Question 1

Response 1

MARKS | DO NOT WRITE IN THIS MARGIN

Total marks — 50

Attempt ALL questions

1. Given that $f(x)=5x^3$, evaluate $f(-2)$. 2

$f(-2) = 5 \times (-2)^3$

$f(-2) = 5 \times 8$

$f(-2) = 40$

Response 2

MARKS | DO NOT WRITE IN THIS MARGIN

Total marks — 50

Attempt ALL questions

1. Given that $f(x)=5x^3$, evaluate $f(-2)$. 2

$f(-2) = 5 \times (-2)^3$

$= (-10)^3$

$= 1000$

OR ~~$5 \times (-8)$~~ ~~$= -40$~~

Question 2

Response 3

2. Evaluate $\frac{3}{8} \times 1\frac{5}{7}$.

Give your answer in its simplest form. 2

$\frac{3}{8} \times 1\frac{5}{7}$

$\frac{3}{8} \times \frac{12}{7}$

$\frac{36}{56}$

$= \frac{13}{28}$

Response 4

2. Evaluate $\frac{3}{8} \times 1\frac{5}{7}$.

Give your answer in its simplest form. 2

$\frac{3}{8} \times 1\frac{5}{7}$

$\frac{3}{8_2} \times \frac{12}{7}\ 3$ $\frac{9}{14}$ $= \frac{3}{4}$

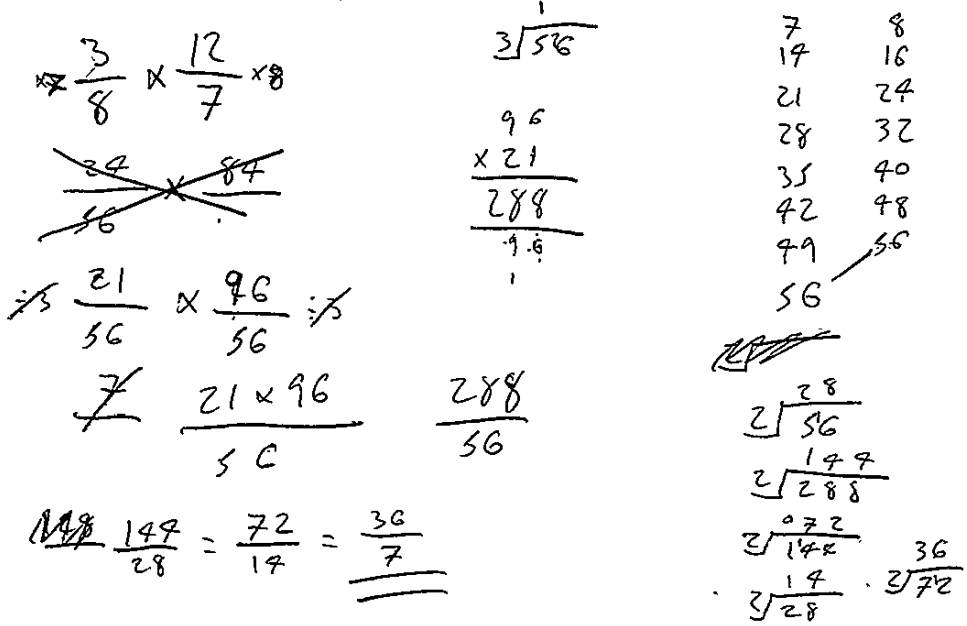
$\frac{3}{8} \times \frac{12}{7}$ $\frac{3}{4}$

56

Response 5

2. Evaluate $\frac{3}{8} \times 1\frac{5}{7}$.

Give your answer in its simplest form. 2



Question 3

Response 6

MARKS | DO NOT WRITE IN THIS MARGIN

3. Expand and simplify $(x+5)(2x^2-7x-3)$. (3)

$x+(2x^2-7x-3)5(2x^2-7x-3)$

$2x^3 -7x^2 -3x +10x^2 -35x -15$

$=2x^3-17x^2+28x-15$

Response 7

MARKS | DO NOT WRITE IN THIS MARGIN

3. Expand and simplify $(x+5)(2x^2-7x-3)$. 3

$(x+5)(2x^2-7x-3)$

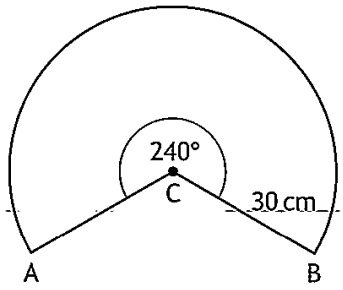
$2x^3-7x^2-3x+10x^2+35x-15$

$2x^3+3x^2+32x-15$

Question 4

Response 8

4. The diagram below shows a sector of a circle, centre C.



The radius of the circle is 30 centimetres.

Calculate the length of the major arc AB.

Take $\pi = 3{\cdot}14$.

$AS = \frac{?}{360} \times \pi d$

$= \frac{240}{360} \times 3.14 \times 60$

$= 1.5 \times 3.14 \times 60$

$= 12.1 \times 60$

$= 720.6$

1.50 × 3.14 = 6.00, 1.500 + 4.5000 = 12.1

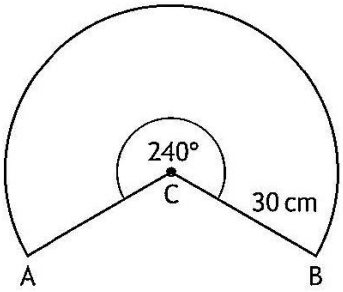
1.5 × 24 = 36.00

24 + 24 = 48, 48 + 24 = 72, 72 + 24 = 96, 96 + 24 = 120

12.1 × 16 = 72.6

Response 9

4. The diagram below shows a sector of a circle, centre C.



The radius of the circle is 30 centimetres.

Calculate the length of the major arc AB.

Take $\pi = 3{\cdot}14$. 3

$AL = \frac{\text{Angle}}{360} \times 3.14 \times 30$

$= \frac{240}{360} \times 3.14 \times 30$

$= \frac{2}{3} \times 3.14 \times 30$

$= 2/3 \times 94.2$

$= 2 \times 31.4$

$= 62.8\text{cm}$

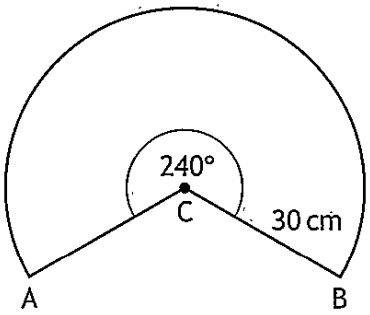
$\frac{24}{36}$ $\frac{4}{6}$ $\frac{2}{3}$

$3.14 \times 30 = 94.20$

$3\overline{)94.2} = 31.4$

Response 10

4. The diagram below shows a sector of a circle, centre C.



The radius of the circle is 30 centimetres.

Calculate the length of the major arc AB.

Take $\pi = 3{\cdot}14$.

3

$$\frac{\text{angle}}{360} = \frac{\text{arc area of sector}}{\pi d}$$

$$\frac{240}{360} = \frac{x}{\pi \times 60}$$

$$360x = 240 \times \pi \times 60$$

$$x = \frac{240 \times \pi \times 60}{360}$$

$$x = 32000$$

$240 \times 60 = 14400$

$14400 \times 3{\cdot}14$

$360 \overline{)\,115200}$ → 32000

Response 10 cont.

ADDITIONAL SPACE FOR ANSWERS

THIS MARGIN

4. $\frac{\text{angle}}{360} = \frac{x}{\pi d}$

$\frac{120}{360} = \frac{x}{3.14 \times 60}$

$360x = 120 \times 3.14 \times 60$

$x = \frac{120 \times 3.14 \times 60}{360}$

$x = \frac{56522}{360}$

$x = \frac{56520}{360}$

$x = 157\text{cm}$

3.14×60

18.84

188.4

$\times 120$

376.80

$1,88,400$

56522

$360 \overline{)56520}$ 157

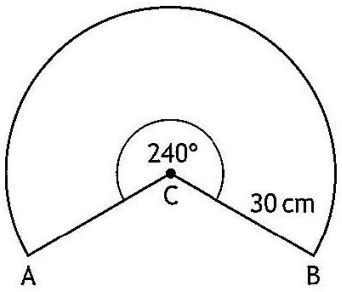
360

$\times 7$

2520

Response 11

4. The diagram below shows a sector of a circle, centre C.



The radius of the circle is 30 centimetres.

Calculate the length of the major arc AB.

Take $\pi = 3{\cdot}14$. 3

$AL = \frac{a}{360} \times \pi r^2$

$AL = \frac{240}{360} \times 3{\cdot}14 \times 900$

$AL = \frac{2}{3}$

$AL = \frac{2}{3} \times 2826$

$AL = 1716\text{cm}$

Question 5

Response 12

MARKS | DO NOT WRITE IN THIS MARGIN

5. The midday temperatures in Grantford were recorded over a nine day period.

The temperatures, in °C, were

4 7 4 3 6 10 9 5 3

(a) Calculate the median and semi-interquartile range for these temperatures. **3**

3, 3 | 4, 4, (5), 6, 7 | 9, 10

Q2

Q1 = 3·5 Q3 = 8

median = 5

$SIQR = \frac{Q3 - Q1}{2}$

$= \frac{8 - 3.5}{2}$

$= \frac{4.5}{2}$

$= 2.21$

$2 \overline{)4.5}$ 2·21

Over the same nine day period the midday temperatures in Endoch were also recorded.

The median temperature was 8 °C, and the semi-interquartile range was 1·5 °C.

(b) Make two valid comments comparing the midday temperatures of Grantford and Endoch during this period. **2**

- On average the temperatures in Endoch were hotter
- The temperatures in Endoch were more consistent over the nine days

Response 13

MARKS | DO NOT WRITE IN THIS MARGIN

5. The midday temperatures in Grantford were recorded over a nine day period.
The temperatures, in °C, were

~~A 7 K 8 6 10 9 5 3~~

(a) Calculate the median and semi-interquartile range for these temperatures. 3

3 3/4 4 (5) 6 7/9 10

median = 5°C

$q_3 = 5$

$q_1 = 3.5$

$q_2 = 8$

$SIQR = \frac{q_3 - q_1}{2}$

$= \frac{5 - 3.5}{2}$

$= \frac{1.5}{2}$

$= 0.75°C$

0.5
0.25

Over the same nine day period the midday temperatures in Endoch were also recorded.

The median temperature was 8 °C, and the semi-interquartile range was 1·5 °C.

(b) Make two valid comments comparing the midday temperatures of Grantford and Endoch during this period. 2

· on average in Endoch the median was higher as 8 > 5.

· on average in Grantford the temperatures varied less ~~as~~ than in Endoch as 0.75 < 1.5

Response 14

MARKS | DO NOT WRITE IN THIS MARGIN

5. The midday temperatures in Grantford were recorded over a nine day period.
The temperatures, in °C, were

4 7 4 3 6 10 9 5 3

(a) Calculate the median and semi-interquartile range for these temperatures. **3**

3 3 4 4 5 6 7 9 10

median = 5

Semi-interquartile range ~~$= \frac{7-4}{2} = \frac{3}{2} = 1.5$~~

$= \frac{7-4}{2} = \frac{3}{2} = 1.5$

Over the same nine day period the midday temperatures in Endoch were also recorded.

The median temperature was 8 °C, and the semi-interquartile range was 1·5 °C.

(b) Make two valid comments comparing the midday temperatures of Grantford and Endoch during this period. **2**

Endoch is warmer in midday than Grantfort

~~Endochs temperature are more varied~~ less

Grantford and Endochs temperatures are both as consistent as each other

Response 15

MARKS | DO NOT WRITE IN THIS MARGIN

5. The midday temperatures in Grantford were recorded over a nine day period.

The temperatures, in °C, were

4 7 4 3 6 10 9 5 3

(a) Calculate the median and semi-interquartile range for these temperatures. 3

median = 6 °C

$SIQR = \frac{Q_3 - Q_1}{2} = \frac{7 - 5{\cdot}5}{2}$

$= \frac{1{\cdot}5}{2}$

$= 7{\cdot}5\,^{\circ}C$

Over the same nine day period the midday temperatures in Endoch were also recorded.

The median temperature was 8 °C, and the semi-interquartile range was 1·5 °C.

(b) Make two valid comments comparing the midday temperatures of Grantford and Endoch during this period. 2

On average, the temperatures in Endoch were higher than the ~~ares in~~ temperatures in Grantford.

~~The range of tempera~~

The variation of temperatures in Endoch were less varied than the temperatures in Grantford.

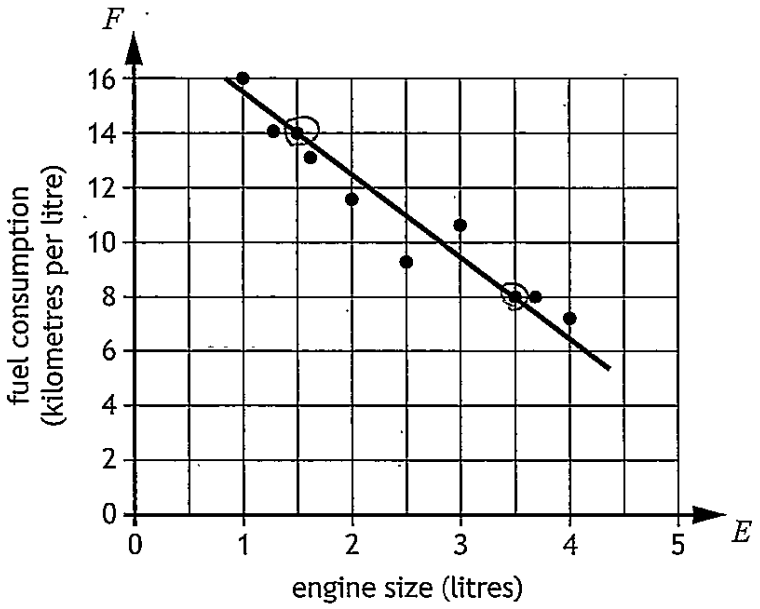
Question 6

Response 16

MARKS | DO NOT WRITE IN THIS MARGIN

6. The fuel consumption of a group of cars is recorded.

The scattergraph shows the relationship between the fuel consumption, F kilometres per litre, and the engine size, E litres, of the cars.



A line of best fit has been drawn.

(a) Find the equation of the line of best fit in terms of F and E.
Give the equation in its simplest form. 3

$(1.5, 14)$ $(3.5, 8)$

$\frac{y_2 - y_1}{x_2 - x_1}$

$\frac{14 - 8}{1.5 - 3.5}$

$\frac{6}{-2} = -3$

$y - b = m(x - a)$

$y - 8 = -3(x - 3.5)$

$y = 8 = -3x + 10.5$

$y = -3x + 18.5$

$F = -3E + 18.5$

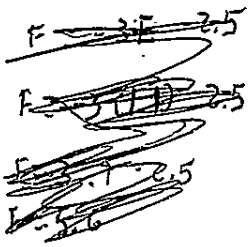
MARKS | DO NOT WRITE IN THIS MARGIN

6. (continued)

Amaar's car has an engine size of 1·1 litres.

(b) Use your equation from part (a) to estimate how many kilometres per litre he should expect to get. **1**

When E = (1.1)



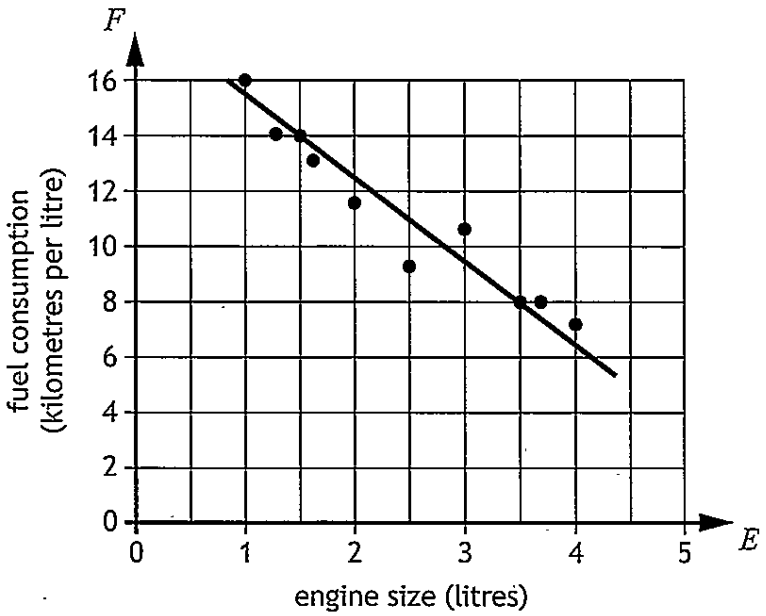
F = -3E + 18.5
F = -3(1.1) + 18.5
F = -3.3 + 18.5
F = 15.16

Response 17

MARKS | DO NOT WRITE IN THIS MARGIN

6. The fuel consumption of a group of cars is recorded.

The scattergraph shows the relationship between the fuel consumption, F kilometres per litre, and the engine size, E litres, of the cars.



A line of best fit has been drawn.

(a) Find the equation of the line of best fit in terms of F and E.
Give the equation in its simplest form. 3

$e(1.5, 14)$ $y(3.5, 8)$
e_1 y_1 e_2 y_2

$y = me + c$

$m = \frac{y_2 - y_1}{e_2 - e_1}$

$= \frac{8 - 14}{3.5 - 1.5} = \frac{-6}{2} = -3$

* Used additional space *

MARKS | DO NOT WRITE IN THIS MARGIN

ADDITIONAL SPACE FOR ANSWERS

6. (a)

$y = mx + c$

$14 = -3 \times 1.5 + c$

$14 = -6.5 + c$

$14 + 6.5 = c$

$20.5 = c$

$c = 20.5$

(1.5, 14)
x y

$3 \times 1.5 = 6.5$

$y = -3x + 20.5$

$F = -3E + 20.5$

MARKS | DO NOT WRITE IN THIS MARGIN

6. **(continued)**

Amaar's car has an engine size of 1·1 litres.

(b) Use your equation from part (a) to estimate how many kilometres per litre he should expect to get. **1**

$F = -3E + 20.5$

$F = -3 \times 1.1 + 20.5$

$F = -3.3 + 20.5$

$F = 17.2$

$3 \times 1.1 = 3.3$

$20.5 - 3.3 = 17.2$

Response 18

MARKS | DO NOT WRITE IN THIS MARGIN

6. (continued)

Amaar's car has an engine size of 1·1 litres.

(b) Use your equation from part (a) to estimate how many kilometres per litre he should expect to get. 1

$F = -3E + 19$

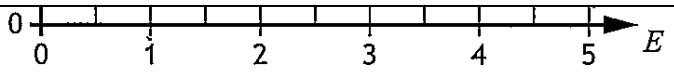
$F = -3(1{\cdot}1) + 19$

$F = -3{\cdot}3 + 19$

$F = 15{\cdot}7$

$1{\cdot}1 \times 3 = 3{\cdot}3$

$19{\cdot}0 - 3{\cdot}3 = 15{\cdot}7$



engine size (litres)

A line of best fit has been drawn.

(a) Find the equation of the line of best fit in terms of F and E.
Give the equation in its simplest form. 3

~~(1, 16) (3·5, 8)~~

~~$m = \frac{y_2 - y_1}{x_2 - x_1}$~~

~~$= \frac{8 - 16}{3{\cdot}5 - 1}$~~

~~$= \frac{-8}{2{\cdot}5}$~~

$=$

$(1, 16)(4, 7)$

$m = \frac{y_2 - y_1}{x_2 - x_1}$

$m = \frac{7 - 16}{4 - 1}$

$m = \frac{-9}{3}$

$m = -3$

$y = mx + c$

$7 = -3(4) + c$

$7 = -12 + c$

$c = 19$

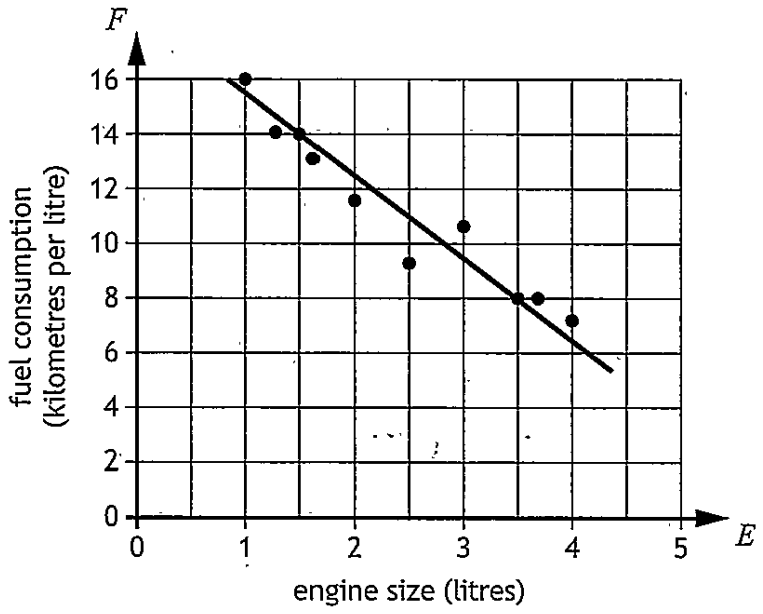
$F = -3E + 19$

Response 19

MARKS | DO NOT WRITE IN THIS MARGIN

6. The fuel consumption of a group of cars is recorded.

The scattergraph shows the relationship between the fuel consumption, F kilometres per litre, and the engine size, E litres, of the cars.



A line of best fit has been drawn.

(a) Find the equation of the line of best fit in terms of F and E.
Give the equation in its simplest form. 3

$(1.5, 14) = x_2\ y_2$
$(3.5, 8) = x_1\ y_1$

$(1.5, 14)$
$a \quad b$

$m = \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{14 - 8}{1.5 - 3.5}$

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

$= -2$

$y - b = m(x - a)$
$y - 14 = -2(x - 1.5)$
$y - 14 = -2x + 3$
$(+14) \qquad (+14)$
$y = -2x + 17$

MARKS | DO NOT WRITE IN THIS MARGIN

6. (continued)

Amaar's car has an engine size of 1·1 litres.

(b) Use your equation from part (a) to estimate how many kilometres per litre he should expect to get. **1**

$y = -2x + 17$

$y = -2(1 \cdot 1) + 17$

$y = -2 \cdot 2 + 17$

$y = 15 \cdot 2$

$= 15 \cdot 2$ kilometres per litre

Question 7

Response 20

7. The area of a trapezium is given by the formula

$$A = \frac{1}{2}h(x+y).$$

Make x the subject of the formula. **3**

$A = \frac{1}{2}h(x+y)$

$\frac{1}{2}h(x+y) = A$

$(x+y) = \frac{A}{\frac{1}{2}h}$

$x = \frac{A}{\frac{1}{2}h} - y$

Response 21

7. The area of a trapezium is given by the formula

$$A=\frac{1}{2}h(x+y).$$

Make x the subject of the formula. 3

$\frac{1}{2}h(x+y)=A$

$h(x+y)=2A$

$x+y=\frac{2A}{h}$

$x=\frac{2A-y}{h}$

Response 22

7. The area of a trapezium is given by the formula

$$A=\frac{1}{2}h(x+y).$$

Make x the subject of the formula. 3

$\frac{1}{2}h(x+y)=A$

$\frac{1}{2}h(x)=A-y$

$h(x)=2(A-y)$

$x=\frac{2(A-y)}{h}$

Response 23

7. The area of a trapezium is given by the formula

$$A=\frac{1}{2}h(x+y).$$

Make x the subject of the formula. (3)

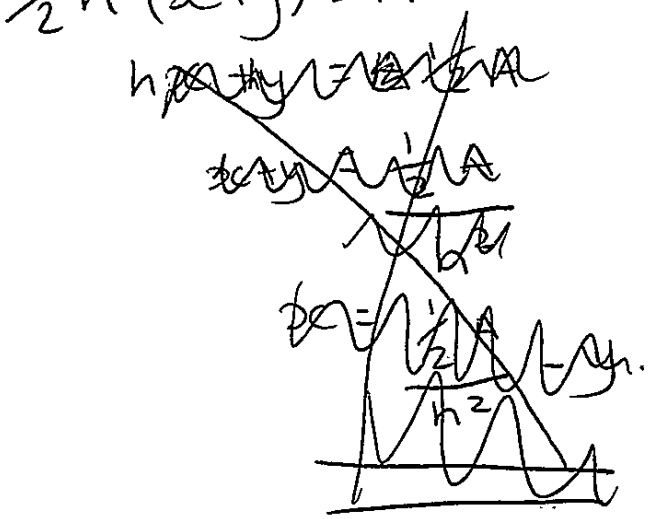
$A = \frac{1}{2}h(x+y)$

$\frac{1}{2}h(x+y) = A$

$\frac{1}{2}hx + \frac{1}{2}hy = A$

$x + y = \frac{A}{\frac{1}{2}h^2}$

$x = \frac{A}{\frac{1}{2}h^2} - y$



Question 8

Response 24

MARKS | DO NOT WRITE IN THIS MARGIN

8. John bought 7 bags of cement and 3 bags of gravel.
The total weight of these bags was 215 kilograms.

(a) Write down an equation to illustrate this information. **1**

C = cement g = gravel

$7C + 3g = 215\text{ kg}$

Shona bought 5 bags of cement and 4 bags of gravel.
The total weight of her bags was 200 kilograms.

(b) Write down an equation to illustrate this information. **1**

$5C + 4g = 200\text{kg}$

(c) Calculate the weight of one bag of cement and the weight of one bag of gravel. **4**

$7C + 3g = 215$ ① $\times 4$

$5C + 4g = 200$ ② $\times -3$

$28C + 12g = 860$

$-15C - 12g = -600$

$13C = 260$

$C = 20$

1 bag of cement = £20

1 bag of gravel = £25

$4\overline{)100}$ = 25

let C = 20 into ②

$5 \times 20 + 4g = 200$

$100 + 4g = 200$

$4g = 100$

$g = 25$

Response 25

MARKS | DO NOT WRITE IN THIS MARGIN

8. John bought 7 bags of cement and 3 bags of gravel.
The total weight of these bags was 215 kilograms.

(a) Write down an equation to illustrate this information. **1**

$7C + 3g = 215\text{kg}$

Shona bought 5 bags of cement and 4 bags of gravel.
The total weight of her bags was 200 kilograms.

(b) Write down an equation to illustrate this information. **1**

$5C + 4g = 200\text{kg}$

(c) Calculate the weight of one bag of cement and the weight of one bag of gravel. **4**

~~$7 \times 20 + 3 \times 25$~~

$7C + 3g = 215\text{kg}$

$5C + 4g = 200\text{kg}$

$28C + 12g = 860\text{kg}$

$-15C - 12g = -600\text{kg}$

$13C = 260\text{kg}$

$C = \frac{260}{13}$

$C = 20\text{kg}$

$5 \times 20 + 4g = 200\text{kg}$

$100 + 4g = 200\text{kg}$

$4g = 100\text{kg}$

$g = \frac{100}{4}$

$g = 25\text{kg}$

$C = 20\text{kg}$ $g = 25\text{kg}$

Response 26

MARKS | DO NOT WRITE IN THIS MARGIN

8. John bought 7 bags of cement and 3 bags of gravel.
The total weight of these bags was 215 kilograms.

(a) Write down an equation to illustrate this information. **1**

$7c + 3g = 215$

Shona bought 5 bags of cement and 4 bags of gravel.
The total weight of her bags was 200 kilograms.

(b) Write down an equation to illustrate this information. **1**

$5c + 4g = 200$

(c) Calculate the weight of one bag of cement and the weight of one bag of gravel. **4**

$7c + 3g = 215 \quad (\times 4)$

$5c + 4g = 200 \quad (\times 3)$

$28c + 12g = 860$

$15c + 12g = 600$

$13c = 260$

$c = 8.6$

$5(8.6) + 4g = 200$

$43 + 4g = 200$

$4g = 200 - 43$

$4g = 67$

$g = 16.2$

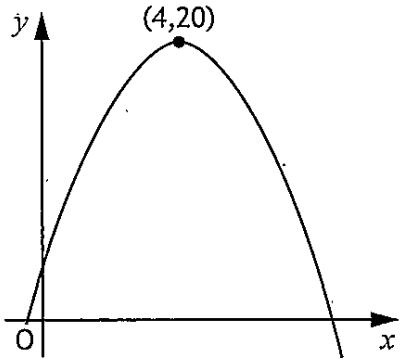
$c = 8.6$
$g = 16.2$

Question 9

Response 27

MARKS | DO NOT WRITE IN THIS MARGIN

9. The graph shows a parabola.



The maximum turning point has coordinates (4,20) as shown in the diagram.

(a) Write down the equation of the axis of symmetry of the graph. 1

4

The equation of the parabola is of the form $y = b - (x + a)^2$.

(b) State the values of

(i) a 1

-4

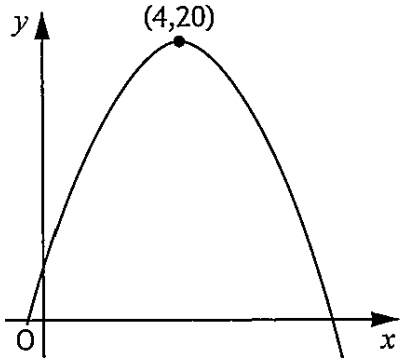
(ii) b. 1

20

Response 28

MARKS | DO NOT WRITE IN THIS MARGIN

9. The graph shows a parabola.



The maximum turning point has coordinates (4,20) as shown in the diagram.

(a) Write down the equation of the axis of symmetry of the graph. 1

$y = -4x + 20$

The equation of the parabola is of the form $y = b - (x + a)^2$.

(b) State the values of

(i) a 1

$a = 20$

(ii) b. 1

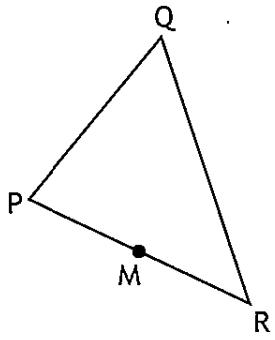
$b = -4$

Question 10

Response 29

MARKS | DO NOT WRITE IN THIS MARGIN

10. In triangle PQR, $\overrightarrow{PR} = \begin{pmatrix} 6 \\ -4 \end{pmatrix}$ and $\overrightarrow{RQ} = \begin{pmatrix} -1 \\ 8 \end{pmatrix}$.



(a) Express $\overrightarrow{PQ}$ in component form. 1

$\overrightarrow{PQ} = \overrightarrow{PR} + \overrightarrow{RQ}$ ✓

$\overrightarrow{PQ} = \begin{pmatrix} 6 \\ -4 \end{pmatrix} + \begin{pmatrix} -1 \\ 8 \end{pmatrix}$

$\overrightarrow{PQ} = \begin{pmatrix} 5 \\ 4 \end{pmatrix}$

M is the midpoint of PR.

(b) Express $\overrightarrow{MQ}$ in component form. 2

$\overrightarrow{MQ} = \frac{1}{2}\overrightarrow{PR}$

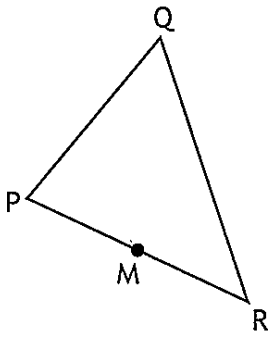
$\overrightarrow{MQ} = \frac{1}{2}\begin{pmatrix} 6 \\ -4 \end{pmatrix}$

$\overrightarrow{MQ} = \begin{pmatrix} 3 \\ -2 \end{pmatrix}$

Response 30

MARKS | DO NOT WRITE IN THIS MARGIN

10. In triangle PQR, $\overrightarrow{PR} = \begin{pmatrix} 6 \\ -4 \end{pmatrix}$ and $\overrightarrow{RQ} = \begin{pmatrix} -1 \\ 8 \end{pmatrix}$.



(a) Express $\overrightarrow{PQ}$ in component form. 1

$\overrightarrow{PQ} = \overrightarrow{PR} + \overrightarrow{RQ}$

$\overrightarrow{PQ} = \begin{pmatrix} 6 \\ -4 \end{pmatrix} + \begin{pmatrix} -1 \\ 8 \end{pmatrix}$

$PQ = \begin{pmatrix} 5 \\ 4 \end{pmatrix}$

M is the midpoint of PR.

(b) Express $\overrightarrow{MQ}$ in component form. 2

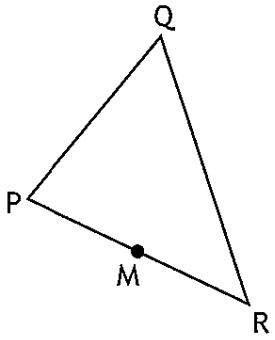
$\overrightarrow{MQ} = \begin{pmatrix} 6 \\ -2 \end{pmatrix} + \begin{pmatrix} -1 \\ 8 \end{pmatrix}$

$= \begin{pmatrix} 5 \\ 6 \end{pmatrix}$

Response 31

MARKS | DO NOT WRITE IN THIS MARGIN

10. In triangle PQR, $\overrightarrow{PR} = \begin{pmatrix} 6 \\ -4 \end{pmatrix}$ and $\overrightarrow{RQ} = \begin{pmatrix} -1 \\ 8 \end{pmatrix}$.



(a) Express $\overrightarrow{PQ}$ in component form. 1

$\overrightarrow{PQ} = \overrightarrow{RQ} - \overrightarrow{PR}$

$= \begin{pmatrix} -1 \\ 8 \end{pmatrix} - \begin{pmatrix} 6 \\ -4 \end{pmatrix}$

$= \begin{pmatrix} -7 \\ 12 \end{pmatrix}$

M is the midpoint of PR.

(b) Express $\overrightarrow{MQ}$ in component form. 2

$\overrightarrow{MQ} = \frac{1}{2}\overrightarrow{PR} + \overrightarrow{PQ}$

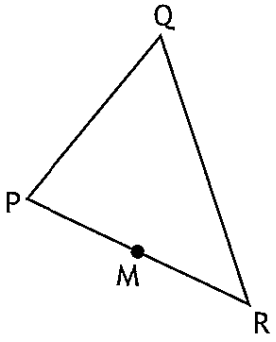
$= \begin{pmatrix} 3 \\ -2 \end{pmatrix} + \begin{pmatrix} -7 \\ 12 \end{pmatrix}$

$= \begin{pmatrix} -10 \\ 10 \end{pmatrix}$

Response 32

MARKS | DO NOT WRITE IN THIS MARGIN

10. In triangle PQR, $\overrightarrow{PR} = \begin{pmatrix} 6 \\ -4 \end{pmatrix}$ and $\overrightarrow{RQ} = \begin{pmatrix} -1 \\ 8 \end{pmatrix}$.



(a) Express $\overrightarrow{PQ}$ in component form. **1**

$PQ = \begin{pmatrix} 6 \\ -4 \end{pmatrix} - \begin{pmatrix} -1 \\ 8 \end{pmatrix} = \begin{pmatrix} 7 \\ -12 \end{pmatrix}$

M is the midpoint of PR.

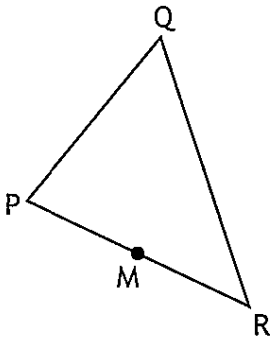
(b) Express $\overrightarrow{MQ}$ in component form. **2**

$\frac{1}{2}\begin{pmatrix} 6 \\ -4 \end{pmatrix} - \begin{pmatrix} -1 \\ 8 \end{pmatrix} = \begin{pmatrix} 3 \\ -2 \end{pmatrix} - \begin{pmatrix} -1 \\ 8 \end{pmatrix} = \begin{pmatrix} 4 \\ -10 \end{pmatrix}$

Response 33 (N5MathematicsCandidateQPaper1)

MARKS | DO NOT WRITE IN THIS MARGIN

10. In triangle PQR, $\overrightarrow{PR} = \begin{pmatrix} 6 \\ -4 \end{pmatrix}$ and $\overrightarrow{RQ} = \begin{pmatrix} -1 \\ 8 \end{pmatrix}$.



(a) Express $\overrightarrow{PQ}$ in component form. 1

$\begin{pmatrix} 6 \\ -4 \end{pmatrix} + \begin{pmatrix} -1 \\ 8 \end{pmatrix}$

M is the midpoint of PR.

(b) Express $\overrightarrow{MQ}$ in component form. 2

$\begin{pmatrix} 3 \\ -2 \end{pmatrix} + \begin{pmatrix} -1 \\ 8 \end{pmatrix}$

Question 11

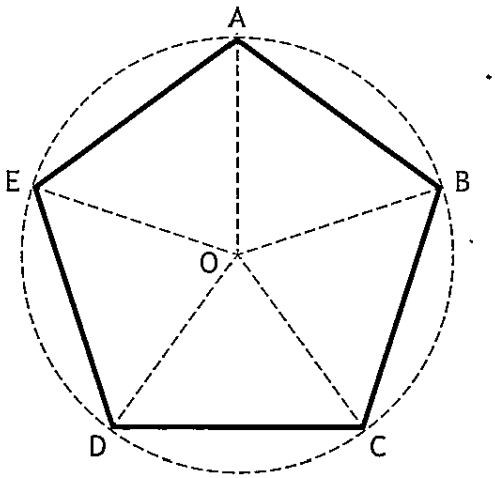
Response 34

MARKS | DO NOT WRITE IN THIS MARGIN

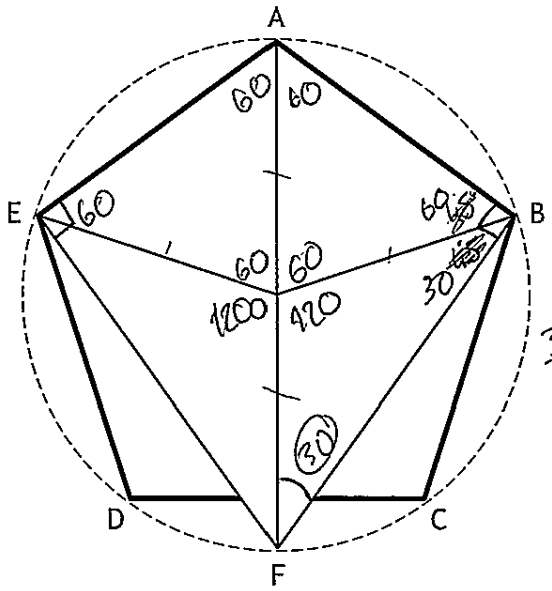
11. Pam is designing a company logo.

She starts by drawing a regular pentagon ABCDE.

The vertices of the pentagon lie on the circumference of a circle with centre O.



She then adds to the design as shown in the diagram below.



AF is a diameter of the circle.

Calculate the size of angle OFB. 3

OFB = 30°

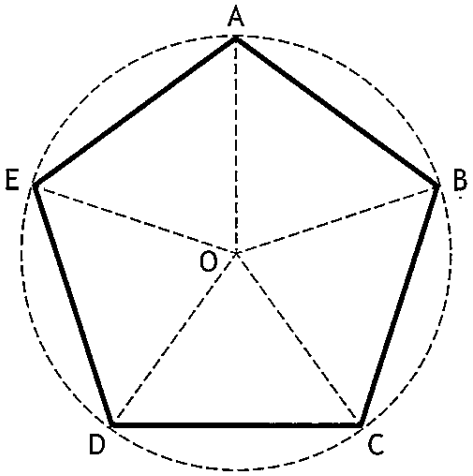
Response 35

MARKS | DO NOT WRITE IN THIS MARGIN

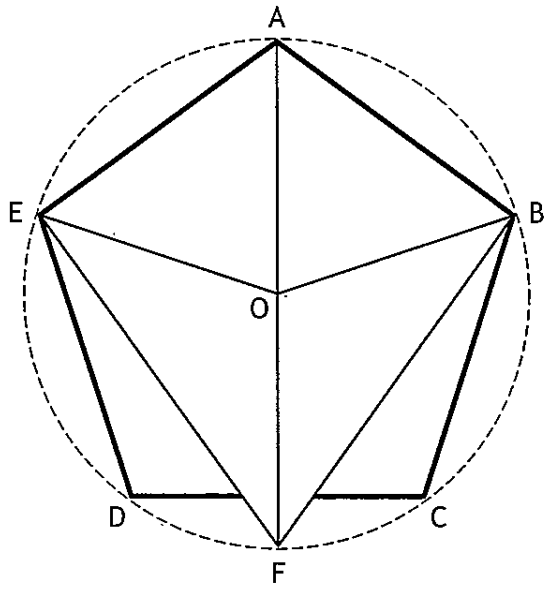
11. Pam is designing a company logo.

She starts by drawing a regular pentagon ABCDE.

The vertices of the pentagon lie on the circumference of a circle with centre O.



She then adds to the design as shown in the diagram below.



AF is a diameter of the circle.

Calculate the size of angle OFB. **3**

O = 360 ÷ 5 = 72°

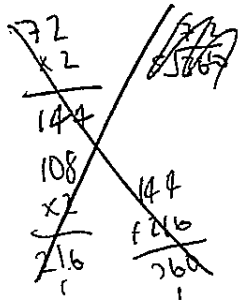
72 ÷ 2 = 36°

72 + 36 = 108°

180 − 108 = 72°

72° ÷ 2 = 36°

OFB = 36°



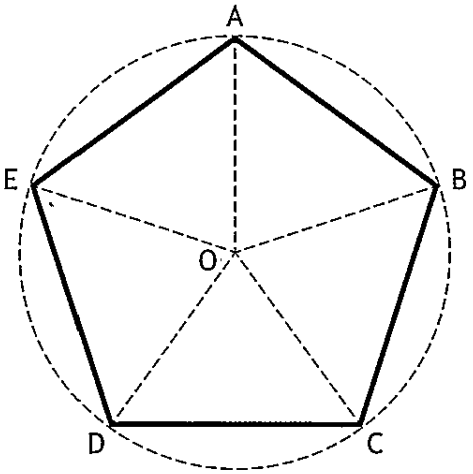
Response 36

MARKS | DO NOT WRITE IN THIS MARGIN

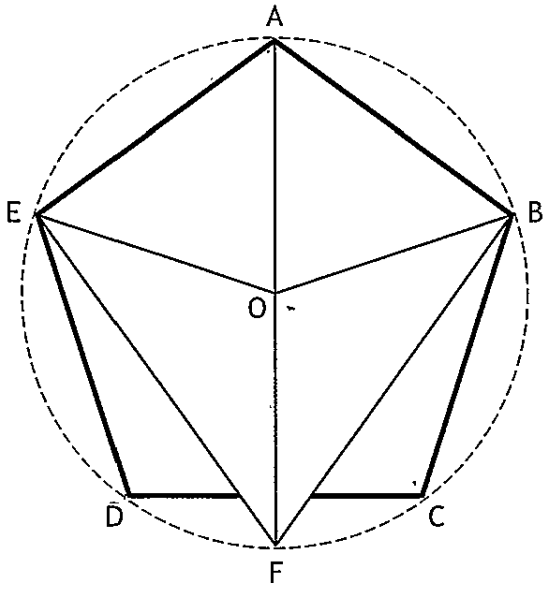
11. Pam is designing a company logo.

She starts by drawing a regular pentagon ABCDE.

The vertices of the pentagon lie on the circumference of a circle with centre O.



She then adds to the design as shown in the diagram below.



AF is a diameter of the circle.

Calculate the size of angle OFB. 3

$5\overline{)360}$ = 072

$2\overline{)72}$ = 36

180 − 72 = 108

108 ÷ 2 = 72

36 36

Question 12

Response 37

MARKS | DO NOT WRITE IN THIS MARGIN

12. Express $\frac{\sqrt{2}}{\sqrt{40}}$ as a fraction with a rational denominator.

Give your answer in its simplest form. 3

$\frac{\sqrt{2}}{\sqrt{40}}$ $\frac{\sqrt{2}}{\sqrt{4}\sqrt{10}}$ $\frac{\sqrt{2}}{2\sqrt{10}} \times \frac{\sqrt{10}}{\sqrt{10}} = \frac{\sqrt{2}\sqrt{10}}{2\,10}$

$\frac{\sqrt{2}\sqrt{10}}{20} = \frac{\sqrt{5}}{10} = \frac{2}{}$

Response 38

MARKS | DO NOT WRITE IN THIS MARGIN

12. Express $\frac{\sqrt{2}}{\sqrt{40}}$ as a fraction with a rational denominator.

Give your answer in its simplest form. 3

$\frac{\sqrt{2}}{\sqrt{40}} = \frac{\sqrt{2} \times \sqrt{40}}{\sqrt{40} \times \sqrt{40}} = \frac{\sqrt{2} \times \sqrt{40}}{40} = \frac{\sqrt{2} \times 2\sqrt{10}}{40}$

$\frac{\sqrt{2} \times \sqrt{10}}{20} = \frac{\sqrt{20}}{20}$

Response 39

MARKS | DO NOT WRITE IN THIS MARGIN

12. Express $\frac{\sqrt{2}}{\sqrt{40}}$ as a fraction with a rational denominator.

Give your answer in its simplest form. 3

$\frac{\sqrt{2}}{\sqrt{40}} \times \frac{\sqrt{40}}{\sqrt{40}} = \frac{\sqrt{2} \times \sqrt{40}}{40} = \frac{\sqrt{2} \times \sqrt{4} \times \sqrt{10}}{40}$

$= \frac{\sqrt{2} \times 2\sqrt{10}}{40^{20}}$

$= \frac{\sqrt{2} \times \sqrt{10}}{20}$

$= \frac{\sqrt{20}}{20}$

$= \frac{\sqrt{2}}{\sqrt{4} \times \sqrt{10}}$

$= \frac{\sqrt{2}}{2\sqrt{10}}$

$= 2\sqrt{5}$

$\frac{\sqrt{2}}{\sqrt{40}} = \frac{\sqrt{2}}{\sqrt{4} \times \sqrt{10}}$

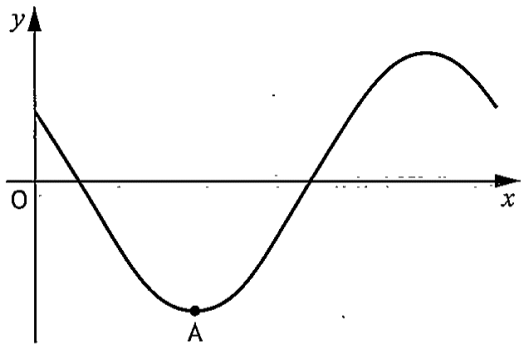
$= \frac{\sqrt{2}}{2\sqrt{10}^{5}}$

$= \frac{1}{2\sqrt{5}}$

Question 13

Response 40

13. Part of the graph of $y = 3\cos(x + 45)°$ is shown in the diagram.



The graph has a minimum turning point at A.

State the coordinates of A. 2

135, -3

Question 14

Response 41

MARKS | DO NOT WRITE IN THIS MARGIN

14. Solve the equation $\frac{x}{2} - 1 = \frac{3-x}{5}$. 3

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

$$5(x-1) = 2(3-x)$$

$$5x - 5 = 6 - 2x$$

$$5x - 5 + 2x = 6$$

$$5x + 2x = 6 + 5$$

$$7x = 11$$

$$x = \frac{11}{7}$$

$$x = ~~1.5\ 10~~$$

7
14
21
28
35
42

Response 42

MARKS | DO NOT WRITE IN THIS MARGIN

14. Solve the equation $\frac{x}{2}-1=\frac{3-x}{5}$. 3

$\frac{x}{2}-1=\frac{3-x}{5}$ (×10)

$10x-10=30-10x$

$10x+10x=30+10$

$20x=40$

$x=2$

Response 43

MARKS | DO NOT WRITE IN THIS MARGIN

14. Solve the equation $\frac{x}{2}-1=\frac{3-x}{5}$. 3

$-1=\frac{3-x}{5}-\frac{x}{2}$ (×2, ×5)

$-1=\frac{6-2x}{10}-\frac{5x}{10}$

$-1=\frac{6-2x-5x}{10}$

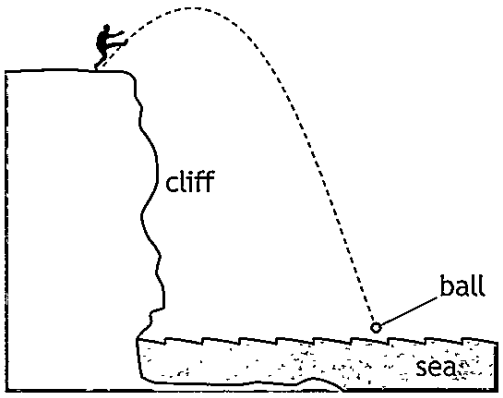
$-1=\frac{6-7x}{10}$

Question 15

Response 44

MARKS | DO NOT WRITE IN THIS MARGIN

15. A ball is kicked from a clifftop.



The height, h metres, of the ball relative to the clifftop after t seconds is given by $h = 12t - 5t^2$.

(a) Calculate the height of the ball above the clifftop after 2 seconds. 1

$h = 12t - 5t^2$

$h = 12(2) - 5(2)^2$

$h = 24 - 20$

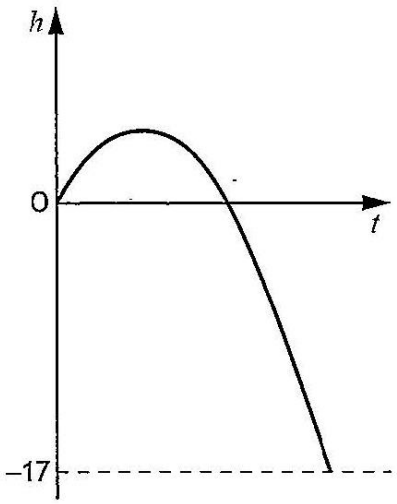
$h = 4$

Response 44 cont.

MARKS | DO NOT WRITE IN THIS MARGIN

15. (continued)

The graph below represents the height, h metres, of the ball relative to the clifftop after t seconds.



The sea is 17 metres below the clifftop.

(b) After how many seconds will the ball hit the sea? 4

$h = 12t - 5t^2$

$17 = 12t - 5t^2$

$17 - 12t + 5t^2 = 0$

$5t^2 + 12t - 17 = 0$

$(5t + 17)(t - 1) = 0$

$5t + 17 = 0$ $\quad t - 1 = 0$

$5t = -17$ $\quad t = 1$

$t = \frac{-17}{5}$

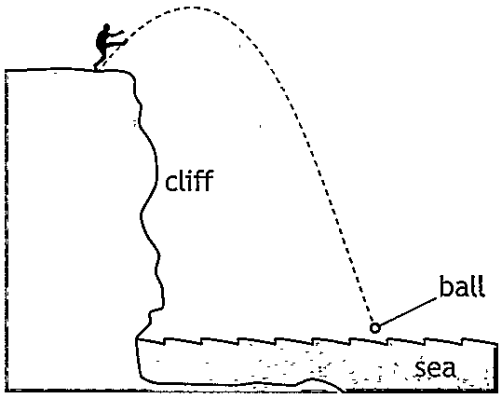
$5t + 17$
$t - 1$

$t = 1$

Response 45

MARKS | DO NOT WRITE IN THIS MARGIN

15. A ball is kicked from a clifftop.



The height, h metres, of the ball relative to the clifftop after t seconds is given by $h = 12t - 5t^2$.

(a) Calculate the height of the ball above the clifftop after 2 seconds. 1

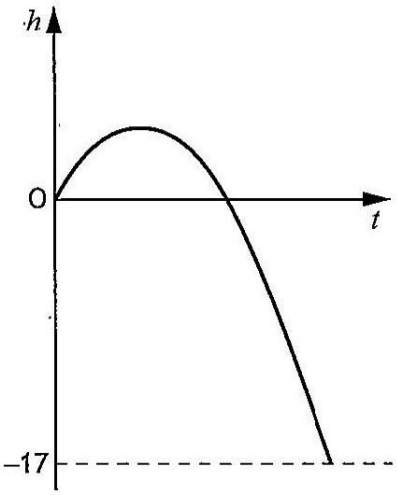
$h = 12t - 5t^2$
$h = 12(2) - 5(2)^2$
$h = 24 - 20$
$h = 4m$

Response 45 cont.

MARKS | DO NOT WRITE IN THIS MARGIN

15. (continued)

The graph below represents the height, h metres, of the ball relative to the clifftop after t seconds.



The sea is 17 metres below the clifftop.

(b) After how many seconds will the ball hit the sea? 4

$h=12t-5t^2$

$17=12t-5t^2$

$12t-5t^2=17$

$t-5t^2=\frac{17}{12}$

$t-t^2=\frac{17}{12}\div 5$

$t(1-t)=$

$h=12t-5t^2$

$-17=12t-5t^2$

$12t-5t^2=-17$

$t-t^2=\frac{-17}{12-5}$

$t(1-t)=\frac{-17}{7}$

$=1-1s$