 42$$

Because $7 \times 6 = 42$

[1]

- (c) (i) Write 60 as a product of its prime factors.



Or:

$$\begin{array}{r|l} 60 & \\ 2 & 30 \\ 2 & 15 \\ 3 & 5 \\ 5 & 1 \end{array}$$

Or: $60 = 2 \times 30$
 $= 2 \times 2 \times 15$
 $= 2 \times 2 \times 3 \times 5$
 (or: $2^2 \times 3 \times 5$)

..... $2 \times 2 \times 3 \times 5$ [2]

- (ii) Find the lowest common multiple (LCM) of 36 and 60.

$$60 = 2 \times 2 \times 3 \times 5 \quad \text{Or} \quad 36, 72, 108, 144, 180$$

$$36 = 2 \times 2 \times 3 \times 3 \quad \quad \quad 60, 120, 180$$

$$\text{LCM} = 2 \times 2 \times 3 \times 3 \times 5 = 180$$

Or

60	36	
2	30	18
2	15	9
3	5	3

.....180 [2]

- (d) Find the value of $\sqrt[3]{0.729}$.

.....0.9 [1]

Examiner comment

Question 2

- (a) (i) Many candidates will be able to do this mentally. It is advisable to write down the first few two-digit multiples of 7 and see if the necessary cards are in the diagram. 28 is another acceptable answer. 1/1
- (ii) Many candidates will be able to do this mentally. Advice as above. 81 is another acceptable answer. 1/1
- (iii) Many candidates will be able to do this mentally. Advice as above. 1/1
- (iv) Many candidates will be able to do this mentally. Advice as above. 61, 67 and 71 are other acceptable answers. 1/1
- (b) This question requires use of the BIDMAS. 1/1
- (c) (i) Knowledge of product, prime and factor is required in this question. The three most common methods are shown with the factor tree method tending to be the more successful. B part mark is available for identifying the prime factors in such a way if the final answer is not reached. This mark is also given for a product of non-primes such as 5×12 . 2/2
- (ii) The standard method of listing the prime factor products of both numbers (60 has already been done in part (i)) tends to be the most successful. Two other common valid methods are also shown. A part mark is given for $(36 =) 2 \times 2 \times 3 \times 3$ or for any common multiple such as 360, 540. 2/2
- (d) Many candidates will be able to do this using a calculator, although common errors of cubing or taking the square root are seen. 1/1

Total mark awarded = 10 out of 10

Question 3

Specimen answers

3 Joel spins a fair five-sided spinner numbered 2, 3, 4, 5 and 6.

(a) Write down the probability that the spinner lands on

(i) an odd number,

Odd: 3, 5

$$\frac{2}{5} \quad [1]$$

(ii) a prime number,

Prime: 2, 3, 5

$$\frac{3}{5} \quad [1]$$

(iii) the number 7

$$0 \quad [1]$$

(b) The table shows the results of his first 20 spins.

Number	2	3	4	5	6
Frequency	3	2	6	4	5

(i) Write down the mode.

Highest frequency is 6, most common number is 4

$$4 \quad [1]$$

(ii) Calculate the mean.

$$(2 \times 3 + 3 \times 2 + 4 \times 6 + 5 \times 4 + 6 \times 5) \div 20$$

$$(6 + 6 + 24 + 20 + 30) \div 20$$

$$180 \div 20$$

$$4.3$$

$$4.3 \quad [3]$$

(iii) Joel wants to draw a pie chart to show the results in the table.

(a) Show that the sector angle for the number 2 is 54° .

$$\frac{3}{20} \times 360 = 54$$

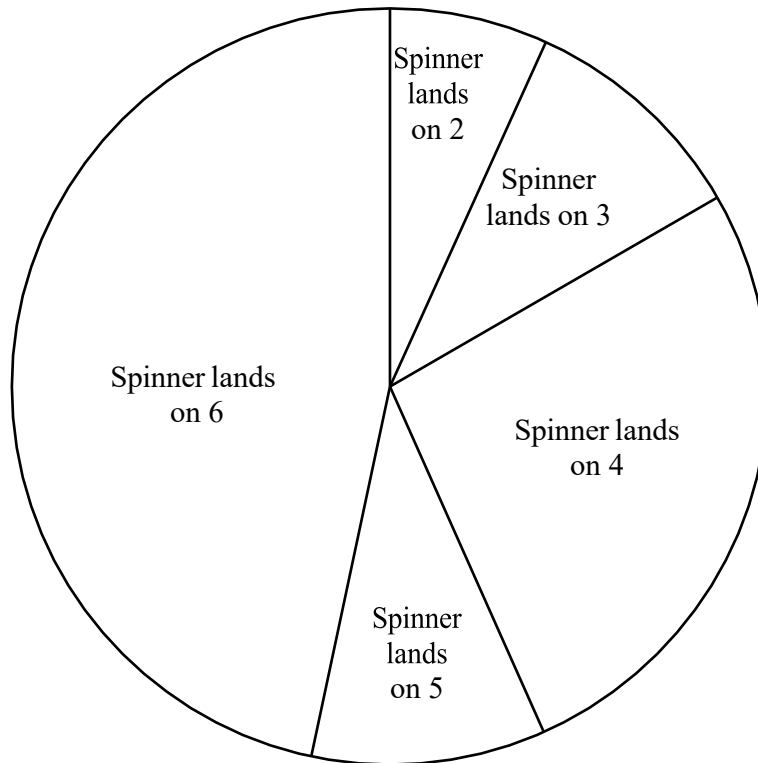
[1]

(b) Find the sector angle for the number 6.

$$\frac{5}{20} \times 360 = 90$$

$$90 \quad [2]$$

- (c) Joel asks 30 students to guess the number that the spinner will land on next. This pie chart show the results.



- (i) The sector angle for the number 6 is 168° .

How many students guessed the number 6?

$$\frac{168}{360} \times 30 = 14$$

..... 14 [2]

- (ii) Find the percentage of the students who guessed a number **less than 5**.

Angle for (2, 3, 4) = 156 by measurement,

$$\frac{156}{360} \times 100 = 43.3 \text{ to 3 s.f.}$$

..... 43.3 % [3]

- (iii) Joel spins the spinner.
10% of the students guessed correctly.

Which number did the spinner land on?

$$\frac{10}{100} \times 360^\circ = 36^\circ \text{ so number 5 by measuring.}$$

..... 5 [2]

Examiner comment

Question 3

- (a) (i) Many candidates will be able to do this mentally. It is advisable to write down the odd numbers that are on the spinner first. 1/1
- (ii) Many candidates will be able to do this mentally. It is advisable to write down the prime numbers that are on the spinner first. 1/1
- (iii) Knowledge that an impossible event has a probability of 0 is required. 1/1
- (b) (i) Throughout this part, candidates need to appreciate and understand the given table. In part (i) the fact that the mode comes from the highest frequency needs to be known. 1/1
- (ii) It is strongly recommended that the full working to find the mean is shown. A first Method mark is given for correct working to find the total, with a second Method mark given for the subsequent division by 20. There is a Special Case mark for 57.5 which comes from incorrect use of the calculator of $6 + 6 + 24 + 20 + 30 \div 20$. 3/3
- (iii)(a) As this is a 'show that' question the full working must be shown as justification. For example, working of just 3×18 is not sufficient to be awarded the mark. 1/1
- (iii)(b) Again, the full working is desirable. In this part a Method mark is awarded for $\frac{5}{20} \times 360$ or 5×18 , or for a partial method of $\frac{5}{20}$ or $\frac{360}{20}$ or 18 seen. 2/2
- (c) (i) The standard method is as shown. The alternative ratio method of finding that one student is represented by $360 \div 30 = 12^\circ$ and then $168 \div 12 = 14$ students is equally valid. A part Method mark is awarded for $\frac{168}{360}$ or $\frac{360}{30}$ or 12 seen. 2/2
- (ii) As the sector angle is not given in this part, candidates need to appreciate that this angle needs to be measured first. The fraction $\frac{156}{360}$ can then be converted to a percentage. The alternative of $156 \div 12 = 13$ and then $\frac{13}{30}$ converted to a percentage is equally valid. A part B mark is given for the correct measurement of 156° , and a further Method mark for correctly using 156 or their angle in either method outlined. There is a Special Case mark for an answer of 53.3% which comes from including the number 5 in the angle measurement. 3/3
- (iii) The standard method is as shown. The alternative method of 10% of $30 = 3$, then $3 \times 12 = 36^\circ$ is equally valid. Once this angle has been found, the pie chart needs to be measured to ascertain the answer as the number 5. There is a part Method mark for $\frac{10}{100} \times 360^\circ$ or 36. 2/2

Total mark awarded = 17 out of 17

Question 4

Specimen answers

4 (a) A farmer has 45 horses and 20 cows.

- (i) Write this as a ratio of horses : cows.
Give your answer in its simplest form.

$$45 : 20 = 9 : 4 \quad \text{.....} \quad 9 : 4 \quad [1]$$

- (ii) The farmer wants the ratio of horses : cows to equal 5 : 3.
He keeps his 45 horses and buys some more cows.

Work out the number of cows he must buy.

$$5 : 3 = 45 : 27, \text{ so } 27 - 20 = 7 \text{ more cows} \quad \text{.....} \quad 7 \quad [2]$$

(b) Six years ago the farmer invested \$3750 at a rate of 4% per year compound interest.

- (i) Calculate the total value of his investment after the 6 years.
Give your answer correct to the nearest dollar.

$$3750 \times 1.04^6 = 4744.946319$$

$$\text{Nearest dollar} = 4745 \quad \text{\$} \quad \text{.....} \quad 4745 \quad [3]$$

- (ii) The farmer wants to spend his investment on buying goats.
Goats cost \$126 each.

Work out the maximum number of goats he can buy **and** the amount of money left over.

$$4745 \div 126 = 37.66 \text{ so maximum of } 37 \text{ goats}$$

$$\text{Cost} = 37 \times 126 = 4662$$

$$\text{Amount left over} = 4745 - 4662 = 83$$

$$\begin{array}{r} \text{Number of goats} \quad \text{.....} \quad 37 \\ \text{Amount of money left over \$} \quad \text{.....} \quad 83 \end{array} \quad [4]$$

- (c) The farmer grows carrots.
In 2018 the selling price for carrots was \$96 per tonne.
In 2019 this selling price increased by 18%.

Work out the increase in the selling price from 2018 to 2019.

$$\text{Increase} = \frac{18}{100} \times 96 = 17.28$$

$$\text{\$} \quad \text{.....} \quad 17.28 \quad [1]$$

Examiner comment

Question 4

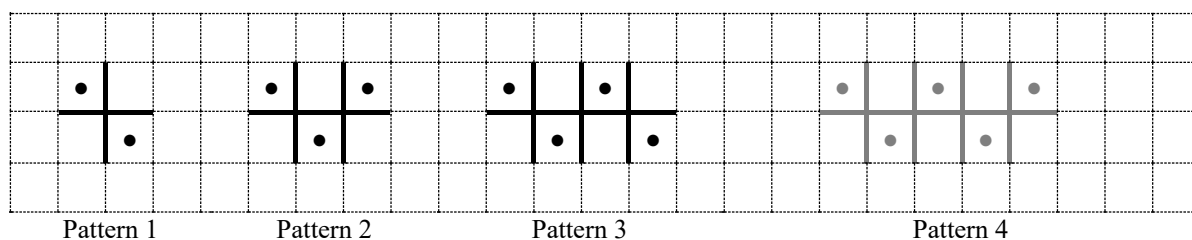
- (a) (i) The initial ratio should then be simplified to its simplest form. 1/1
- (ii) This two-stage method requires the number of cows needed for the given new ratio to be found first. This could be done as $45:3 \times 9$ or $\frac{3}{5} \times 45$ which would be awarded the Method mark. This then needs 20 subtracted to give the number of cows he must actually buy. Candidates are advised to read questions carefully and to answer the actual question set. Common errors are often seen in multi-part questions, in this case leaving the answer as 27. 2/2
- (b) (i) The standard method of using the compound interest formula is expected and shown here. Efficient use of a calculator would then give the correct answer which then needs rounding to the nearest dollar as stated in the question. The total value can be worked out on a year-by-year basis but this is a longer method and often leads to omissions or arithmetic errors. Candidates need to be aware of the difference between 'the total value of the investment' and 'the interest paid on this investment'. A part mark of two is given for the correct method seen or the final answer of 4744.94..., whilst one mark is given for use of 1.04^6 or equivalent. No marks are given for calculating simple interest. 3/3
- (ii) This multi-stage question requires careful reading and clear understanding of the methods to be used before any calculations are done. The first value to find is the number of goats he can buy with his investment, and then to appreciate that the answer of 37.66 means that a maximum of 37 goats can be bought. There are two marks for this part with a Method mark available for $4745 \div 126$ or a follow through of their answer in part (i) $\div 126$. The next step is to find the amount paid by doing the relevant multiplication. The final step is then to find the amount of money left over by doing the relevant subtraction. There are two marks for this part with a Method mark available for the full method either correct or with follow through values. It is strongly recommended that candidates treat such questions as a series of steps to be done and that the working for each step is clearly shown. 4/4
- (c) The standard method of finding a percentage of a quantity is expected and shown here. Efficient use of a calculator would then give the correct answer which, as it is an exact money answer, should not be rounded. 1/1

Total mark awarded = 11 out of 11

Question 5

Specimen answers

- 5 A sequence of patterns is made using lines and dots.
The first three patterns in the sequence are shown below.



- (a) Draw Pattern 4 on the grid. [1]

- (b) Complete the table.

Pattern	1	2	3	4		10
Number of dots	2	3	4	5		11
Number of lines	4	7	10	13		31

[4]

- (c) Find an expression, in terms of n , for

- (i) the number of dots in Pattern n , $n + 1$ [1]

- (ii) the number of lines in Pattern n .

1	2	3	4		Or	$a + (n - 1)d$	
4	7	10	13	$3n + 1$		$4 + (n - 1)3$	
3	6	9	12	$3n$		$4 + 3n - 3$	
						$3n + 1$ $3n + 1$ [2]

- (d) A pattern has 76 lines.

Work out how many **dots** are in this pattern.

Using the n th term for lines, $3n + 1 = 76$, $3n = 75$, $n = 25$

Then using the n th term for dots, $n + 1 = 25 + 1 = 26$ 26 [2]

Examiner comment

Question 5

- (a) The required pattern 4 should be completed by considering the three examples given. **1/1**
- (b) Candidates should complete the table for patterns 3 and 4 by counting the dots and lines in the diagrams. The values for pattern 10 can then be found by counting on or by using the sequences generated by patterns 1, 2, 3 and 4. The part marks for this part are two marks for 4, 5, 10, 13 (one mark for any two of these), one mark for 11 and one mark for 31. **4/4**
- (c) (i) Candidates need to realise that in part (c) the answers need to be an expression in terms of n and not numerical. By comparing the patterns with the numbers of dots gives the generalised expression of $n + 1$. **1/1**
- (ii) There are a number of ways to find the required expression in this part, the two most successful of these are shown. A part mark is awarded for either part of the expression being correct. **2/2**
- (d) This multi-stage question requires careful reading and clear understanding of the methods to be used before any calculations are done. The first stage is to find the pattern number which is best done by equating their answer to part (c)(ii) to 76. This stage is awarded a Method mark which can be implied by the correct answer of 25. The second stage is to find the number of dots in this pattern by using their answer to part (c)(i). Counting on to generate a long list of numbers in sequence is not an efficient method and although not penalised if the correct answer is reached, arithmetic errors often occur and the Method part mark is not awarded in this case. **2/2**

Total mark awarded = 10 out of 10

Question 6

Specimen answers

6 (a) Solve these equations.

(i) $x + 7 = 15$

$$\begin{aligned} x &= 15 - 7 \\ x &= 8 \end{aligned}$$

$$x = \underline{\hspace{1.5cm} 8 \hspace{1.5cm}} [1]$$

(ii) $5(3x + 8) = 10$

$$\begin{array}{ll} 3x + 8 = 2 & \text{OR} & 15x + 40 = 10 \\ 3x = 2 - 8 & & 15x = 10 - 40 \\ 3x = -6 & & 15x = -30 \\ x = -2 & & x = -2 \end{array}$$

$$x = \underline{\hspace{1.5cm} -2 \hspace{1.5cm}} [3]$$

(b) A club is arranging transport for its members.

Speedy Coaches charges \$625 plus \$15 per member.

The total cost, in dollars, for x members is given by the expression $15x + 625$.

(i) Sporty Coaches charges \$117 plus \$19 per member.

Write an expression for the total cost, in dollars, for x members.

$$19x + 117$$

$$\underline{\hspace{1.5cm} 19x + 117 \hspace{1.5cm}} [2]$$

(ii) The total cost is the same for both Speedy Coaches and Sporty Coaches.

Write down an equation and solve it to find x .

$$\begin{aligned} 19x + 117 &= 15x + 625 \\ 19x - 15x + 117 &= 625 \\ 4x + 117 &= 625 \\ 4x &= 625 - 117 \\ 4x &= 508 \\ x &= 127 \end{aligned}$$

$$x = \underline{\hspace{1.5cm} 127 \hspace{1.5cm}} [3]$$

Examiner comment

Question 6

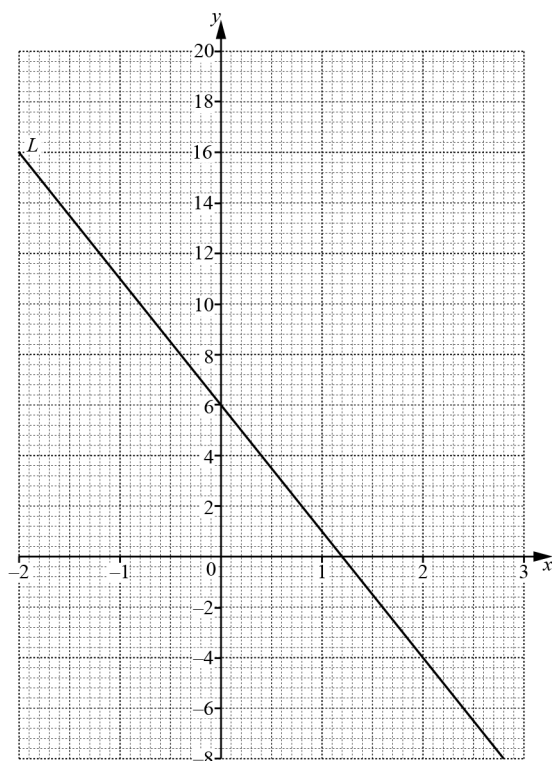
- (a) (i) Many candidates will be able to do this mentally. It is advisable to write down the working as shown. **1/1**
- (ii) This second equation requires a multi-step solution and so the clear setting out of each step is highly recommended. The two standard methods are shown. There is a Method mark for a correct first step, and a further Method mark for a second correct step. **3/3**
- (b) (i) Candidates should read and use the example given to write a similar expression for Sporty Coaches. There is a part mark for either part of the expression being correct. **2/2**
- (ii) The important part for candidates is the statement ‘the total cost is the same’, which would then enable them to write down the equation connecting the two expressions. This equation, either correct or correct follow through, is a necessary and stated part of the question and has to be seen to be awarded the first mark. The equation can then be solved using standard techniques for the remaining two marks. A Method mark is awarded for a correct first step of their equation. **3/3**

Total mark awarded = 9 out of 9

Question 7

Specimen answers

7



- (a) The line L is shown on the grid.

Find the equation of the line in the form $y = mx + c$.

$$m = \text{gradient} = \frac{\text{change in } y}{\text{change in } x} = \frac{16 - -4}{-2 - 2} = \frac{20}{-4} = -5,$$

$c = \text{intercept} = 6$ (from diagram)

$$y = \underline{\quad -5x + 6 \quad} \quad [3]$$

- (b) (i) Complete the table of values for $y = x^2 + 2x + 4$.

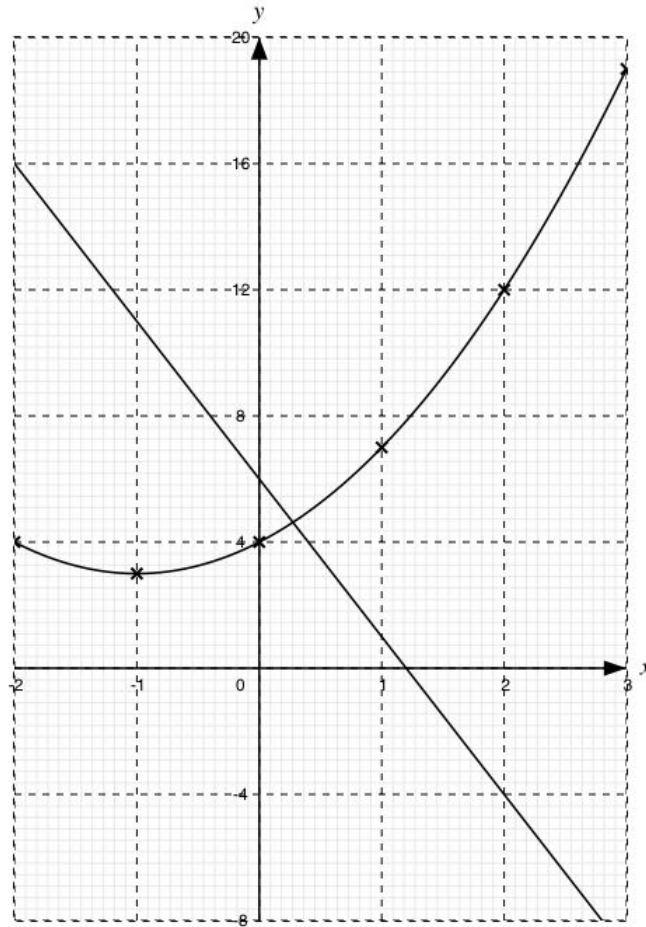
x	-2	-1	0	1	2	3
y	4	3	4	7	12	19

$$2^2 + 2 \times 2 + 4 = 12, \quad (-1)^2 + 2 \times -1 + 4 = 3$$

[2]

- (ii) On the grid, draw the graph of $y = x^2 + 2x + 4$ for $-2 \leq x \leq 3$

[4]



- (c) For $-2 \leq x \leq 3$, write down the x -coordinate of the point of intersection of the line L with the curve $y = x^2 + 2x + 4$.

Reading from graph

$x =$ 0.25 [1]

Examiner comment

Question 7

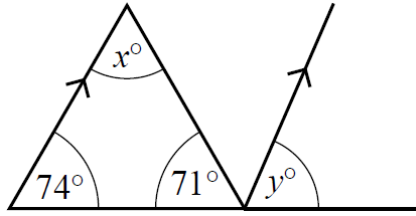
- (a) Candidates should show their working for the rise/run calculation to find the gradient and indicate the coordinates used. Part marks of B2 are awarded for the correct calculation of the gradient, and B1 for the correct identification of the intercept or correct method to find the gradient. **3/3**
- (b)(i) Many candidates will be able to do this mentally or by use of a calculator. It is advisable to write down the working as shown. Each correct value is awarded a mark. **2/2**
- (ii) A correct curve should be a smooth continuous curve that passes through the six correctly plotted points. Part marks of 3, 2 or 1 are available dependent on the number of correctly plotted points with a follow through applied from part (b)(i). **4/4**
- (c) Candidates are expected to read off the required value from their graph and to be as accurate as possible given the scale used. It is not advisable to attempt the algebraic equation at this stage. **1/1**

Total mark awarded = 10 out of 10

Question 8

Specimen answers

8 (a)



NOT TO SCALE

Work out the value of

(i) x ,

$$180 - (74 + 71) = 180 - 145 = 35$$

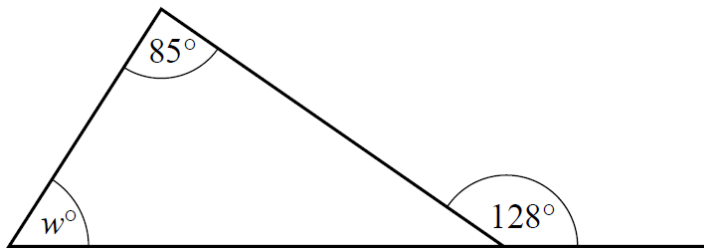
$$x = \underline{\hspace{2cm} 35 \hspace{2cm}} [1]$$

(ii) y ,

corresponding angles are equal

$$y = \underline{\hspace{2cm} 74 \hspace{2cm}} [1]$$

(b)



NOT TO SCALE

Work out the value of w .
Give reasons for your answer.

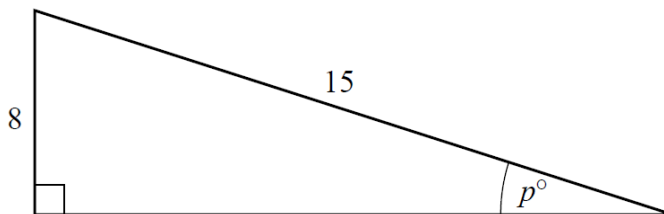
$$128 - 85 = 43$$

Or

$$180 - 85 - (180 - 128) = 180 - 85 - 52 = 43$$

$w = \underline{\hspace{1cm} 43 \hspace{1cm}}$ because the exterior angle of a triangle equals the sum of the interior opposite angles (Or: the angles on a straight line sum to 180 and then the angles in a triangle sum to 180)[3]

(c)



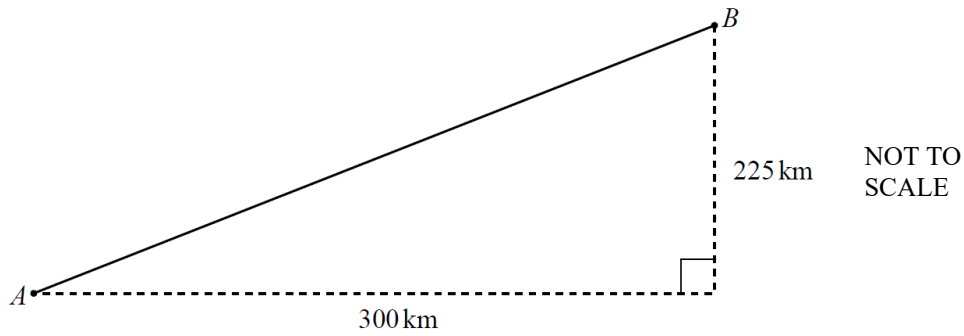
NOT TO SCALE

Use trigonometry to calculate the value of p .

$$\sin p = 8 \div 15 = 0.53333, \quad p = \sin^{-1} 0.53333, \quad p = 32.23, \\ p = 32.2 \text{ to 1 decimal place}$$

$$p = \underline{\hspace{2cm} 32.2 \hspace{2cm}} [2]$$

- (d) The diagram shows the path of a plane from airport A to airport B .



- (i) Show that the distance between A and B is 375 km.

$$AB^2 = 300^2 + 225^2$$

$$AB = \sqrt{(300^2 + 225^2)} \quad [= \sqrt{90000 + 50625} = \sqrt{140625}]$$

$$AB = 375$$

shown

[2]

- (ii) The plane flies at an average speed of 450 km/h.
It leaves A at 14 45 and flies directly to B .

Work out the time the plane arrives at B .

$$T = \frac{D}{S} = \frac{375}{450} = 0.833333$$

$$0.833333 \text{ hours} = 0.833333 \times 60 \text{ minutes} = 50 \text{ minutes}$$

$$\text{arrives at } 1445 + 50 \text{ mins} = 1535$$

.....1535 [4]

Examiner comment

Question 8

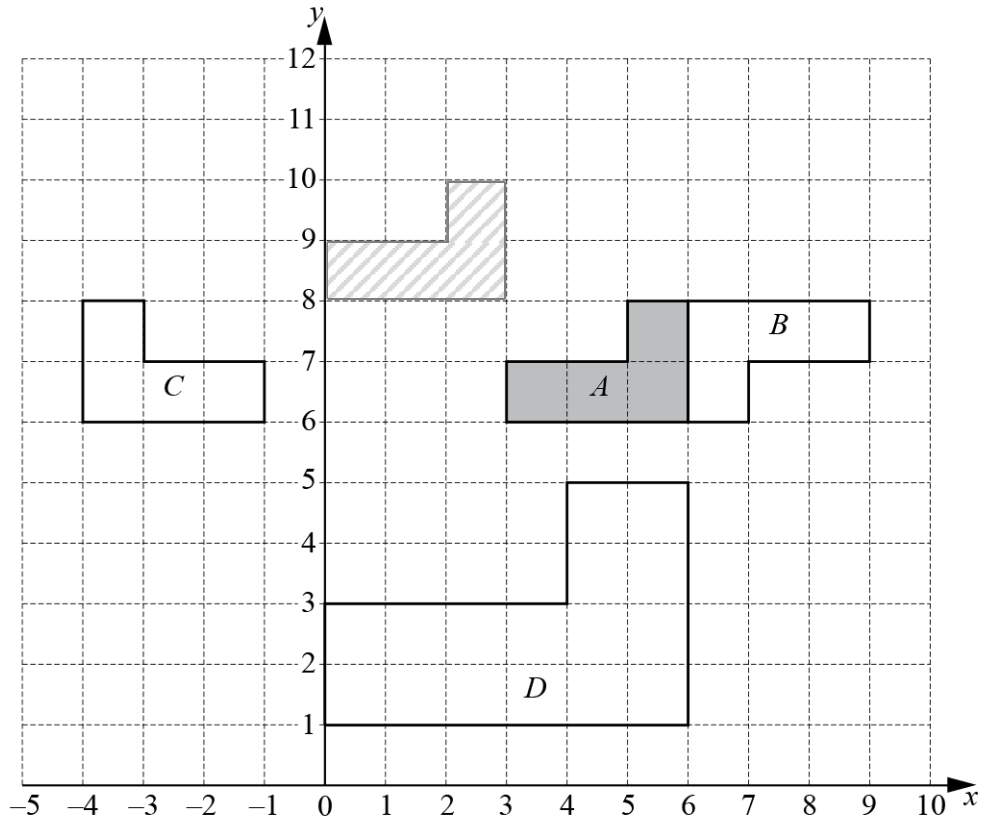
- (a) (i) Many candidates will be able to do this mentally or by use of a calculator. It is advisable to write down the working as shown. **1/1**
- (ii) The most efficient method here is to recognise the corresponding angles and write down the answer accordingly. Longer methods are equally valid. **1/1**
- (b) Many candidates will be able to work out the value of w mentally or by use of a calculator. It is advisable to write down the working as shown. Part marks of B2 are awarded for this correct value of $w = 43$, or M1 for a correct step in the calculation such as $180 - 128$ or $128 - 85$. The reasons given should be written clearly and fully: the two standard responses are shown. A part mark of B1 is awarded for a correct explanation. **3/3**
- (c) The standard method using the sine ratio is shown, and candidates are strongly advised to show all their working. Efficient use of a calculator is recommended to avoid the premature approximation of values which can often lead to an inaccurate answer and the loss of the final accuracy mark. A part Method mark is awarded for the correct first step of $\sin p = 8 \div 15$. **2/2**
- (d) (i) This is a 'show that' question and so the working should show complete justification with the values of 300 and 225, their squaring, the addition and the square root all clearly shown. The intermediary working could be written down as part of the working but is insufficient on its own. A part Method mark is available for the correct first step of $300^2 + 225^2$, although $90\,000 + 50\,625$ on its own would not get this mark for the reasons stated above. **2/2**
- (ii) Again this multi-stage question requires careful reading and clear understanding of the methods to be used before any calculations are done. The first stage is to find the time taken for the flight for which the standard method of $T = D \div S$ is shown. This is awarded the first Method mark. The second stage requires the conversion of this flight time to minutes with care taken to give the correct and accurate answer of 50 minutes. This is awarded the second Method mark. Premature approximation or inefficient use of the calculator will often lead to answers such as $0.8 \times 60 = 48$. The third and final stage is to use the time of departure with this flight time to find the time of arrival. This is awarded the third Method mark. It is strongly recommended that candidates treat such questions as a series of steps to be done and that the working for each step is clearly shown. **4/4**

Total mark awarded = 13 out of 13

Question 9

Specimen answers

9



The diagram shows four shapes *A*, *B*, *C* and *D*.

(a) Describe fully the **single** transformation that maps shape *A* onto

(i) shape *B*,

rotation, 180° , centre (6,7)

[3]

(ii) shape *C*,

reflection, in $x = 1$

[2]

(iii) shape *D*.

enlargement, Scale Factor = 2, centre (6,11)

[3]

- (b) On the grid, draw the image of shape A after a translation by the vector $\begin{pmatrix} -3 \\ 2 \end{pmatrix}$. [2]
- (c) Which shapes, if any, are congruent to shape D ?
Give a reason for your answer.

..... None are congruent to D as they are all a different size to D [1]

Examiner comment

Question 9

- (a) Candidates should be aware that a single transformation is required throughout this part. A combination of transformations will not be awarded any marks.
- (i) The full description requires the transformation to be correctly identified as a rotation, its angle of rotation stated and the centre of rotation stated. Part marks are awarded for each correct statement. **3/3**
- (ii) The full description requires the transformation to be correctly identified as a reflection and its line of reflection stated. Part marks are awarded for each correct statement. **2/2**
- (iii) The full description requires the transformation to be correctly identified as an enlargement, the scale factor and the centre of enlargement stated. Part marks are awarded for each correct statement. **3/3**
- (b) The correct translation should be drawn clearly on the diagram with care taken that the correct directions are used as indicated by the translation vector. A part mark of B1 is awarded if a translation with one correct direction is drawn. **2/2**
- (c) Candidates need to be aware of the definition for congruent shapes and to use this in their written reason. There are a number of equivalent reasons which could be given and are acceptable for the mark to be awarded. It is worth noting that mathematical reasons are required. **1/1**

Total mark awarded = 11 out of 11

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