OCR
Oxford Cambridge and RSA

GCSE (9–1)

Exemplar Candidate Work

MATHEMATICS

J560
For first teaching in 2015

J560/02 Summer 2019 examination series

Version 1

Contents

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Introduction

These exemplar answers have been chosen from the summer 2019 examination series.

OCR is open to a wide variety of approaches and all answers are considered on their merits. These exemplars, therefore, should not be seen as the only way to answer questions but they do illustrate how the mark scheme has been applied.

Please always refer to the specification https://www.ocr.org.uk/Images/168982-specification-gcse-mathematics-j560.pdf for full details of the assessment for this qualification. These exemplar answers should also be read in conjunction with the sample assessment materials and the June 2019 Examiners' report or Report to Centres available from Interchange https://interchange.ocr.org.uk/.

The question paper, mark scheme and any resource booklet(s) will be available on the OCR website from summer 2020. Until then, they are available on OCR Interchange (school exams officers will have a login for this and are able to set up teachers with specific logins – see the following link for further information http://www.ocr.org.uk/administration/support-and-tools/interchange/managing-user-accounts/).

It is important to note that approaches to question setting and marking will remain consistent. At the same time OCR reviews all its qualifications annually and may make small adjustments to improve the performance of its assessments. We will let you know of any substantive changes.

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]

Exemplar 1   1 mark

$$3.9 \, kg = 4 \, kg$$
$$87p = 90$$

$$4 \times 90 =$$

£ __3.60__ [2]

Examiner commentary

Both numbers have been correctly rounded to 1 significant figure. However, it is important to check the units in the question and on the answer line. Here the candidate provided their answer in pence rather than pounds so the accuracy mark has been lost.

Exemplar 2   1 mark

3.9 kg apples

87p 1kg   4
2 kg   3.48
3 kg
4 kg

87 ×
3 [5/2 7/8] 4
4   8

£ __3.48__ [2]

Examiner commentary

This candidate has not considered the part of the question 'By rounding each value to one significant figure' as they have only rounded 3.9 kg and not 87p. M1 is earned.

Question 3 (b)

(b) Work out.

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

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

Exemplar 1

1 mark

$$\frac{6}{15} - \frac{3}{15} = \frac{3}{15}$$

(b) ....3/15.......................... **[2]**

Examiner commentary

It is useful to set out working to find equivalent fractions. Here $\frac{2}{3}$ has been converted to $\frac{6}{15}$ rather than $\frac{10}{15}$. Showing working such as $\frac{2}{3} = \frac{10}{15}$ and $\frac{1}{5} = \frac{3}{15}$ before writing the subtraction would allow a candidate to check for errors. This candidate earns M1 for $\frac{3}{15}$.

Question 5 (b)

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

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

Exemplar 1   1 mark

```
7
14
21
28
35
41  8
4 55
```

$8 \times 7 =$

55

**(b)** .... 55 .... **[2]**

Examiner commentary

The candidate has correctly cubed 2 and found the square root of 49, so M1 is awarded. However, certain multiplication tables prove difficult for some candidates to remember, in particular the 6, 7, 8 and 12 times tables, so 8×7 can prove difficult. Here the candidate has attempted to continually add 7 but has made an error with $35 + 7$.

Question 6 (a) (ii)

6 Here is a function machine.

Input ⟶ × 5 ⟶ − 3 ⟶ Output
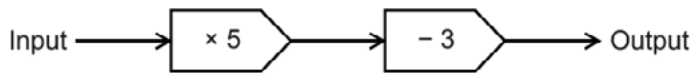
(ii) Find the input when the output is 42.

(ii) .... [2]

Exemplar 1   1 mark

$$42 + 3 = 45 \div 5 = 8$$

(ii) ....8............................ [2]

Examiner commentary

Travelling in reverse through the function machine, both steps are reversed correctly for the method mark. The accuracy mark is lost for 45 ÷ 5 being incorrectly calculated.

Question 6 (b)

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

Write an equation for *y* in terms of *x*.

(b) .... [2]

Exemplar 1   2 marks
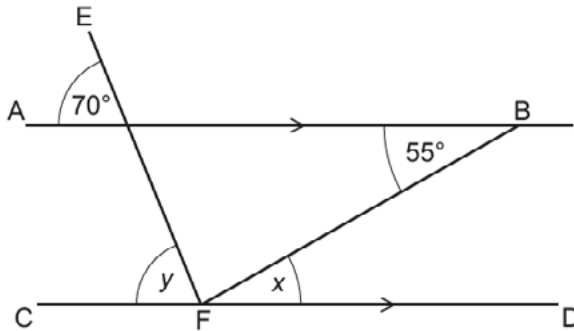
(b) ......$y = (x \times 5) - 3$...... [2]

Examiner commentary

This answer is not fully simplified but is accepted. It would be even better if the candidate had written their final answer as $y = 5x - 3$.

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]

Exemplar 1   1 mark

$x = 55°$ because Angles On Parallel lines are always equal
$y = 70°$ because Corrosponding angles are always [2]
            equal

Examiner commentary

Identifying parallel lines is common but often without being accompanied with a correct angle property, as shown here. The first mark is not earned. The misspelling of corresponding is condoned in the second statement as the intended word is clear.

Exemplar 2   1 mark

$x = 55°$ because opposite angles are equal
$y = 70°$ because corrosponding angles are equal [2]

Examiner commentary

Opposite angles are often confused with alternate angles, as this candidate has written here and so the first mark is not earned. In some responses a sentence will state both but opposite is describing how the angles are located rather than it being intended as an angle property. It is clearer to just state 'alternate angles are equal'. The candidate earns 1 mark for their second statement which is correct.

Question 8 (b)

8   Darren has these 20 crayons in a box:

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

(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]

Exemplar 1   3 marks

he now has 36 crayons   36 ÷ 2 = 18
                                       = evens
Original
= 8 blue   he buys
                      10 blue
   4 red   crayons
            The remaining 6 are
                      red

(b) ....6............................... [3]

Examiner commentary

The candidate has correctly interpreted 'The probability that he picks a blue crayon is even' showing the calculation
36 ÷ 2 = 18 = evens. As mentioned in the Examiners' Report this was commonly misinterpreted as 'the number of red crayons and blue crayons should be even'.

The candidate has correctly used the fact that there were originally 8 blue crayons to state that 10 blue crayons were bought and so the remaining 6 crayons are red. The solution would be even better if the calculations '18 – 8 = 10 blue crayons bought' and '16 – 10 = 6 red crayons bought' were also stated.

Exemplar 2　　　　　　　　　　　　　　　　　　　　**1 mark**

$$\frac{16}{20}$$

$$20 + 36 \quad 20 + 16 = 36 \text{ crayons now}$$

$$\frac{1}{2} \text{ of } 36 = 18 = \text{Blue}$$

$$\frac{18}{36} \quad\quad +8 \quad 20 - 18 = 2 \text{ red.}$$

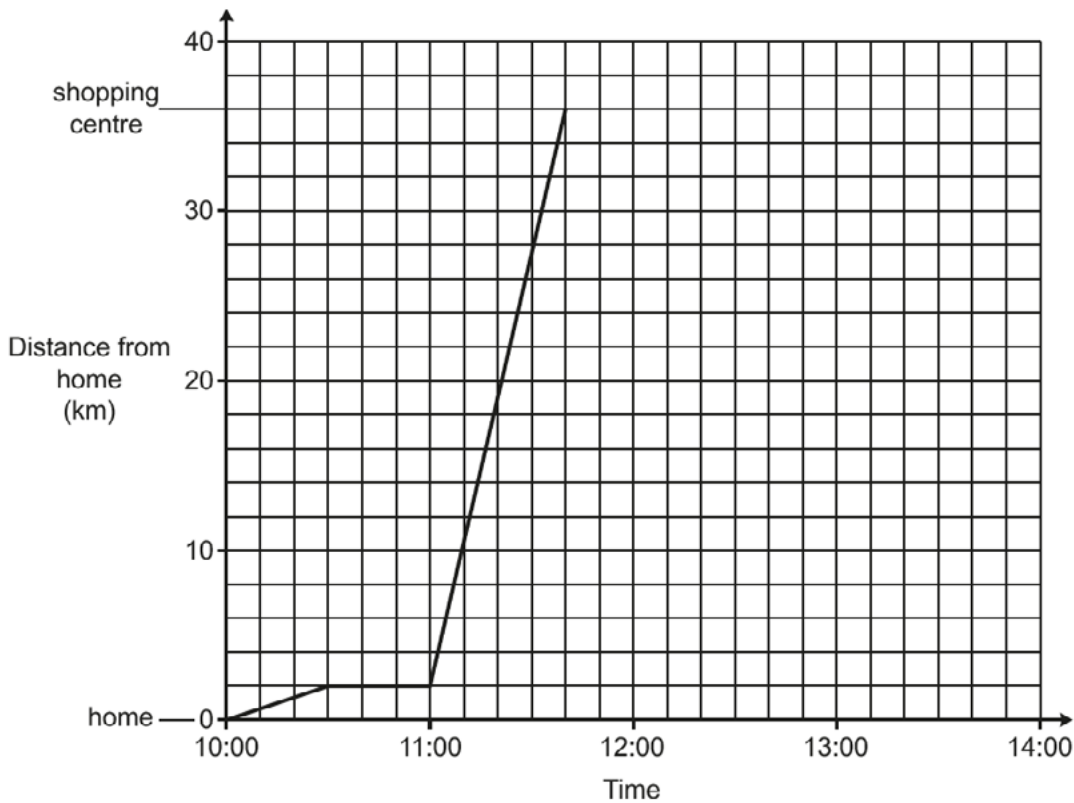(b)　.................................2.................................. **[3]**

Examiner commentary

This candidate also interpreted 'The probability that he picks a blue crayon is even' correctly and gained a method mark. Further scoring was impeded by not considering all 36 crayons and all colours.

Question 9 (c)

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

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

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

....

.... [2]

Exemplar 1   1 mark

From 10:30 to 11 shown on the graph by a line at a constant until 11:00.

[2]

Examiner commentary

The correct time interval gains a mark but the description of the line using the word 'constant' is insufficient to imply the distance stays the same. Scoring answers use the word 'horizontal' to describe the line or state 'the line went straight across'.
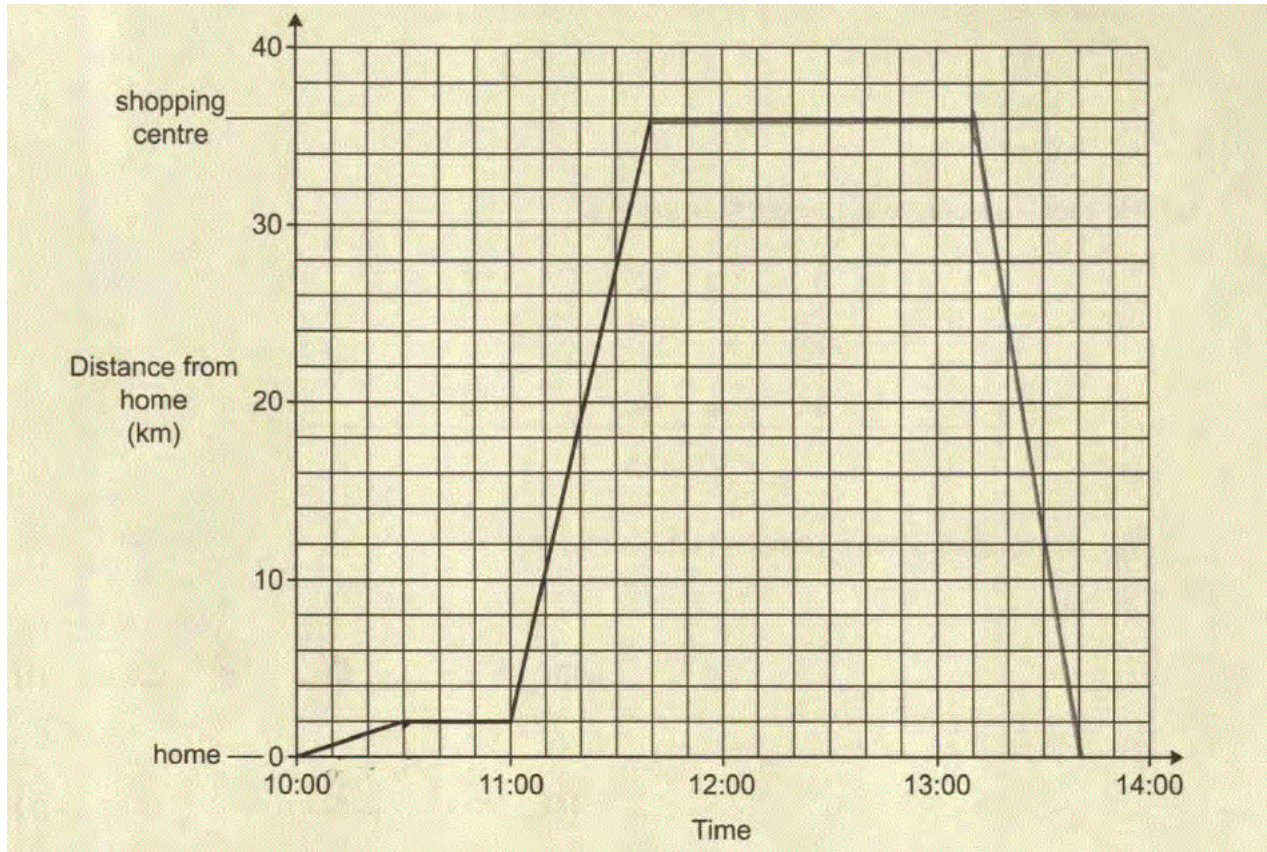
Question 9 (d) (i)

(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]

Exemplar 1   2 marks

Examiner commentary

The horizontal line starting at (1140, 36) goes across one square too many ending at (1310, 36) rather than (1300, 36). Use of a ruler placed vertically up from 1300 rather than placing a point 'by eye' helps with accuracy. The candidate, from this error, drew a line back down to the correct point of (1340, 0) and therefore gained 2 of the 3 available marks.

Exemplar 2

1 mark
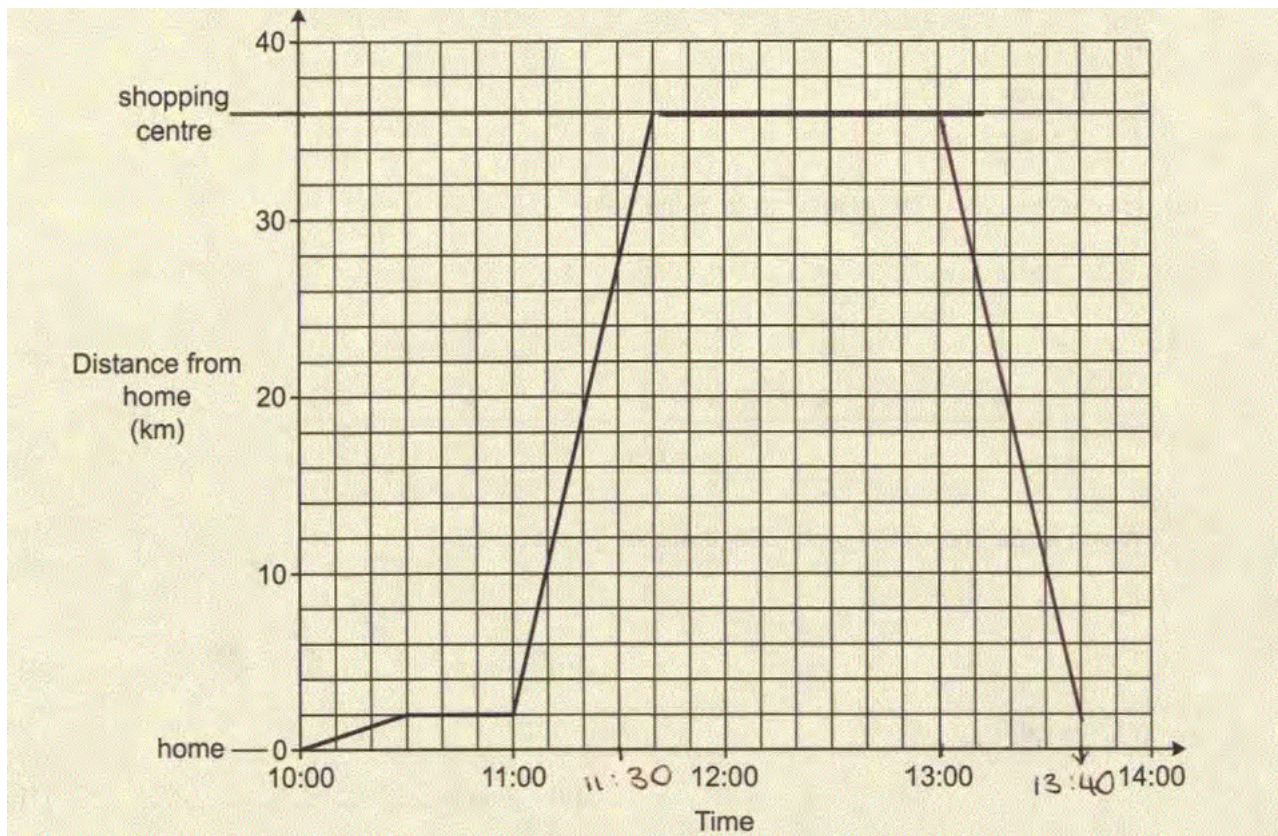
Examiner commentary

This candidate corrected a horizontal line that was too long by drawing the second line from (1300, 36) so the first mark was condoned. However, they did not ensure the line reached home, stopping at (1340, 2). Neither the second nor the third mark can be awarded as they both depend on the line returning to the time axis.

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]**

Exemplar 1   2 marks

$36 + 14 = 50$

36 ~~000~~ km in 40 mins
÷4 = 7 km in 10 mins
14 km in 20 mins

(d)(ii) .... 50 .... km/h **[3]**

Examiner commentary

This candidate has considered the difference in time units and has attempted to use a ratio approach by finding how far they would go in 10 minutes, 20 minutes and therefore 60 minutes. Their only error is in dividing 36 by 4 to give 7 rather than 9. This complete method to find the distance travelled in 60 minutes gains both method marks.

Exemplar 2

1 mark

$$\text{speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\text{Speed} = \frac{36}{40}$$

$$\text{speed} = 1.4$$

D / S | T (triangle)

$36\overline{)40.}^{01.4}$

(d)(ii) .... 1.4 .... km/h **[3]**

Examiner commentary

The speed, distance, time triangle is successfully used to set up the correct formula and the values are correctly substituted to give speed = $\frac{36}{40}$. This scores a method mark. The candidate then makes an error that is very commonly seen when using the bus stop method to divide. The numbers are placed the wrong way around and so they go on to work out 40 ÷ 36 rather than the required 36 ÷ 40.

It is also common for candidates to not consider the units used in the question. The time is in minutes but the speed is wanted in km/h and so a time conversion is required. To gain both method marks we are looking for evidence of multiplying by 60 at some stage.

Question 10 (a) (i)

10 (a) Simplify fully.

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

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

Exemplar 1   1 mark

10 (a) Simplify fully.

    (i) $\boxed{3t} + \boxed{5u} - \boxed{2t} + \boxed{3u}$

$3t + 2t.$
$5u + 3u.$ $5t - 8u$

                           (a)(i) .... $5t + 8u$ .... **[2]**

Examiner commentary

This candidate has separated the terms but has not considered the sign written in front of each term. This leads to $3t + 2t$ instead of $3t - 2t$. They have correctly written $5u + 3u$ and even though an intermediate step states $- 8u$ this has been corrected in the final expression written on the answer line. Therefore, this gains a method mark for $+ 8u$.

Question 10 (a) (ii)

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

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

Exemplar 1   1 mark

$6a \times 2a^2 = 8a^3$

                             (ii) .... $8a^3$ .... **[2]**

Examiner commentary

This candidate has worked with the powers of a correctly to give a^3 but have added rather than multiplied the integers. Their final answer attains a B1 for ka^3.

Exemplar 2   0 marks

$6,12,18,24$

$2a^2 = 4a$

$6a \times 4a = 24a$

(ii) ......$24a$......... **[2]**

Examiner commentary

This was a common non-scoring answer where as a result of squaring 2, rather than a, $2a^2$ becomes $4a$, the next step was $6a \times 4a$. A further error is made in multiplying $6a \times 4a$ as the resulting power of a is also incorrect. No marks are earned.

Question 10 (b)

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

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

Exemplar 1   1 mark

$+1 \qquad +1$

$\div \dfrac{y+1}{y}$ $= x^2$

$\dfrac{y \times 1}{x} = x$

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

Examiner commentary

Adding 1 to both sides of the equation is clearly seen in the working resulting in a method mark gained for the equation $y + 1 = x^2$. At this point very few candidates were able to deal with x^2 and, as is seen here, dividing by x was a common incorrect solution. Few identified that to 'undo' x^2 they needed to take the square root of each side of the equation.

Question 11 (a)

## Exemplar 1   1 mark

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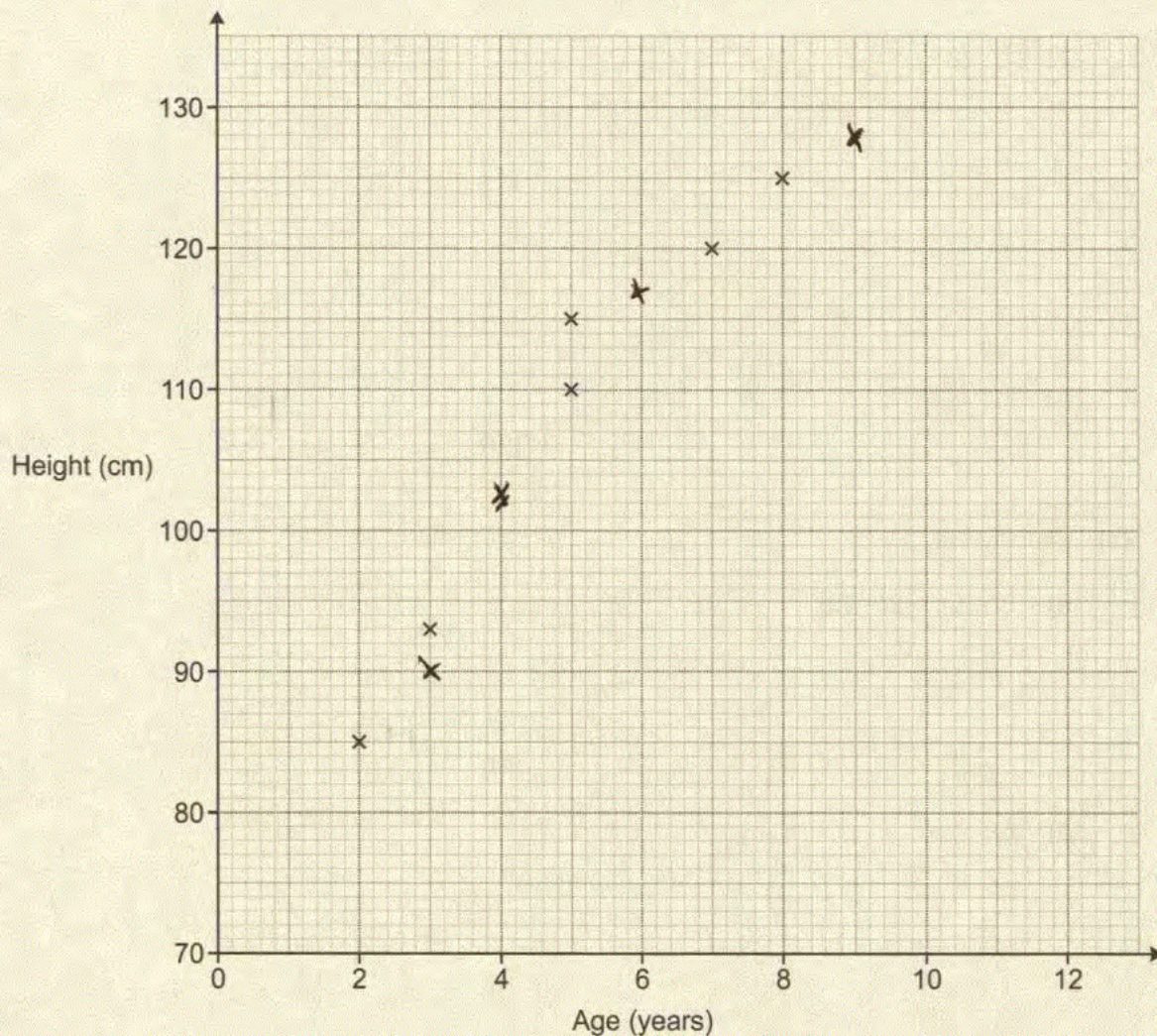
(a) Plot the points for the remaining four girls.   [2]

Examiner commentary

It is important when plotting points that the pencil used has a sharp point so that inaccuracies in plotting are minimised. The point (9, 127) on this scatter diagram is a thickly lined cross and taking where the centre of this cross is placed it is closer to 128 than 127. In this case an accuracy mark is lost.

Exemplar 2

1 mark

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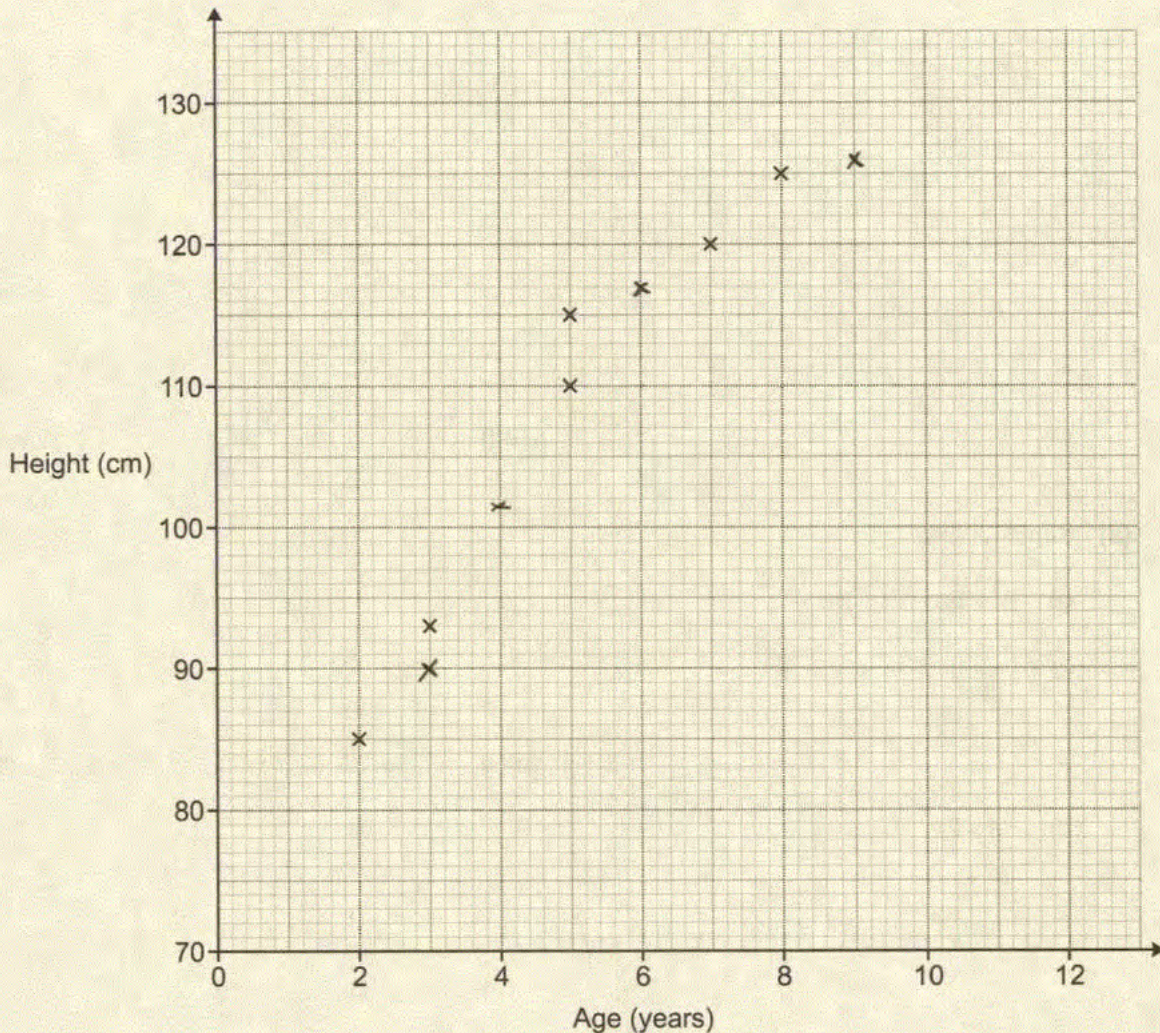
(a) Plot the points for the remaining four girls.   [2]

Examiner commentary

Inaccuracies in plotting can come from misreading the vertical scale. Here (4, 103) has been plotted at (4, 101.5) and (9, 127) has been plotted one square above (9, 125) indicating that the candidate read each small square on the vertical axis to be 2 cm rather than 1 cm. As the candidate's other 2 points are accurately plotted 1 mark is awarded.

Question 11 (c)

Exemplar 1   1 mark

(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.

NO as the average height of a 6 years old using a line of best fix is 116cm. [2]
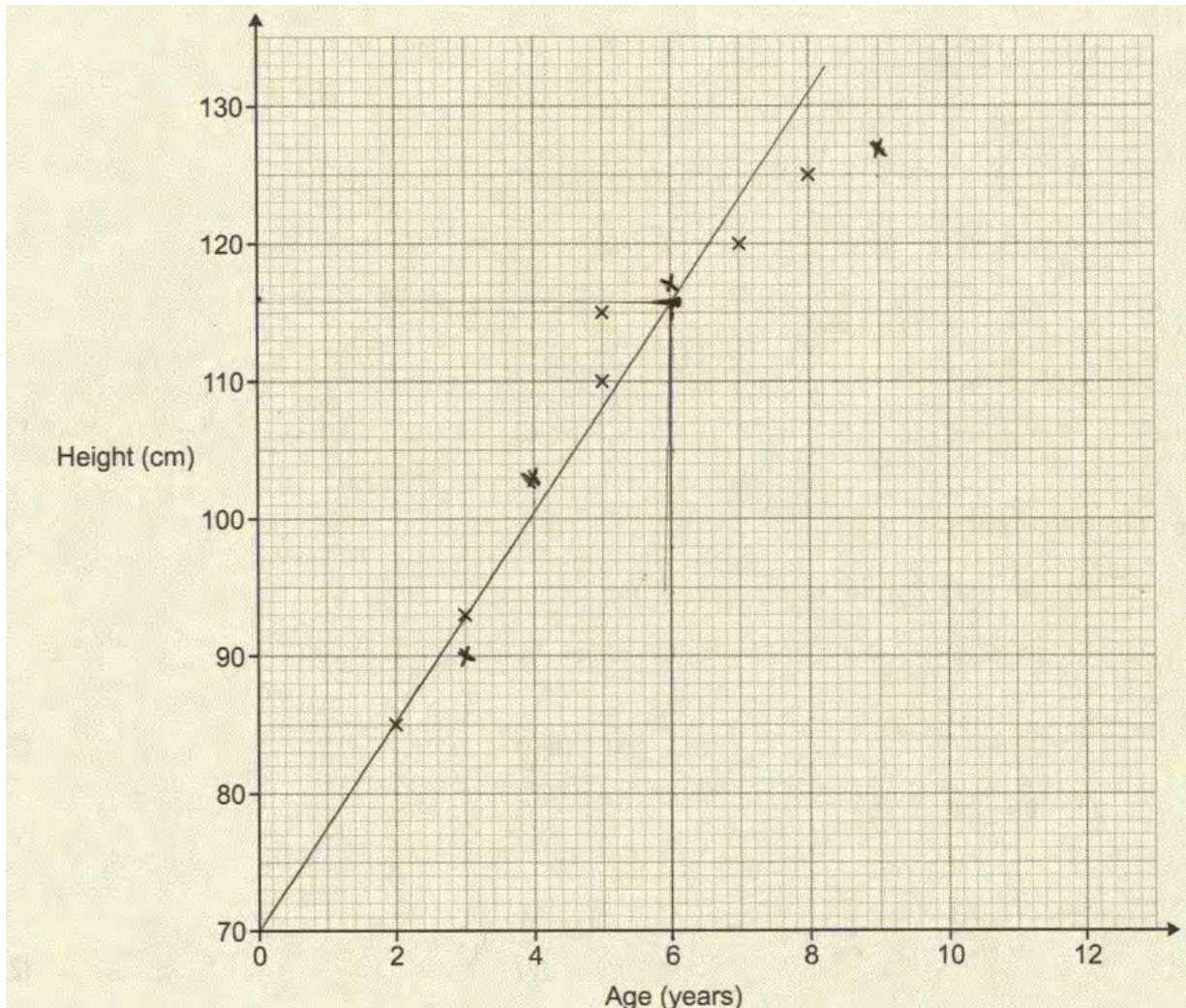
Examiner commentary

As with this exemplar, it is very common when drawing lines of best fit for candidates to assume their line must go through the origin of the axis. This often results in their line not best representing the data plots. This candidate's line does not score a mark for ruled line of best fit but does score the statement mark as it is correct reasoning for their line.

Another error in drawing a line of best fit is not extending far enough across the points plotted. To be a good representation of the data it should extend beyond the lowest and highest points plotted.

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]

Exemplar 1   4 marks

$$12 \times 5 = 60$$
$$5 \text{ feet} = 60 \text{ inches}$$
$$60 \times 2.5 =$$
$$2.5 \times 10 = 25 \times 6 = 150 \text{ centimetres}$$
$$+5 = 155 \text{ cm}$$
$$\text{Kate} = 1.55 \text{ metres}$$

Alice is correct because she is 1.57 metres tall whereas Kate is 1.55 metres tall which means that Alice is taller than Kate by 0.02 metres [4]

Examiner commentary

This is a good exemplar to show that the best method, on this non-calculator paper, is to compare both measurements in metric units.

The candidate has earned both the first and second method marks by converting 5 feet into 60 inches, multiplying by 2.5 to give 150 cm and then adding 5 cm converted from the extra 2 inches.

They have then converted 155 cm to 1.55 m so they have 2 correct comparable figures and earn the third method mark. This has been achieved by using multiplication rather than the divisions required for the alternative method.

A final accuracy mark is awarded as 'Alice is correct' is stated.

Exemplar 2   2 marks

$12 \times 5 = 62$ inches $157 \div 2.5 = 32.75$ inches

Kate is taller than Alice   [4]

Examiner commentary

This candidate has shown the calculations of using the alternative method of comparing both measurements in inches. It would be clearer to state the full calculation to arrive at 62 inches, however the value of 62 earns the second method mark. As this is the non-calculator paper 157 ÷ 2.5 has proved too difficult resulting in an incorrect value of 32.75 as a comparison figure. The first method mark is gained for stating the correct division but no further marks are earned as one of the 2 comparable figures is incorrect.

Exemplar 3   2 marks

$12 \times 5 = 60$

$2 \times 2.5 = 5$

$\begin{array}{r} 60 \\ + \ 5 \\ \hline 6 \ 5 \end{array}$

5 feet 2 inches = 65 inches

$5 \times 12 = 60 + 2 = 62$

$62 \times 2.5 = 95 \ cm$

$60 \times 2.5 = 90$

$\begin{array}{r} 2 \times 2.5 = + \ 5 \\ \hline 95 \end{array}$

$95 \ cm = 0.95 m$

Alice = 157 cm

$157 \times 2.5 = 393.5.$

$100 \times 25 = 250$

$50 \times 2.5 = 125$

$7 \times 2.5 = 17.5$

$\begin{array}{r} 250 \\ 125 \\ 17.5 \\ \hline 393.5 \\ \end{array}$

[4]

Examiner commentary

This candidate has attempted the method to convert Kate's height to inches and gains the first two method marks for 5 × 12 + 2 and 62 × 2.5. Their answer of 95 cm is not a correct figure to make a comparison with Alice's height so no further marks are gained.

Question 13 (b)

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

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

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

Exemplar 1   1 mark

$$\frac{140}{20} = 6g \times 5$$

(b) ....30................................ g **[2]**

Examiner commentary

A correct unitary method is used with the arithmetic error of $\frac{140}{20}$ found as 6 g rather than 7 g. Therefore, the method mark is earned but the accuracy mark is lost.

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]**

Exemplar 1   3 marks

60g makes 20 cupcakes

30g makes 10 cupcakes

7 × 30g = 210g = 10 cupcakes × 7 = 70 cupcakes

No he is not, because he has just enough cocoa
for 70 cakes **[3]**

Examiner commentary

Using proportion, the candidate has correctly stated the amount of cocoa powder needed for 10 cupcakes and has identified they can make 7 times as many with 210 g leading to 70 cupcakes. This earns both method marks. Their conclusion correctly states 'No he is not…' and continues to explain why so the final mark is also awarded.

Exemplar 2

2 marks

$$\frac{60}{20} = 3\cancel{4}g \text{ (required to make 1)}$$

$$\begin{array}{r} '75 \\ \underline{3} \\ 225g \end{array} \text{ (required to make 75 cupcakes)}$$

Rashid is correct he has more than [3] enough

Examiner commentary

Using the unitary method, the amount of cocoa powder for 1 cake has been correctly found, as has the amount of cocoa powder required to make 75 cakes. Here the alternative method has been used and 2 method marks are gained. The resulting value of 225 g has not been compared with the 210 g that Rashid has and an incorrect conclusion has been drawn, therefore the final mark is not achieved.

Question 14 (a)

Exemplar 1

3 marks

14 Triangle **A** is drawn on the grid below.
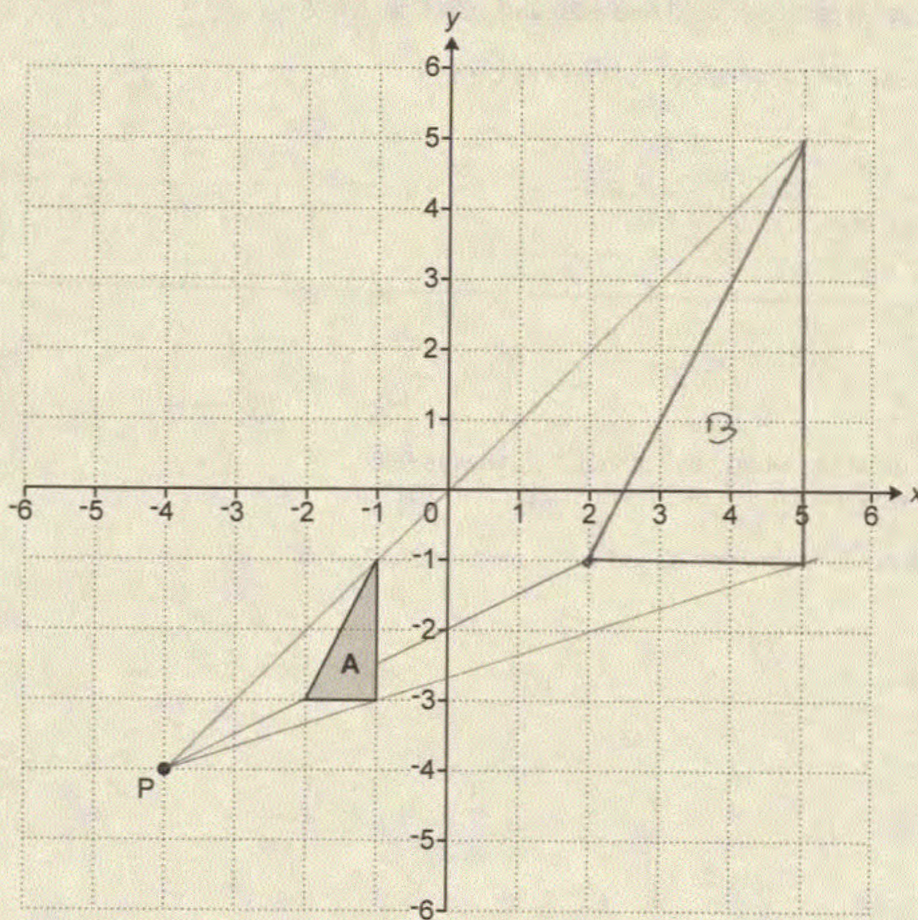
(a) Enlarge triangle **A** with scale factor 3 from the centre of enlargement P.
Label the image **B**.

[3]

Examiner commentary

The candidate has measured distances from the centre of enlargement to each point of the original triangle. Each distance is multiplied by the scale factor of 3 and ray lines are drawn to place the enlarged shape correctly. All 3 marks are achieved.

Exemplar 2   **1 mark**

14   Triangle **A** is drawn on the grid below.
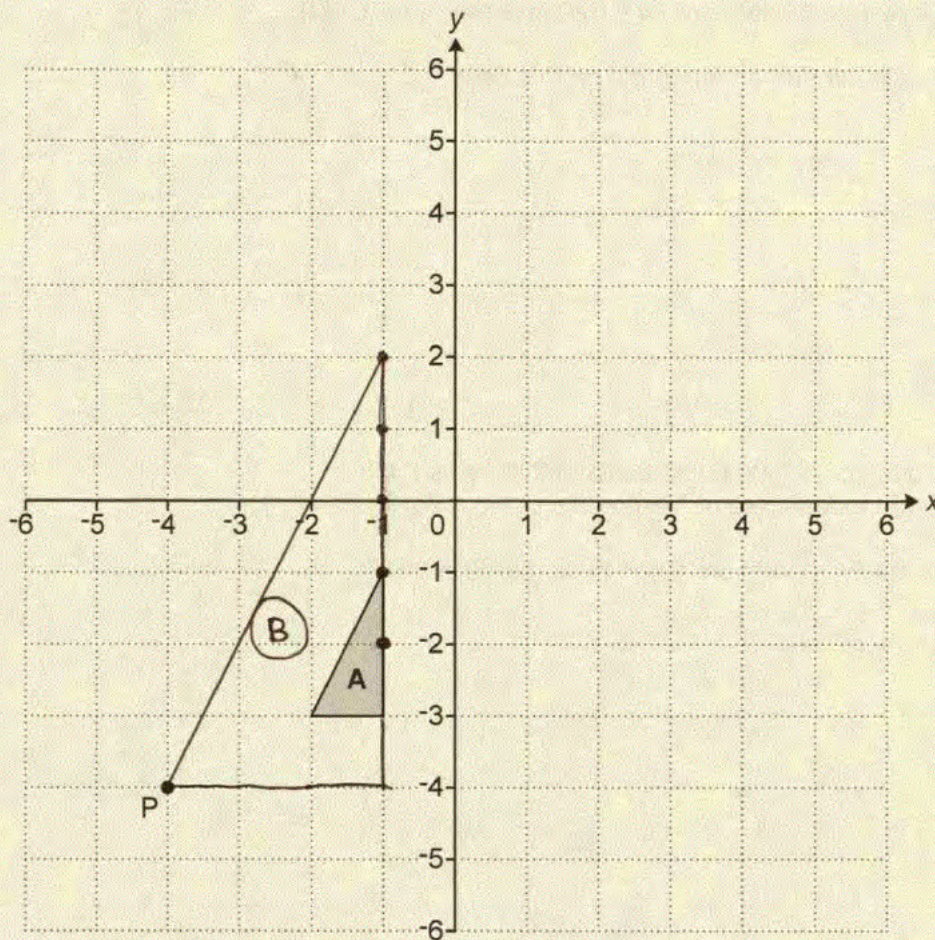
(a)   Enlarge triangle **A** with scale factor 3 from the centre of enlargement P.
      Label the image **B**.   [3]

Examiner commentary

A method mark is gained as the triangle has been enlarged by the correct scale factor of 3. However, the centre of enlargement has only been used to anchor the enlarged triangle.

Question 14 (b)

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

....

.... [3]

Exemplar 1   2 marks

enlargement by Scale factor 3
from the centre of P (-4,-4)   [3]

Examiner commentary

Enlargement has been correctly stated and the centre has been correctly given as a coordinate. A mark is awarded for each.

The scale factor of 3 is correct for the transformation from A to B but here the question requires the transformation from B to A so the correct scale factor is $\frac{1}{3}$.

Exemplar 2   0 marks

Scale factor 3, translation (1,-2), center of
enlargement (-4,-4)   [3]

Examiner commentary

Extra transformations spoil all marks as the question states 'Describe fully the **single** transformation…'. Extra properties are treated as choice of answers. Here, 'translation' is stated, enlargement is implied and 3 properties are given, 2 of which are incorrect. Therefore no marks can be awarded.

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]

Exemplar 1   3 marks

$1 \cdot 68 - 1.20$

$= £0 \cdot 48$

$\dfrac{0.48}{1.20} \times 100$

or $\dfrac{\overset{4}{\cancel{48}}}{\cancel{120}} \times \cancel{100} = 40 \%$

(a) .... 40 % [3]

Examiner commentary

In this full scoring exemplar, firstly the profit is found then a correct calculation to find this as a percentage of the price Ed bought at has been stated. The calculation has been rewritten with 0.48 and 1.20 converted to pence. Cancelling within the calculation reduces it to 4×10 leading to the correct answer of 40.

Exemplar 2   3 marks

£ 1·68
− £ 1·20
———
£ 0·48

48p profit .

$\dfrac{48}{120} = \dfrac{24}{60} = \dfrac{4}{10} = \dfrac{2}{5} \overset{\times 20}{\underset{\times 20}{\rightarrow}} \dfrac{40}{100}$

(a) .... 40 % [3]

Examiner commentary

Another full scoring exemplar. This time, similar fractions are used to convert $\dfrac{48}{120}$ to a fraction with a denominator of 100 which is then easily converted to the correct percentage.

Exemplar 3

2 marks

$$168 - 120 = 48 \qquad 100 - 24 =$$
$$\frac{48}{120} \times 100 = 24 \qquad 76\%$$
$$48 \div 100 =$$

So
So.

(a) .... 24 .... % [3]

Examiner commentary

In this exemplar, 2 method marks are awarded for the correct calculation of $\frac{48}{120} \times 100$. The accuracy mark is lost as this has been calculated as 24 after crossed out attempts to divide using the bus stop method.

Exemplar 4

1 mark

$$1.68$$
$$1.20 -$$
$$\overline{0.48}$$

$$0.48 \qquad \frac{48}{100} = 48\%$$

(a) .... 48 .... % [3]

Examiner commentary

Candidates often earned a method mark for finding the profit in pence or pounds but many struggled with the next step or, as in this case, incorrectly assumed 0.48 was converted directly to 48%.

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]**

Exemplar 1   3 marks

$$360 = 80\%$$
$$180 = 40\%$$
$$90 = 20\%$$
$$450 = 100\%$$

(b) £ **450** .... **[3]**

Examiner commentary

A full scoring exemplar where the candidate has identified that 360 represents 80% of the profits made in 2017. They then use proportion effectively to find what 40% and 20% represent before stating 100% = 450 and therefore the profit in 2017 is £450.

Exemplar 2   0 marks

20% of 360
10% = 36 = £72
10% = 36 = £72
    72

$$\begin{array}{r} 360 \\ +\ \ 72 \\ \hline 432 \end{array}$$

(b) £ **432** .... **[3]**

Examiner commentary

Assuming that the 2017 profit would be 120% of the 2018 profit was a very common error. Finding 20% of 360 and adding it on to 360, as seen in this exemplar, was often seen.

The other common error was to reduce 360 by 20% leading to the incorrect answer of £288.

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]**

Exemplar 1   2 marks

$$106\,cm - 80 = 26\,cm$$

$$26 \div 4 = 6.5$$

                       6. 5

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

Examiner commentary

A completely correct method is given and 2 marks are awarded for a partially correct answer of 6.5. To gain full marks the candidate would need to consider the context of the question and realise that an integer answer is more appropriate.

Exemplar 2   1 mark

1·06m → 106cm

day	1	2	3	4	5	6	7	8
cm	80	84	88	92	96	100	104	108

+4 +4 +4 +4 +4 +4 +4

   (a) ....8 days........................ **[3]**

Examiner commentary

Many candidates made use of a repeated addition method rather than using the calculation $\dfrac{106 - 80}{4}$. This candidate

demonstrates a common error when finding the number of days. They have considered 80 cm to be day 1 rather than interpreting that after 1 day's growth the plant is 84 cm. This has led to an answer 1 day more than the correct answer.

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.

Exemplar 1   1 mark

[2]
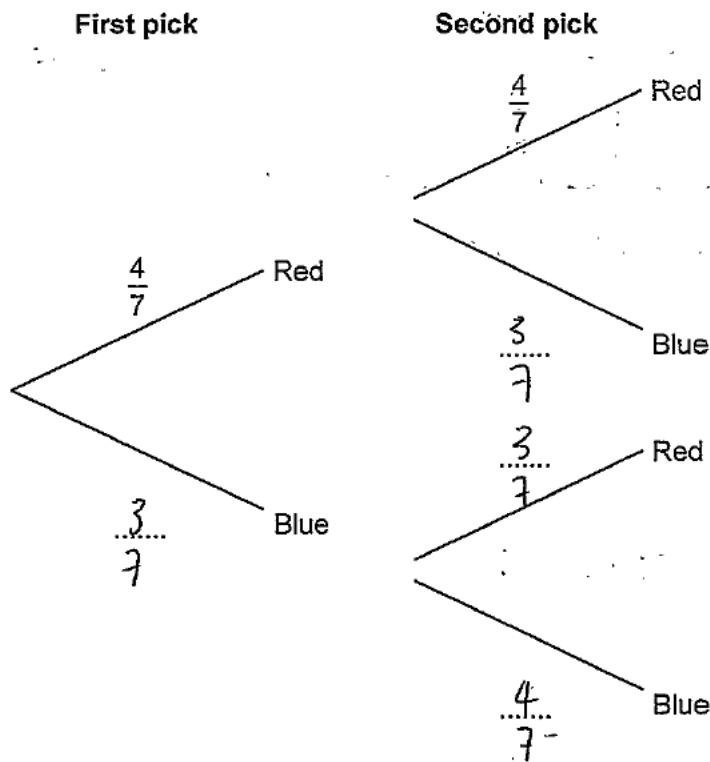
Examiner commentary

A method mark was attained by many candidates who correctly stated $\frac{3}{7}$ for the probability of blue on the branches where the probability of red was given. Where candidates had to complete both red and blue probabilities, they often reversed the fractions as is seen in this exemplar.

Exemplar 2   1 mark

First pick   Second pick

$\frac{4}{7}$ ⟶ Red

$\frac{4}{7}$ ⟶ Red

$3/7$ ⟶ Blue

$3/7$ ⟶ Red

$\frac{3}{7}$ ⟶ Blue

$3/7$ ⟶ Red

$2/7$ ⟶ Blue

[2]
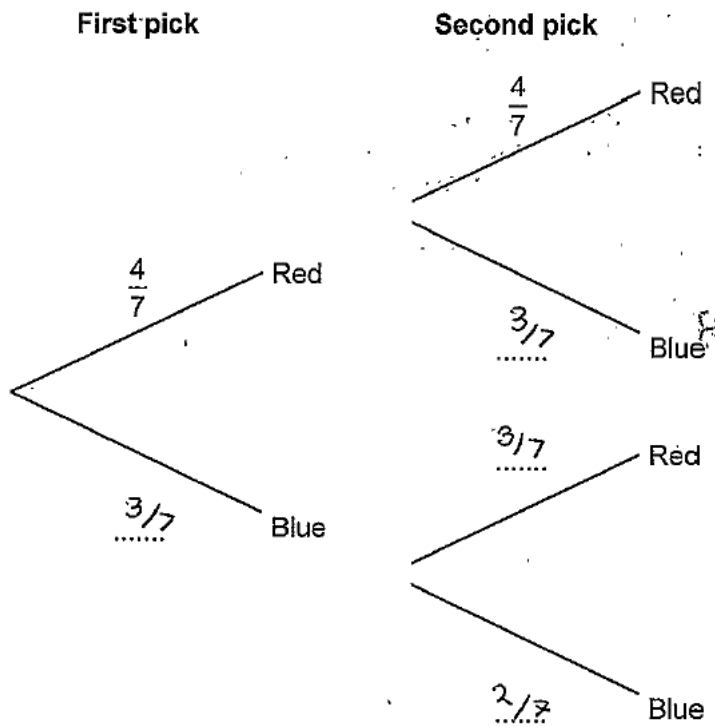
Examiner commentary

Even though both red probabilities are the same, some candidates did not consider that the counter was replaced so gave the bottom blue probability on the second pick as $\frac{2}{6}$, or in this case as $\frac{2}{7}$.

Question 17 (b)

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

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

Exemplar 1   1 mark

$$\frac{4}{7} \times \frac{4}{7} \qquad \frac{8}{14} \qquad 32$$

$$\frac{4}{7} \times 4 = 7$$

(b) .... $\frac{8}{14}$ .... **[2]**

Examiner commentary

In this exemplar a method mark is given for correctly stating that the 2 probabilities are multiplied but then the candidate is not able to recall the rules for multiplying fractions.

Exemplar 2

0 marks

$$\frac{4}{7} + \frac{4}{7} = \frac{8}{7}$$

(b) .... $\frac{8}{7}$ .... [2]

Examiner commentary

Many candidates made this error of adding the 2 fractions rather than multiplying them to get the correct answer of $\frac{16}{49}$.

There was no evidence that candidates checked the reasonableness of this answer and identified that a probability greater than 1 was not possible.

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.

Ticket Sale
All prices reduced
by 15%

(2% booking fee
applies)

£ .... [6]

Exemplar 1   5 marks

$$\frac{80}{}$$
$10\% = 8$
$5\% = 4$
$15\% = 12$
Total for 1 = 78

Total for 2 = £156

$$\begin{array}{r} 78 \\ \times 2 \\ \hline 156 \\ 1 \end{array}$$

$$\frac{40}{}$$
$10\% = 4$
$5\% = 2$
$15\% = 6$
Total for 1 = 34

Total
$$\begin{array}{r} 156 \\ 34 \\ \hline 190 \\ \end{array}$$

Booking fee

$$\frac{190}{}$$
$1\% = 1.9$
$2\% = 3.8$

$$\begin{array}{r} 19 \\ \times 2 \\ \hline 38 \\ 1 \end{array}$$

Total with booking fee

$190 + 3.8 = 193.8$

Total Cost Adam must pay = £193.8   £ 193.8 .... [6]

Examiner commentary

This exemplar demonstrates a completely correct method with just one arithmetic error. The working is clearly set out and easy to follow.

In the working to reduce 80 by 15% the candidate has calculated it to be 78 rather than 68. As the working for 80 – 12 is not shown the M2 is not awarded at this point.

40 has been reduced by 15% completely correctly to 34 so M2 is achieved here.

M1 is awarded for intention to find the total ticket cost of 2 adults + 1 child with the calculation 156 + 34 = 190.

Following through with the candidate's ticket combination price of £190, this has been increased by 2% correctly and so a further M2 is awarded for the calculation 190 + 3.8.

Exemplar 2 4 marks

$$80 \div 10 = 8 = 10\%$$
$$4 = 5\%$$
$$12 = 15\%$$
$$80 - 12 = 68$$
$$68 \times 2 = 136.$$
$$40 \div 10 = 4$$
$$6 = 15\%$$
$$40 - 6 = 34$$
$$136 + 34 = 170$$
$$170 \div 100 = 1.7 \times 2 = 3.4$$
$$170 - 3.4 = 166.6$$

£ .... 166.6 .... **[6]**

Examiner commentary

When listing percentages of an amount such as here with 8 = 10%, 4 = 5%, this doesn't provide a complete method. However, as these values are correct M2 is awarded for the calculation 80 – 12.

M1 is given for 136 + 34 to find the total ticket price for 2 adults + 1 child.

M2 is not achieved for increasing 170 by 2% as the candidate has reduced 170 by 2%. However, M1 is earned for the complete method to find 2% shown by 170 ÷ 100 = 1.7 × 2 = 3.4.

Exemplar 3

3 marks

15% of £80 = £12

1% = £0.8p
2% = £1.6p

£80p − £12 = £68

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 + £3.54p = £181.54p

£ 181 .54p .... **[6]**

Examiner commentary

In this exemplar, steps of working are clearly identified by the candidate underlining the final result at the end of each step.

A complete method is not seen but the calculation 80 – 12 earns M2 for reducing a ticket price by 15%. The £40 ticket price has incorrectly been reduced by 20%.

M1 is awarded for the calculation 136 + 32 as an intention to find the total ticket cost of 2 adults + 1 child.

In calculating 2% of their ticket combination of £178, a complete method is not written down. 1% is stated as £1.78p and for 178 this value is correct. However, 2% is incorrect and as the calculation of 1.78 × 2 is not seen the method mark cannot be awarded.

Exemplar 4

3 marks

$2 \times 80 = 160$
4.0

$160 + 40 = 200$ £

$10\% = 20$
$5\% = 10$
$1\% = 2.0$

$20 + 10 = 30$

$200 - 30 = 170$

$170 + 1 = 171$

£ ....171............ **[6]**

Examiner commentary

By finding the total ticket cost for 2 adults and 1 child first, as this comes to £200, the calculation to reduce this amount by 15% is made easier than attempting to find 15% of £80 and 15% of £40 first.

A method mark is earned for 160 + 40 and 2 method marks are earned for 200 – 30. There is no calculation to find 2% and adding 1 to 170 is incorrect so no further marks are gained.

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]**

Exemplar 1   5 marks

$$40 \div 5 = 8$$
$$8 \times 3 = 24$$

$\frac{2}{3}$ of the total women = 24

$$24 \div 3 = 8$$
$$8 \times 3 = 24$$
$$24 \div 2 = 12$$
$$12 \times 3 = 36$$

3
6
9
12
15
18
21
24

.... 36 .... **[5]**

Examiner commentary

This exemplar demonstrates a completely correct solution. Firstly, the candidate has found $\frac{3}{5}$ of 40 giving the working of

40 ÷ 5 = 8 and 8 × 3 = 24.

They have correctly interpreted this 24 as being $\frac{2}{3}$ of the total women and have stated this.

They have then divided 24 by 2 and multiplied the result by 3 which leads them to the correct final answer of 36.

Exemplar 2

3 marks

$$\frac{1}{5} \text{ of } 40 = 24 \qquad \frac{2}{3} \text{ of } \overset{36}{?} = 24$$

$$40 + 36$$

.... 76 .... **[5]**

Examiner commentary

Stating ' $\frac{3}{5}$ of 40' is not enough to gain a method mark and it would be better to show the calculation $\frac{3}{5} \times 40$.

The statement ' $\frac{2}{3}$ of ? = 24' indicates that the candidate has interpreted what 24 represents correctly as they have not gone on to find $\frac{2}{3}$ of 24. This statement earns 3 method marks.

They have also identified the value of 36 correctly but have spoiled achieving any further marks by doing 36 + 40 leading to their answer of 76. This is the total number of men and women who took the test, whereas the question requires the number of women that took the test.

Exemplar 3   **2 marks**

men = 40

$\frac{3}{5}$ of 40 = 24

40 ÷ 5 = 8
8 × 3 = 24 men passed

$\frac{2}{3}$ = 24 women passed

$\frac{2}{3}$ of ? = 24

24 ÷ 3 = 8
8 × 2 = 16
24 + 16 = 40

..............40.........🖤.............. **[5]**

Examiner commentary

In this exemplar the statement '$\frac{3}{5}$ of 40' is followed by the correct calculations to find the correct number of men who passed. M1 A1 is earned at this stage.

The candidate writes the statements '$\frac{2}{3}$ = 24 women passed' and '$\frac{2}{3}$ of ? = 24' which could imply the third mark. However, they have gone on to calculate $\frac{2}{3}$ of 24 and so M1 A1 is the maximum they can score.

Question 20

Exemplar 1   6 marks

20 The diagram shows two intersecting straight lines.
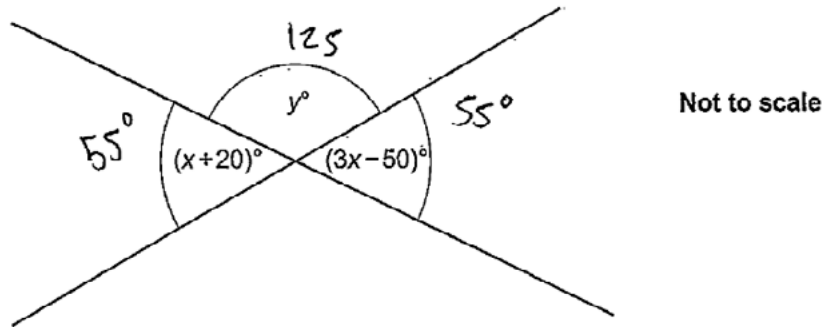
125

$y°$

$55°$

$55°$

$(x+20)°$ $(3x-50)°$

Not to scale

Find the value of y.

$3x - 50 = x + 20$
$-x \qquad -x$

$2x - 50 = 20$
$+50 \quad +50$

$2x = 70$
$\div 2 \quad \div 2$
$x = 35$

125
$+ 125$
250

$35 + 20 = 55$

$(3 \times 35) - 50 = 55$

$105 - 50 = 55$

$55 + 55 = 110$

$360 - 110 = 250$

$250 \div 2 = 125$

$\begin{array}{r} 35 \\ \times 3 \\ \hline 105 \end{array}$

$\begin{array}{r} 105 \\ - 50 \\ \hline 55 \end{array}$

$y = \underline{\quad 125° \quad}$ [6]

Examiner commentary

This exemplar demonstrates a completely correct algebraic solution. The equation, $3x - 50 = x + 20$, from using the angle property **vertically opposite angles are equal**, has been set up and solved correctly to give $x = 35$. Three marks are earned at this stage.

A method mark is gained for substituting the value of $x = 35$ into either $x + 20$ or $3x - 50$ to give the value for each vertically opposite angle as 55.

A further method mark is achieved for using the angles of 55 and the angle property **the sum of the angles at a point is 360°** in the steps of working $55 + 55 = 110$, $360 - 110 = 250$, $250 \div 2$.

The final mark is earned for the correct answer of $y = 125$.

Exemplar 2

4 marks

20 The diagram shows two intersecting straight lines.
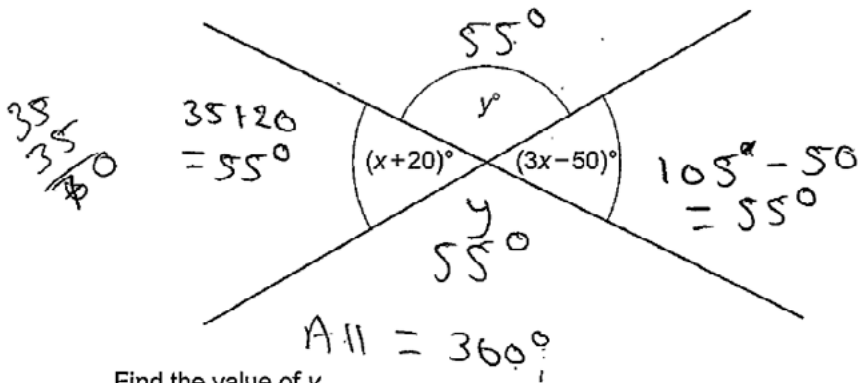
$$35$$
$$35$$
$$35$$
$$\overline{105}$$

Not to scale

$$\frac{35}{35}\Big/0$$

$$35 + 20$$
$$= 55°$$

$$55°$$
$$y°$$

$$(x+20)° \quad (3x-50)°$$

$$55°$$

$$105° - 50$$
$$= 55°$$

$$\begin{array}{r} 1\,0\,5 \\ -\,5\,0 \\ \hline 5\,5 \end{array}$$

$$All = 360°$$

Find the value of *y*.

$$x + 20 = 3x - 50$$
$$+50 \qquad +50$$

$$x + 70 = 3x$$
$$-x \qquad -x$$

$$70 = 2x$$
$$\div 2 \qquad \div 2$$

$$35 = x$$

$$\begin{array}{r} 5\,5 \\ 5\,5 \\ \hline 1\,1\,0 \end{array}$$

$$2\,|\,1\,1\,0 \qquad 2\,|\,1\,1\,0$$
$$\qquad \qquad 5\,5$$
$$\qquad \qquad 5\,5$$
$$\qquad \qquad \overline{1\,1\,0}$$

$$y \times 2 = 110$$
$$\div 2 \qquad \div 2$$

$$y = 55$$

$$y = \underline{\quad 55 \quad} \quad [6]$$

Examiner commentary

Similar to the previous exemplar this candidate has worked algebraically, scoring the first 3 marks for achieving 35 = *x*.

They have also correctly substituted this value to find the size of the vertically opposite angles as 55°. A method mark is earned for this.

No further marks are earned as they have incorrectly assumed $y \times 2 = 55 + 55$.

Exemplar 3   3 marks

20 The diagram shows two intersecting straight lines.
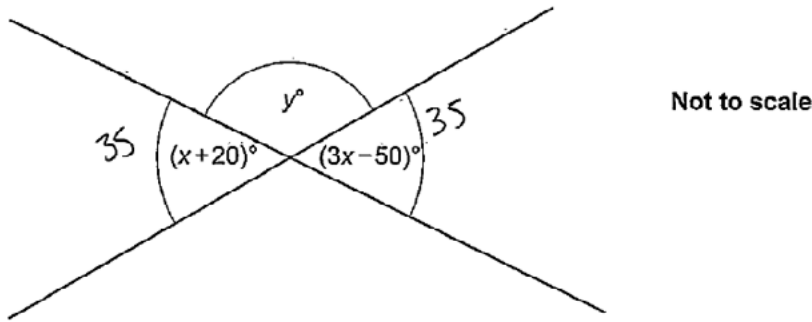
Not to scale

Find the value of y.

$$x + 20 = 3x - 50$$

$$35 \times 2 = 70$$
$$360 - 70 = 290$$
$$290 \div 2 = 145°$$

$$-x \qquad -x$$
$$20 = 2x - 50$$
$$+50 \qquad +50$$
$$70 = 2x$$
$$\div 2 \qquad \div 2$$
$$35 = x$$

$y =$ .....145°................................... [6]

Examiner commentary

After achieving 3 marks for finding algebraically the value of x to be 35, this candidate has misinterpreted this to be the size of each vertically opposite angle.

As the method mark for $y = (360 - 2 \times$ their 55)/2 is dependent on substituting a value of x into either $x + 20$ or $3x - 50$, no further marks are earned.

Exemplar 4   **0 marks**

20 The diagram shows two intersecting straight lines.

82   (x + 20)°   (3x − 50)°   82   y°   Not to scale
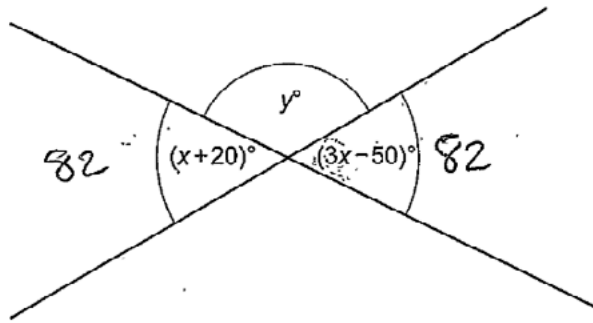
Find the value of y.

$$\begin{array}{r} 82 + \\ 82 \\ \hline 164 \end{array}$$

y° will be the same as the angle opposite as opposite angles are equal

$(x + 20) + (3x - 50)$

$+20 \qquad -50 + 20 = -30$

all angles around a point add up to 360°

$+30\left(\dfrac{4x - 30}{0}\right)+30 \qquad \dfrac{34 \cdot x}{4}$

$+30\left(\dfrac{4x - 30}{34x + 0}\right)+30 \qquad \boxed{\times 4} \; \boxed{+30}$

$34x ÷ 4 = 48.2$

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

Examiner commentary

This candidate has demonstrated that they were familiar with the required angle properties for this question. In setting up the equation they have incorrectly added x + 20 and 3x – 50 rather than make them equal and so they have been unable to correctly use the properties they have identified.

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