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OCR
Oxford Cambridge and RSA

GCSE (9-1)

Examiners' report

MATHEMATICS

J560
For first teaching in 2015

J560/02 Summer 2019 series

Version 1

Contents

Introduction

Our examiners' reports are produced to offer constructive feedback on candidates' performance in the examinations. They provide useful guidance for future candidates. The reports will include a general commentary on candidates' performance, identify technical aspects examined in the questions and highlight good performance and where performance could be improved. The reports will also explain aspects which caused difficulty and why the difficulties arose, whether through a lack of knowledge, poor examination technique, or any other identifiable and explainable reason.

Where overall performance on a question/question part was considered good, with no particular areas to highlight, these questions have not been included in the report. A full copy of the question paper can be downloaded from OCR.

Paper 2 series overview

This non-calculator paper is the second of the three papers taken by Foundation candidates for the GCSE (9-1) Mathematics specification.

The paper was accessible to almost all candidates with a higher proportion of marks above 70 attained than in June 2018. The number of instances where no response was offered was very low, and was only significant on Q19 and Q20 which may have indicated that a small number of candidates ran out of time.

Three questions required candidates to interpret/explain results and four questions required comments relating to the context. Some found it difficult to express their ideas in correct mathematical language, but showing coherent methods is essential in multiple mark questions. The vast majority of candidates made efforts to show their working and make themselves understood. Presentation in questions worth a large number of marks, such as Q18, is improving with many setting out their work logically. There are still a significant number of candidates whose methods were not always written clearly and some handwriting, especially figures, was difficult to decipher. It is clear on occasion that candidates were confused by their own work and misread their own figures.

Basic arithmetic skills were sometimes unreliable. Many simple errors arose with multiplication and division and the latter was often spoiled by dividing the denominator by the numerator. Some candidates attempted divisions by carrying out repeated addition, this can be time consuming and if an error is made a method mark is lost.

Working algebraically is still an area that candidates find challenging. This was evident in questions on simplifying expressions and rearranging formulae (Q10) and using algebra to determine angles (Q20). Other areas for development of understanding: working with fractions (Q3 and Q19); ×/÷ decimals (Q4); powers and roots (Q5); metric/imperial conversion (Q12); calculating percentage profit and reverse percentages (Q15); some aspects of probability (Q17).

It is important that candidates refer back to the wording of a question to check whether their answers are reasonable. This was particularly highlighted in Q12, the extremes of which were heights of Kate = 14 inches and Alice = 24 inches, while another stated Alice as 11ft 2in.

Question 1 (a) (i)

1 **(a)** Work out.

(i) £4.25 + £5.18

(a)(i) £ ..... **[1]**

This was very well answered.

Question 1 (a) (ii)

(ii) $^{-}8 + 11$

(ii) ..... **[1]**

This was also very well answered, with the occasional $^{-}19$ coming from $^{-}8 - 11$.

Question 1 (a) (iii)

(iii) $^{-}6 \times {}^{-}9$

(iii) ..... **[1]**

Good multiplication of the numbers, but it was common to see $^{-}54$ which demonstrated a difficulty in dealing with negative signs.

Question 1 (b) (i), (ii) and (iii)

(b) Use one of these symbols $<$, $>$ or $=$ to make each statement true.

(i) 4.5 ..... 4.34 **[1]**

(ii) $\frac{3}{4}$ ..... 0.8 **[1]**

(iii) $\frac{3}{5}$ ..... 0.6 **[1]**

No conversion was needed to compare the values and so part (b)(i) was most often correct. In part (b)(ii) where $\frac{3}{4} = 0.75$ was seen in working the correct inequality was used. If candidates scored 0 in part (b)(i) they generally also got parts (b)(ii) and (b)(iii) wrong.

Question 2

2 By rounding each value to one significant figure, estimate the cost of 3.9 kg of apples at 87p per kg.

£ ..... **[2]**

Many candidates were able to round 3.9 to 4; less common was a correct attempt to round 87p to one significant figure. Therefore, 4 × 87 was a very common method leading to an answer of 3.48, and this earned 1 mark. When 4 × 90 was stated, a few candidates forgot to convert from pence to pounds giving an answer of 360, this earned 1 mark. Time was lost by candidates attempting to multiply 3.9 by 87, some then rounded their answer; others did 3 lots of 87 'plus a bit' to give an approximate value.

Question 3 (a) (i)

3 **(a)** Complete each statement.

(i) $\frac{3}{7} = \frac{\ldots\ldots}{28}$ **[1]**

This was often correct. 21 was a common error.

Question 3 (a) (ii)

(ii) $4\frac{1}{2} = \frac{\ldots\ldots}{2}$ **[1]**

This was not as well answered, the common error being 4 + 1 to give a numerator of 5 or a numerator of 7 from 4 + 1 + 2.

Question 3 (b)

(b) Work out.

$\frac{2}{3} - \frac{1}{5}$

(b) ..... **[2]**

Where equivalent fractions were used, sometimes only one of the numerators was correctly calculated. A very common error was $\frac{1}{2}$ from just subtracting the given numerators and denominators. Other candidates demonstrated knowledge of other operations with fractions with incorrect answers of $\frac{2}{15}$ from multiplying, $\frac{3}{15}$ from incorrect or missing equivalent fractions, $\frac{10}{3}$ from dividing and $\frac{13}{15}$ from adding. Some candidates adopted a type of grid method but unless fully correct, as no equivalent fractions were seen, this method earned 0 marks.

Question 4 (a)

4 Work out.

(a) 0.7×0.3

(a) ..... **[1]**

A common wrong answer was 2.1 or, to a lesser extent, 0.021. This part was answered far better than part (b).

Question 4 (b)

(b) $0.48 \div 6$

(b) ..... **[1]**

In this part, many candidates obtained the correct figure of 8 but had problems with the placement of the decimal point. A common wrong answer was 0.8, and errors were seen in attempting 48 ÷ 6.

Question 5 (a) (i)

5 **(a)** Complete the following.

(i) $5^2 =$ ..... **[1]**

This was very well answered. The most common error was 10. The mark was also lost for incomplete processing, such as leaving the answer as 5 × 5.

Question 5 (a) (ii)

(ii) $\sqrt[3]{64}$ = ... **[1]**

This was one of the least well answered questions on this paper and some candidates did not attempt it. The main errors seen were finding the square root of 64, dividing by 3 to give 21.3, 21.1 or 21 r 1, multiplying 64 by 3, $\sqrt{64} \times 3$ or attempting 64^3. Where the correct answer was known the mark was occasionally lost by writing 4 × 4 × 4 on the answer line.

Question 5 (b)

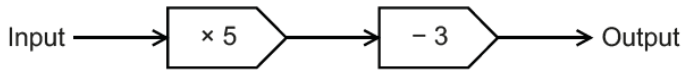
(b) Work out $2^3 \times \sqrt{49}$.

(b) ..... **[2]**

Many correct responses were seen. Many other candidates gained a method mark for one correct value of 8 or 7 but not both, so 6 × 7 or 8 × 49 were sometimes seen. A few stated 8 × 7 but gave an incorrect product such as 54. Candidates were more successful in evaluating the 2^3 rather than $\sqrt{49}$. A common error in calculating 2^3 came from 2 × 2 = 4 then 4 × 4 = 16. Common errors from lower ability candidates were evaluating 2^3 as 6 or treating the square root symbol as a division sign.

Question 6 (a) (i)

6 Here is a function machine.



(a) (i) Find the output when the input is 7.

(a)(i) ..... **[1]**

This was often correct and errors were a result of inaccurate multiplication.

Question 6 (a) (ii)

(ii) Find the input when the output is 42.

(ii) ..... **[2]**

While a lot of candidates answered this part well, the most common error was to use 42 as the input and consequently 42 × 5 – 3 was calculated. Arithmetic errors such as 45 ÷ 5 = 8 lost the accuracy mark and some candidates only reversed one of the operations finding 42 – 3 then ÷ 5, or 42 + 3 then × 5.

Question 6 (b)

(b) The input is x and the output is y.

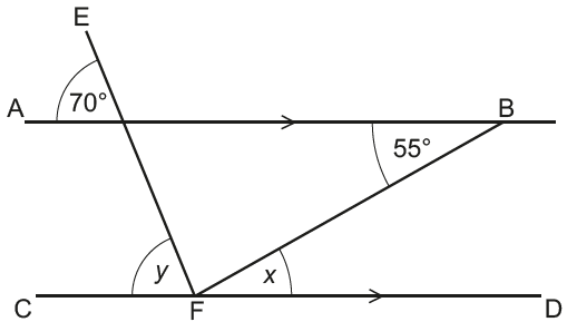
Write an equation for y in terms of x.

(b) ..... **[2]**

This was the least successful part. Very often the accepted answers were in the format $y = x \times 5 - 3$ from the literal interpretation of the given flow diagram or $x \times 5 - 3 = y$ rather than the format $y = 5x - 3$. Among the most frequent incorrect answers were $y \times 5 - 3 = x$, $x = \times 5 - 3 = y$ and examples such as $x \rightarrow \times 5 \rightarrow - 3 \rightarrow y$ in place of an equation.

Question 7

7 AB and CD are parallel lines.
EF and FB are straight lines.



Not to scale

Complete the following statements.

$x = 55°$ because .....

$y = 70°$ because ..... **[2]**

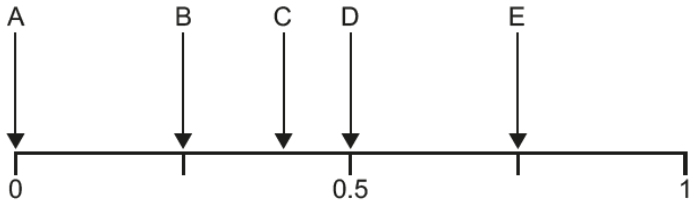
Z angles and F angles were often seen instead of the correct words. 'Corresponding' appeared to be a difficult word to recall. Many answers just referred to parallel lines while some mentioned opposite angles, angles on a straight line, or isosceles. Those candidates able to identify the words "alternate" and "corresponding" often had them reversed.

Question 8 (a) (i)

8 Darren has these 20 crayons in a box:

- 8 blue
- 4 red
- 5 black
- 3 green.

(a) He chooses a crayon at random from the box.



Which arrow shows the probability that this crayon is

(i) blue,

(a)(i) Arrow ..... **[1]**

Many candidates identified blue as the majority colour but not that 8 was less than half of 20 and so gave the answer E.

Question 8 (a) (ii)

(ii) yellow,

(ii) Arrow ..... **[1]**

Almost all candidates correctly identified the probability of yellow as 0 and stated the correct position for this.

Question 8 (a) (iii)

(iii) **not** black.

(iii) Arrow ..... **[1]**

Those candidates who stated E in part (a)(i) generally answered C for this part. Some candidates gave multiple answers such as A, B, C, E or B, C, D.

Question 8 (b)

(b) Darren buys 16 more crayons that are either blue or red.
He puts these in the box with the 20 crayons he already has.

He now picks a crayon at random from the box.
The probability that he picks a **blue** crayon is evens.

How many **red** crayons did he buy?

(b) ..... **[3]**

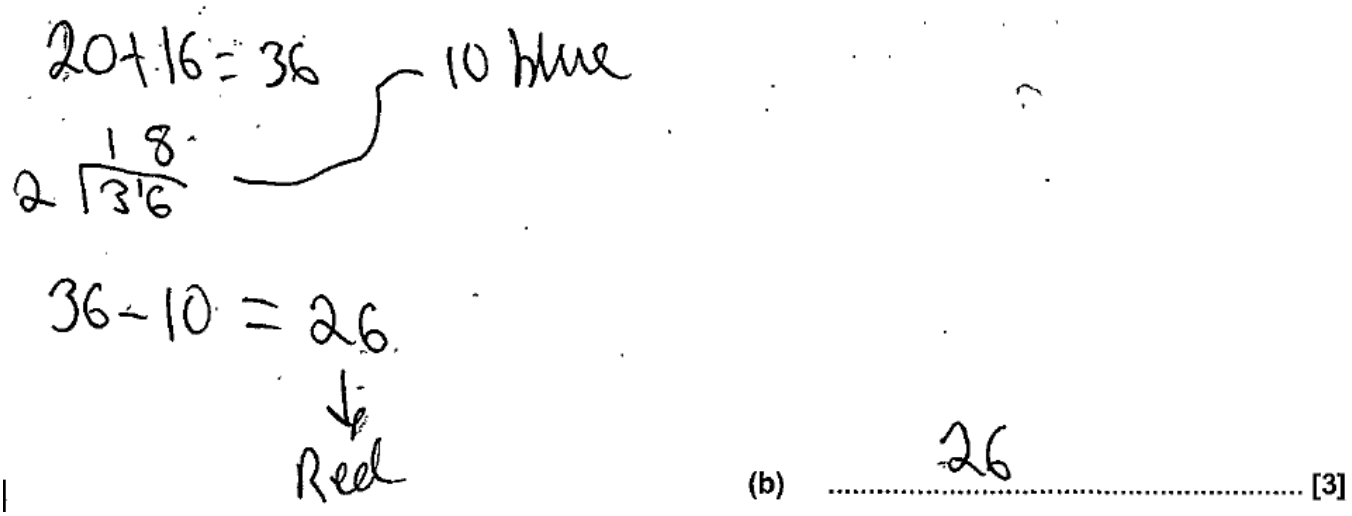
A very common misconception was to think the number of red crayons and the number of blue crayons should be even without considering the other colours or the total number of crayons. Therefore, many candidates did 'total number of blue and red crayons (12 + 16)' ÷ 2 rather than 'total number of crayons' ÷ 2 as a first step. This resulted in stating that 14 blues and 14 reds were needed leading to an answer of 10 more reds. Others decided the 16 new crayons were to be shared equally leading to an incorrect answer of 8.

Where candidates correctly identified that number of blue crayons = 36 ÷ 2, this was often the only mark achieved with very few going on to score further.

A successful but much less common correct method was to consider 'blues' versus 'non-blues', i.e. if 18 out of 36 are blue, then 'non-blue' = 18 – (4 + 5 + 3) = 6 reds bought.

Some work was difficult to follow so figures of 10 were seen but not clearly identified. A few candidates gave 10 on the answer line with no working shown and therefore scored 0 marks. This may have represented 10 'total reds', but without explanation had to be marked as 10 'more reds' which was incorrect.

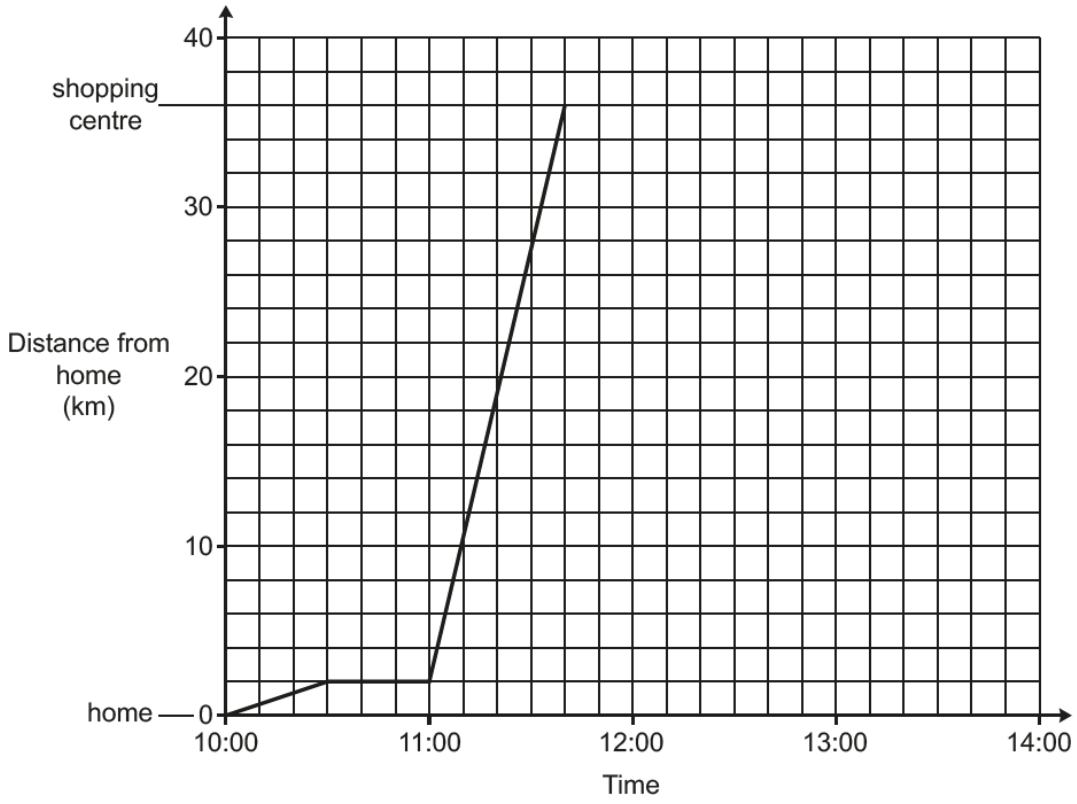
Exemplar 1



M2 is given as the candidate has found $\frac{20+16}{2}-8$ in separate steps. Subtract 8 is not seen but 10 has been identified as 'blue' so the subtraction can be assumed.

Question 9 (a)

9 The graph shows Sarah's journey from her home to a shopping centre.



(a) State an assumption that has been made when the graph was drawn.

.....

..... **[1]**

Very few candidates were able to identify the assumption that when Sarah travelled it was at a constant speed. Many described different parts of the journey such as a break, or referred to mode of transport or traffic conditions as opposed to assumptions made to plot the graph. A few candidates that referred to constant speed implied the whole journey which spoiled the answer.

Question 9 (b)

(b) What is the distance from Sarah's home to the shopping centre?

(b) ..... km **[1]**

While the correct answer was usually seen, 35 or 38 also appeared a number of times.

Question 9 (c)

(c) Between which two times did Sarah stop?
Explain how the graph shows this.

From ..... to ..... shown on the graph by .....

.....

..... **[2]**

The majority of candidates identified the correct time interval. Correct statements mentioned a line that was horizontal, flat, or went across without moving up or down. A few described how time moved on while distance stayed the same. Non-scoring comments often referred to a straight line with no realisation of the fact that all the lines were straight and therefore it was important to state that this line was also horizontal. Some called it a constant line or referred to not moving or stationary.

Question 9 (d) (i)

(d) (i) Sarah stays at the shopping centre until 13:00.
She then travels home without stopping.
Her journey home takes 40 minutes.

Complete the graph to show this information. **[3]**

Many fully correct graphs completed with ruled lines were seen. Some candidates misread the scale and had a one square error at 1300/1340 while others did not always reach the time axis with their sloping line. A few did not draw the horizontal line and others returned home immediately on reaching the shopping centre.

Question 9 (d) (ii)

(ii) Work out Sarah's average speed for her journey home.
Give your answer in kilometres per hour.

(d)(ii) ..... km/h **[3]**

It was rare to see the correct answer. An efficient method of 36 km in 40 mins, 18 km in 20 mins, 36 + 18 in 1 hour was sometimes seen. Those candidates that identified they should divide distance by time stated $\frac{36}{40}$ but could often not carry out this calculation fully, or reversed the numbers when using the bus stop method therefore calculating 40 ÷ 36. Some realised they needed to convert the time units but often stated 40 mins = 0.6 hours rather than using a more accurate figure. Others multiplied distance by time.

Question 10 (a) (i)

10 (a) Simplify fully.

(i) $3t + 5u - 2t + 3u$

(a)(i) ..... **[2]**

Candidates showed a good understanding of simplifying expressions as many correctly stated $t + 8u$. A notable number showed a correct simplification which was then spoiled on the answer line by stating $9tu$. Some struggled to deal correctly with the negative sign, resulting in common incorrect terms of $5t$ or ^-t and ^-8u.

Question 10 (a) (ii)

(ii) $6a \times 2a^2$

(ii) ..... **[2]**

About $\frac{1}{3}$ of candidates answered this question correctly, of the errors made the power of a was more often incorrect than the integer part of the answer. Another common error was an integer of 24 from squaring 2 rather than squaring a, and sometimes the working $6a \times 4a$ was seen but this was followed by $24a$ as much as $24a^2$.

Question 10 (b)

(b) Make x the subject of the formula $y = x^2 - 1$.

(b) ..... **[2]**

Turn over

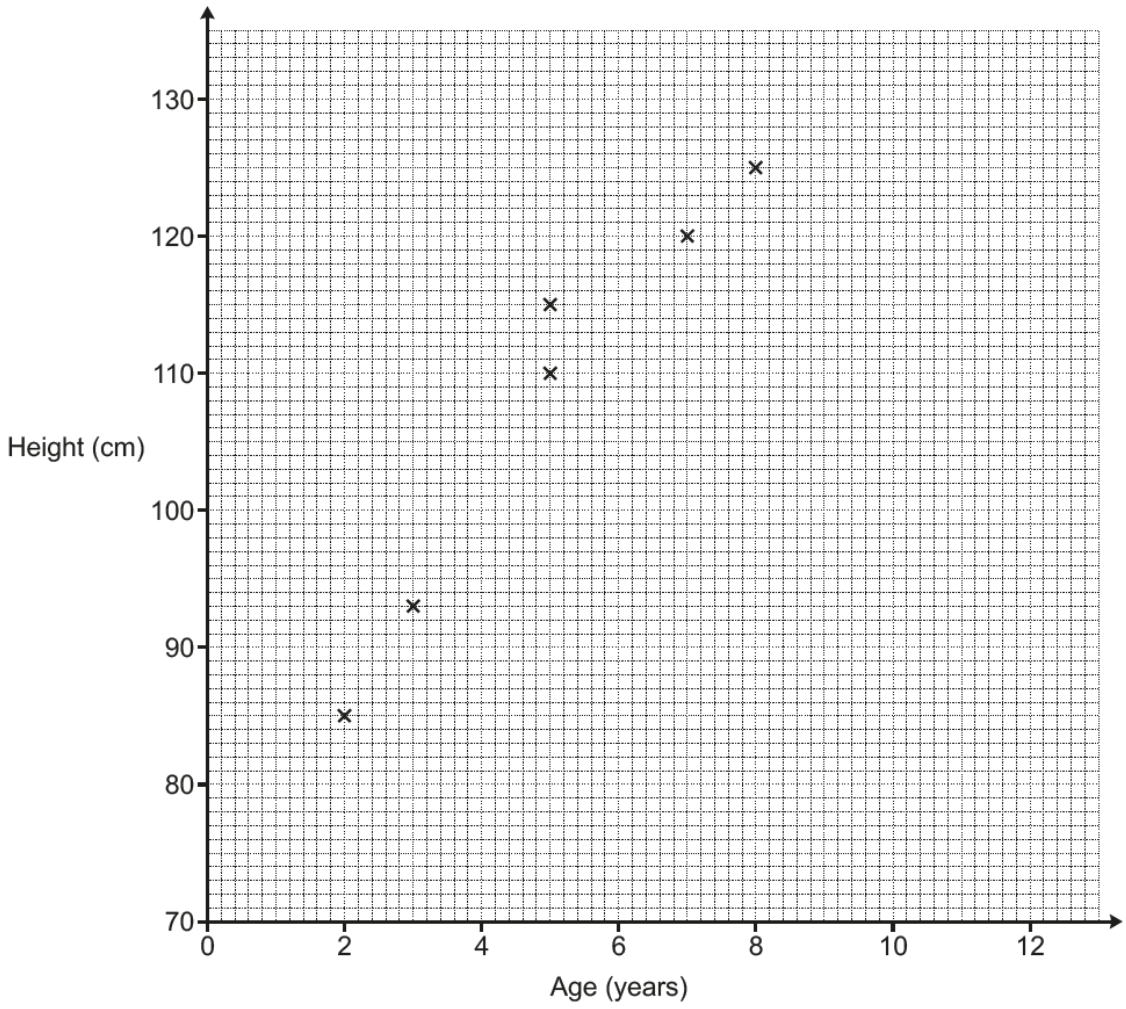
This posed a greater level of difficulty with only a minority of candidates achieving 2 marks. The few that managed the first manipulation struggled with the inverse of squaring and a number stopped at answers of $x^2 = y + 1$. Others attempted to go further by dividing by 2 or by x rather than finding the square root. Some gave the answer $x = \sqrt{y} + 1$ indicating a probable correct first step but not an understanding that y and + 1 both needed to be square rooted. However, this was often without working shown so as the step of $x^2 = y + 1$ was not seen the method mark could not be given. A lot of responses just placed the $^-1$ on the opposite side of the equation and a common answer came from swapping over x and y thus $x = y^2 - 1$.

Question 11 (a)

11 A doctor records the ages, in years, and the heights, in centimetres, of 10 girls.

Age (years)	2	5	3	7	5	8	3	6	9	4
Height (cm)	85	115	93	120	110	125	90	117	127	103

The points for the first six girls are plotted on the scatter diagram.



(a) Plot the points for the remaining four girls. **[2]**

Generally all four points were plotted correctly by most candidates. There was occasional inaccuracy particularly in the plotting of (6, 117) and (9, 127). A few plotted only three of the four points.

Question 11 (b)

(b) Describe the type of correlation shown in the scatter diagram.

..... **[1]**

While this was generally well answered, common errors were to describe the relationship rather than state the type of correlation. Very few candidates gave the answer 'negative', and a small number described the correlation as 'increasing' or 'scattered'.

Question 11 (c)

(c) The doctor says that by using a line of best fit on the scatter diagram, the height of a 6-year-old girl is around 95 cm.

Does the scatter diagram support the doctor's statement?
Explain your reasoning.

.....

..... **[2]**

Quite a few candidates answered this question without drawing a line of best fit. The majority who drew a line did so within acceptable parameters. Others drew the line too short, and some too steeply to be acceptable. The vast majority of responses correctly concluded that the statement was not supported but reasons given varied in clarity and accuracy. Some referenced a line they had not drawn, others referred to the diagram itself and often stated the height for a 6 year old that was either estimated or based on the single point plotted on the diagram. Where a line of best fit had been drawn, most responses correctly referenced the point on their line, with only a few inaccuracies. Where candidates justified their conclusion with reference to different ages, most successfully identified an age more appropriate for the given figure of 95 cm.

Question 11 (d)

(d) Explain why the scatter diagram and line of best fit should not be used to estimate the height of a 12-year-old girl.

.....

..... **[1]**

This was not answered well with many candidates not realising that it was about the lack of relevant data, or the trend not continuing beyond the given data. Most correct responses concluded that there was no data for 12 year olds or the given data only covered up to 9 years. Common errors referred to the graph not being big enough or to rate of growth or puberty or statements such as 'everybody is a different height'.

Question 12

12 Kate is 5 feet 2 inches tall.
Alice is 1.57 metres tall.
Alice says that she is taller than Kate.

Use the conversions below to decide if Alice is correct.

12 inches = 1 foot 1 inch = 2.5 centimetres

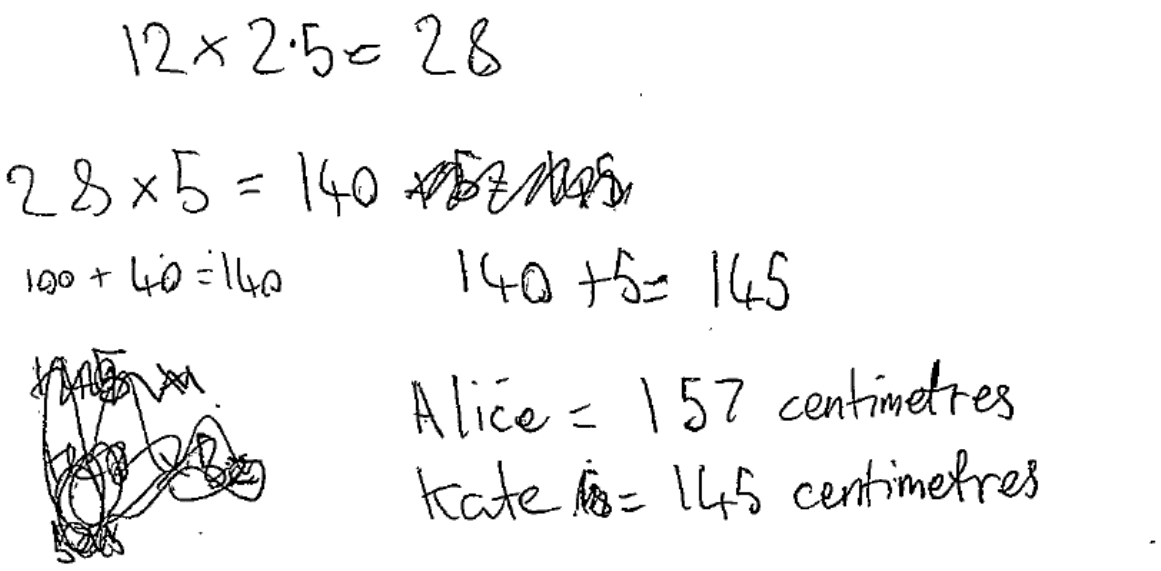
..... **[4]**

This question proved too difficult for many candidates. The most common approach was to attempt to convert 5ft 2in to centimetres, however there was a misconception regarding the conversion table. Many confused the information and used the '12 inches = 1 foot' to convert Kate's 5 feet to inches, but then used the '1 inch = 2.5 cm' for the 2 inches. This led to non-scoring answers of 60 + 2 × 2.5 = 65 inches or 65 cm or 60 inches 5 cm.

The most common scoring responses seen were:
– working leading to 1 mark, 62 inches stated but candidates did not know how to progress from there.
– working leading to 2 marks, 62 × 2.5 often with the wrong answer, or 62 and 157 ÷ 2.5 stated but no progress on the division achieved.

Some candidates attempted to divide 157 by 2.5 starting with dividing 157 by 25. The result of 62.8 was very rare; most were unable to perform the division with any great success. Very few candidates got to a point of two comparable figures, and fewer got to a correct conclusion for their values.

Exemplar 2



In this exemplar, the candidate has converted 1 foot to centimetres first, however they have made an arithmetic error. They have correctly multiplied by 5 and added on 5 cm so their working is equivalent to (5 × 12 + 2) × 2.5 and so scores M1 M1.

Question 13 (a)

13 Rashid is making cupcakes using these ingredients.

Cupcake ingredients

Makes 20 cupcakes

120 g flour

140 g butter

4 eggs

60 g cocoa powder

50 ml of water

(a) How many eggs does he need to make 60 cupcakes?

(a) ..... **[1]**

This was usually correct, however some candidates gave an answer of 8 or 16.

Question 13 (b)

(b) How much butter is needed to make 5 cupcakes?

(b) ..... g **[2]**

A lot of correct answers were seen. The most common error was to divide 140 by 5 with a resulting wrong answer of 28. Some candidates gave the correct method of 140 ÷ 4 but could not do the division.

Question 13 (c)

(c) Rashid has 210 g of cocoa powder and plenty of the other ingredients.
He says that he can make at least 75 cupcakes.

Is he correct?
Explain your reasoning.

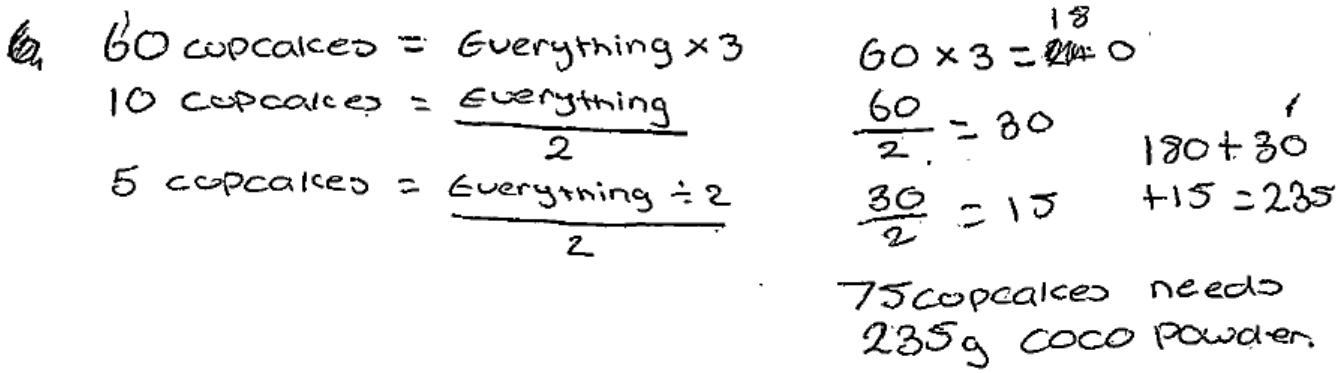
..... **[3]**

A number of candidates attempted this question with well set out working, demonstrating a good level of understanding of how to work through this type of proportion problem. Marks were gained mainly from combinations adding up to 70 cakes rather than by a unitary method.

When using the alternative method (as stated in the mark scheme) a few candidates did not show sufficient working, 225 g was not seen and just 'Rashid would need 15 g more' was stated therefore the question 'Is he correct?' was not sufficiently answered.

Many candidates were comfortable with scaling the 20 cupcakes = 60 g into 40 cupcakes = 120 g and 60 cupcakes = 180 g and 80 cupcakes = 240 g but then made no further progress as they could not see how to deal with the extra 30 g they had used. Some thought the 30 g would produce an extra 5 cupcakes and so their scaling approach scored 0. Others went from 20 = 60 g to 40 = 120 g but then just kept doubling to give 60 = 240 g.

Exemplar 3

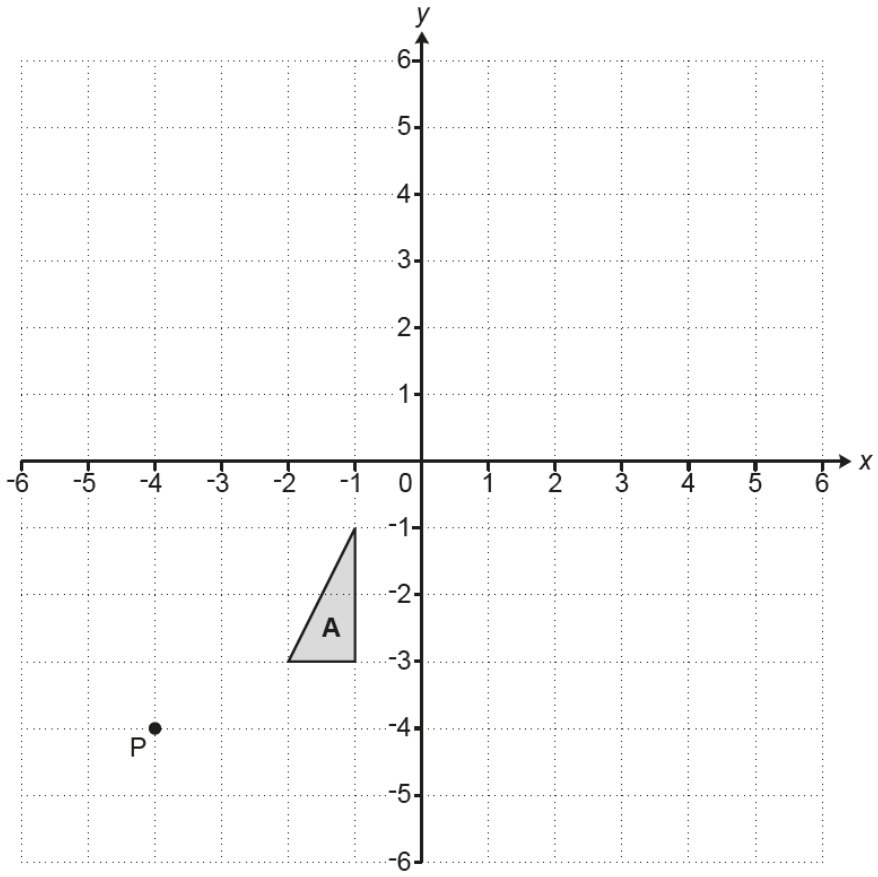


No he is not correct as he needs 235 g and he only has 210g ..... **[3]**

In this exemplar, the alternative method is shown. The candidate has shown how to find the amount of cocoa powder needed for 60 cupcakes, 10 cupcakes and 5 cupcakes. They have added the parts together but have made an error in their addition, so M2 is scored for 180 + 30 + 15 as it is equivalent to 60 ÷ 20 × 75. The final mark is lost as 235 g is incorrect.

Question 14 (a)

14 Triangle **A** is drawn on the grid below.



(a) Enlarge triangle **A** with scale factor 3 from the centre of enlargement P.
Label the image **B**. **[3]**

This question resulted in a wide variety of images. Those candidates who correctly used the centre of enlargement, often with the projection lines drawn, mostly scored full marks. A few of these candidates however, either drew the triangle using the incorrect scale factor or were inaccurate in their use of the centre, resulting in slightly displaced triangles drawn to the correct scale. More candidates scored the method mark for a correct enlargement but from an incorrect centre, often using the point P as one of the vertices.

Question 14 (b)

(b) Describe fully the **single** transformation that maps triangle **B** onto triangle **A**.

.....

..... **[3]**

Two marks were often scored for 'enlargement' or 'enlarge' and 'point P' or, less commonly, (-4, -4). A correct scale factor of $\frac{1}{3}$ was very rare, it was far more common to see 3 or -3. Some candidates incorrectly described the scale factor as 'divide by 3'. Most frequent errors in describing the transformation included reduce, decrease, shrink and unenlarged. Often candidates tried to describe the transformation that mapped triangle A onto B rather than vice versa. A few candidates described other transformations, such as translations or rotations, particularly if their image was not correctly enlarged in part (a). Quite a number did not attempt this part.

Question 15 (a)

15 Ed has a card shop.

(a) He buys a particular card for £1.20 and sells it for £1.68.

Calculate his percentage profit on this card.

(a) ..... % **[3]**

This question proved difficult for candidates. Many gained a method mark for working out the profit of 48p but the difficulty was deciding how to change that into a percentage. Some just divided 48 by 100 and gave an answer of 48%. Those who correctly obtained 40% usually worked with the method of 100% = £1.20, 10% = 12p, 20% =24p and 40% = 48p.

Question 15 (b)

(b) Ed's profit on "Good Luck" cards in 2018 was £360.
This was a decrease of 20% on his profit in 2017.

Work out Ed's profit on "Good Luck" cards in 2017.

(b) £ ..... **[3]**

It was extremely rare to see a correct answer as very few candidates identified that this was a reverse percentage question. 360 was almost always taken as 100% instead of 80% so most attempted to calculate 20% of £360 which they either added on or subtracted, leading to common incorrect answers of £432 or £288. 0.8 was rarely seen but when stated, candidates often calculated 360 × 0.8 instead of 360 ÷ 0.8.

Question 16 (a)

16 (a) A sunflower grows at a rate of 4 cm each day.

How many days does it take to grow from a height of 80 cm to more than 1.06 m?

(a) ..... **[3]**

Many candidates did not focus on the 106 – 80 and tried to find the days from 0–106 cm or from 1–80 cm leading to incorrect answers of 26.5, 27 or 20 days. The most common scoring method was to count on in 4s rather than calculate (106 – 80) ÷ 4. A very common error was to write out 80, 84, 88, etc and then count 80 as day 1. Those candidates who did divide 26 by 4 often gave an answer of 6.5 days, losing a mark as they had not considered the number of days to reach 'more than' 1.06m. Although giving answers such as 26 ÷ 4 = 6.2 days demonstrated errors in division, most were able to convert between metres to centimetres correctly.

Question 16 (b)

(b) If the sunflower grows at a faster rate, how would this affect your answer to part **(a)**?

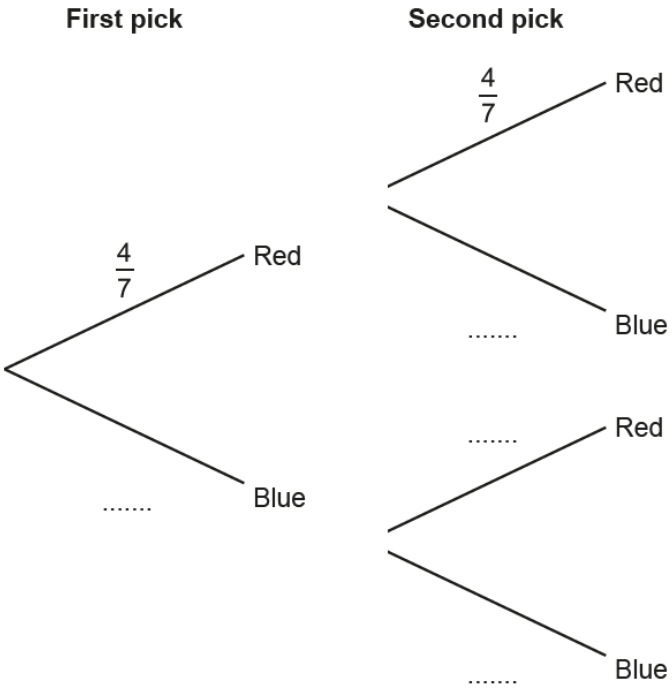
..... **[1]**

This question was well answered with many candidates realising a faster growth rate would result in less days to get to the desired height. Non-scoring comments stated that growth would be faster but did not indicate the effect this would have on their answer to part (a). Another common error was to say that the time would be different, without implying a decrease. Several candidates did not attempt an explanation.

Question 17 (a)

17 A bag contains 4 red counters and 3 blue counters only.
Jack picks a counter at random and then replaces it.
Jack then picks a second counter at random.

(a) Complete the tree diagram.



[2]

Many candidates gained full marks with a few making errors with switching $\frac{4}{7}$ and $\frac{3}{7}$. A small number missed that the counter had been replaced and used a denominator of 6 for the second pick probabilities.

Question 17 (b)

(b) Work out the probability that Jack picks two red counters.

(b) ..... **[2]**

This was not well attempted although often the correct fractions were chosen. Many candidates were not sure whether to add or multiply and usually the correct probabilities were added. $\frac{8}{7}$ or $\frac{8}{14}$ were very common incorrect answers.

Question 18

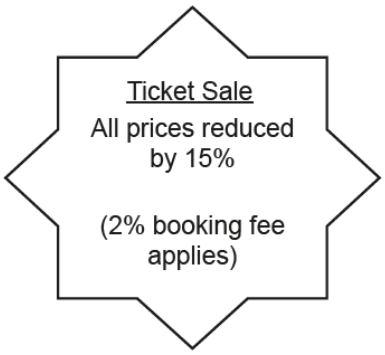
18 Adam buys some theatre tickets in a sale.

The normal prices are:

£80 for each adult
£40 for each child.

In the sale, the prices are reduced by 15%.
Adam buys 2 adult tickets and 1 child ticket at the sale price.
A 2% booking fee is then added to the total cost of the tickets.

Calculate the total amount that Adam must pay.



£ ..... **[6]**

This question was widely attempted, with varying degrees of success. The most common method was to find the 15% reduction first, calculate the total reduced cost, then increase by 2%. The alternative method of finding the combined cost first, then reducing by 15%, then increasing by 2% was less often seen. Candidates did seem better at finding 15% (by using 10% and 5%) than finding 2% (by stating 1% or 10% and stating 2%). Common errors included the omission of the second adult, the incorrect choice of addition and subtraction of the calculated percentages, and numerical errors at each stage that at times made further calculations more difficult e.g. errors in deducting £6 from £40 giving reduced ticket totals of £168 or £172 made the 2% calculation harder.

Common errors in steps of working included:

– Taking £15 off instead of 15%.
– Adding 2 adult tickets, adding the percentages together and consequently reducing £160 by 30%.
– Subtracting 2% instead of adding.
– To find 2%: find 10%, halve to find 5%, halve to find 2.5%, then subtract a little bit to get close to 2%.
– Incorrect placement of the decimal point when calculating 1% such as 1% of £170 given as £17 or £0.17.

Where candidates set out their work methodically, fewer avoidable errors were apparent. Candidates were more likely to confuse their answers or misread them when there was little structure to their workings. For example: with more disorganised work candidates would use the 15% discount itself to calculate further, rather than the discounted ticket price. This resulted in an answer smaller than any single original ticket price.

Exemplar 4

15%. of £80 = £12

£80p − £12 = £68

1%. = £0.8p

2%. = £1.6p

68 × 2 = £136

10%. of £40 = £4 × 2 = £8 20%. = £8

40 − 8 = £32

136 + 32 = £178

1% = £178 = £1.78p

2% = £3.54p

£178 + £3.56p = £181.54p

£ 181.54p [6]

In this exemplar, the working was clearly set out and easy to follow. M2 was earned for reducing 80 by 15% (£80 – £12), and M1 was earned for total ticket cost for 2 adults + 1 child (136 + 32).

When finding the 2% booking fee, a full method was not given as £1.78 × 2 was not stated. If a method is not stated, it can only be implied by correct follow through values i.e. £3.56 clearly implies £1.78 × 2. As the 2% was stated as £3.54 no further marks were earned.

Question 19

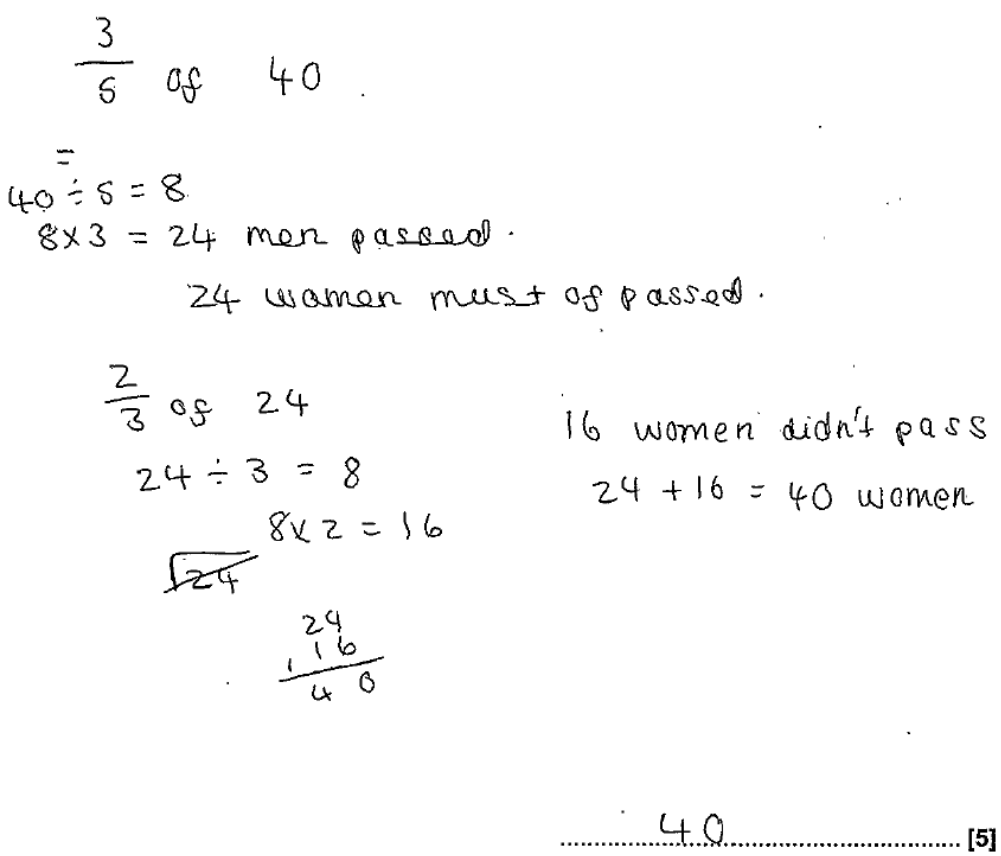
19 One day, a group of people had a driving test.
40 of this group were men and the rest were women.
$\frac{3}{5}$ of the men and $\frac{2}{3}$ of the women passed the driving test.
The number of men and women that passed the driving test was the same.

Work out the number of women that took the driving test that day.

..... **[5]**

A good proportion of candidates gained 2 marks for correctly finding $\frac{3}{5}$ of 40 but could not progress past the value of 24. For the few that continued, a common approach from there was stating $\frac{2}{3} = \frac{24}{x}$ which then usually yielded the correct answer. A less eloquent mathematical statement such as $\frac{2}{3} = 24$ was more commonly seen and many went on to attempt to find $\frac{2}{3}$ **of** 24. Incorrect working showed attempts to find a common denominator for $\frac{3}{5}$ and $\frac{2}{3}$ rather than working towards a common numerator of 24.

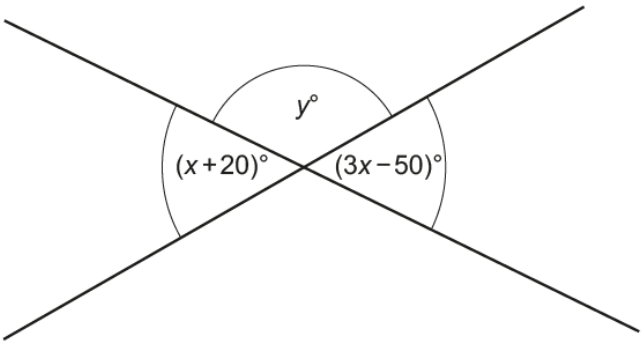
Exemplar 5



In this exemplar, the candidate calculated the correct number of men who passed and scored M1 A1 for 40 ÷ 5 = 8 followed by 8 × 3 = 24. They correctly stated 24 women passed but further working shows them finding $\frac{2}{3}$ of women rather than identifying that 24 represents $\frac{2}{3}$ of women so no further marks were earned.

Question 20

20 The diagram shows two intersecting straight lines.



Not to scale

Find the value of y.

$y =$ ..... **[6]**

This was a very challenging question where the algebraic aspect proved too difficult for most candidates and a significant number made no attempt at all. Only the most able candidates successfully earned 6 marks from an algebraic method. Others gained a mark for $x + 20 = 3x - 50$ but most did not appreciate the need to equate $x + 20$ to $3x - 50$.

Common errors were multiplying out $(x + 20)(3x - 50)$ to form a quadratic, incorrectly stating $(x + 20) + (3x - 50) = 180$ or $(x + 20) + (3x - 50) + y = 360$.

Some candidates employed trial and improvement and the finding of a value of x did allow them to demonstrate some algebraic understanding as well as correct use of angle relationships to make further progress to find a value for y. However, some candidates only tried multiples of 10 and hence were unable to find a value that worked. Those that arrived at $x = 35$ often used this as the acute angle incorrectly leading them to $y = 145$.

Higher ability candidates very occasionally used a simultaneous equation approach but sign errors often spoiled their solution.

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