Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

MATHEMATICS **0580/41**

Paper 4 (Extended) **October/November 2014**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

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CAMBRIDGE International Examinations

1 **(a)** A company makes compost by mixing loam, sand and coir in the following ratio.

View solution

$$\text{loam} : \text{sand} : \text{coir} = 7 : 2 : 3$$

(i) How much loam is there in a 72 litre bag of the compost?

Answer(a)(i) ..... litres [2]

(ii) In a small bag of the compost there are 13.5 litres of coir.

View solution

How much compost is in a small bag?

Answer(a)(ii) ..... litres [2]

(iii) The price of a large bag of compost is \$8.40 .
This is an increase of 12% on the price last year.

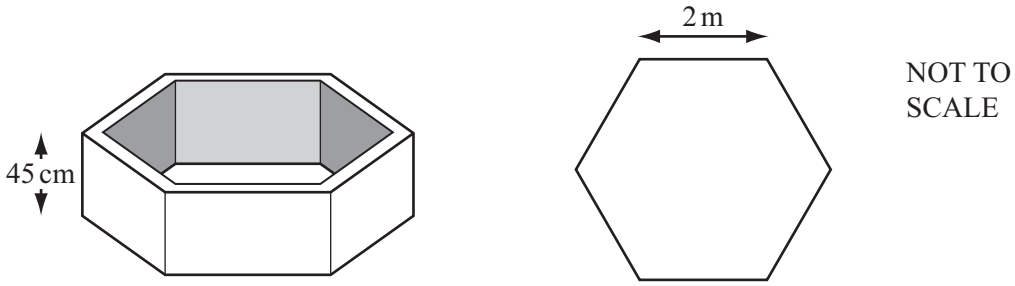
View solution

Calculate the price last year.

Answer(a)(iii) \$ ..... [3]

(b) Teresa builds a raised garden bed in the shape of a hexagonal prism.

View solution



The garden bed has a height of 45 cm.
The cross section of the inside of the garden bed is a regular hexagon of side 2 m.

(i) Show that the area of the cross section of the inside of the garden bed is $10.4\,m^2$, correct to 3 significant figures.

Answer(b)(i)

[3]

(ii) Calculate the volume of soil needed to fill the garden bed.

View solution

Answer(b)(ii) ..... m^3 [2]

(iii) Teresa wants to fill the garden bed with organic top soil.
She sees this advertisement in the local garden centre.

View solution

ORGANIC TOP SOIL	**Number of tonnes purchased**		
	1 to 5	**6 to 10**	**Over 10**
Cost per tonne	$47.00	$45.50	$44.00

Organic top soil is sold in one tonne bags.
$1\,m^3$ of organic top soil has a mass of 1250 kg.

Calculate the cost of the organic top soil needed to fill the garden bed completely.
[1 tonne = 1000 kg]

Answer(b)(iii) $ ..... [4]

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2 **(a)** Rearrange the formula $v^2 = u^2 - 2as$ to make u the subject.

View solution

Answer(a) u = ... [2]

View solution

(b) Chuck cycles along Skyline Drive.
He cycles 60 km at an average speed of x km/h.
He then cycles a further 45 km at an average speed of $(x + 4)$ km/h.
His total journey time is 6 hours.

(i) Write down an equation in x and show that it simplifies to $2x^2 - 27x - 80 = 0$.

Answer(b)(i)

[4]

(ii) Solve $2x^2 - 27x - 80 = 0$ to find the value of x.

View solution

Answer(b)(ii) x = ... [3]

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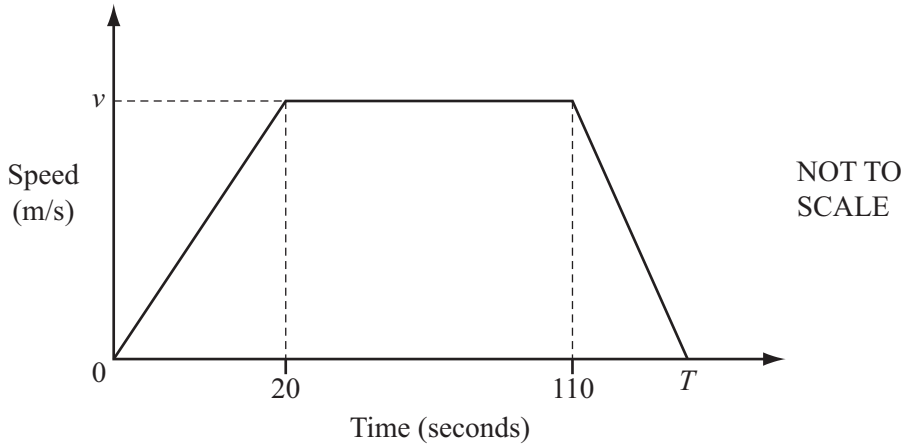
(c) The diagram shows the speed-time graph for a car travelling along a road for T seconds.

View solution



To begin with the car accelerated at $0.75\,m/s^2$ for 20 seconds to reach a speed of v m/s.

(i) Show that the speed, v, of the car is 15 m/s.

Answer(c)(i)

[1]

View solution

(ii) The total distance travelled is 1.8 **kilometres**.

Calculate the total time, T, of the journey.

Answer(c)(ii) ..... seconds [4]

View solution

(d) Asma runs 22 kilometres, correct to the nearest kilometre.
She takes $2\frac{1}{2}$ hours, correct to the nearest half hour.

Calculate the upper bound of Asma's speed.

Answer(d) ..... km/h [3]

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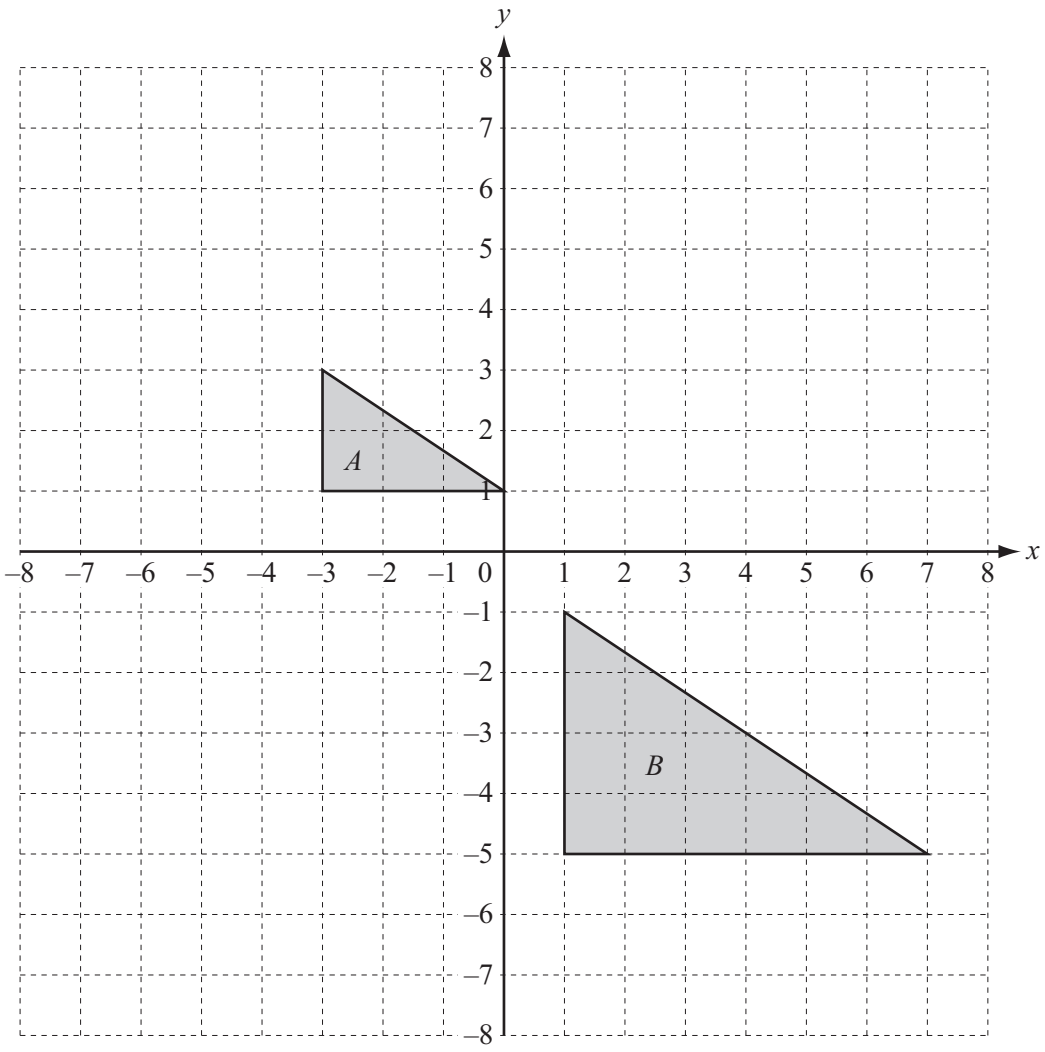
3



View solution

(a) Draw the image when triangle A is reflected in the line $x = 0$. [1]

View solution

(b) Draw the image when triangle A is rotated through 90° anticlockwise about (–4, 0). [2]

View solution

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

Answer(c)(i) .....

..... [3]

(ii) Complete the following statement.

Area of triangle A : Area of triangle B = ... : ..... [2]

View solution

(d) Write down the matrix that represents a stretch, factor 4 with the y-axis invariant.

View solution

Answer(d) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

(e) **(i)** On the grid, draw the image of triangle A after the transformation represented by the matrix $\begin{pmatrix} 1 & 0 \\ 2 & 1 \end{pmatrix}$.

View solution

[3]

(ii) Describe fully this **single** transformation.

View solution

Answer(e)(ii) .....

..... [3]

(iii) Find the inverse of the matrix $\begin{pmatrix} 1 & 0 \\ 2 & 1 \end{pmatrix}$.

View solution

Answer(e)(iii) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

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4 **(a)** Expand and simplify.

(i) $4(2x - 1) - 3(3x - 5)$

View solution

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

(ii) $(2x - 3y)(3x + 4y)$

View solution

Answer(a)(ii) ..... [3]

(b) Factorise.

$x^3 - 5x$

View solution

Answer(b) ..... [1]

(c) Solve the inequality.

$$\frac{2x + 1}{3} \leqslant \frac{5x - 8}{4}$$

View solution

Answer(c) ..... [3]

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(d) (i) $x^2 - 9x + 12 = (x - p)^2 - q$

View solution

Find the value of p and the value of q.

Answer(d)(i) p = ...

q = ... [3]

(ii) Write down the minimum value of $x^2 - 9x + 12$.

View solution

Answer(d)(ii) ..... [1]

(iii) Write down the equation of the line of symmetry of the graph of $y = x^2 - 9x + 12$.

View solution

Answer(d)(iii) ..... [1]

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5 **(a)** Complete the table of values for $y = x^2 + \frac{3}{x}$, $x \neq 0$.

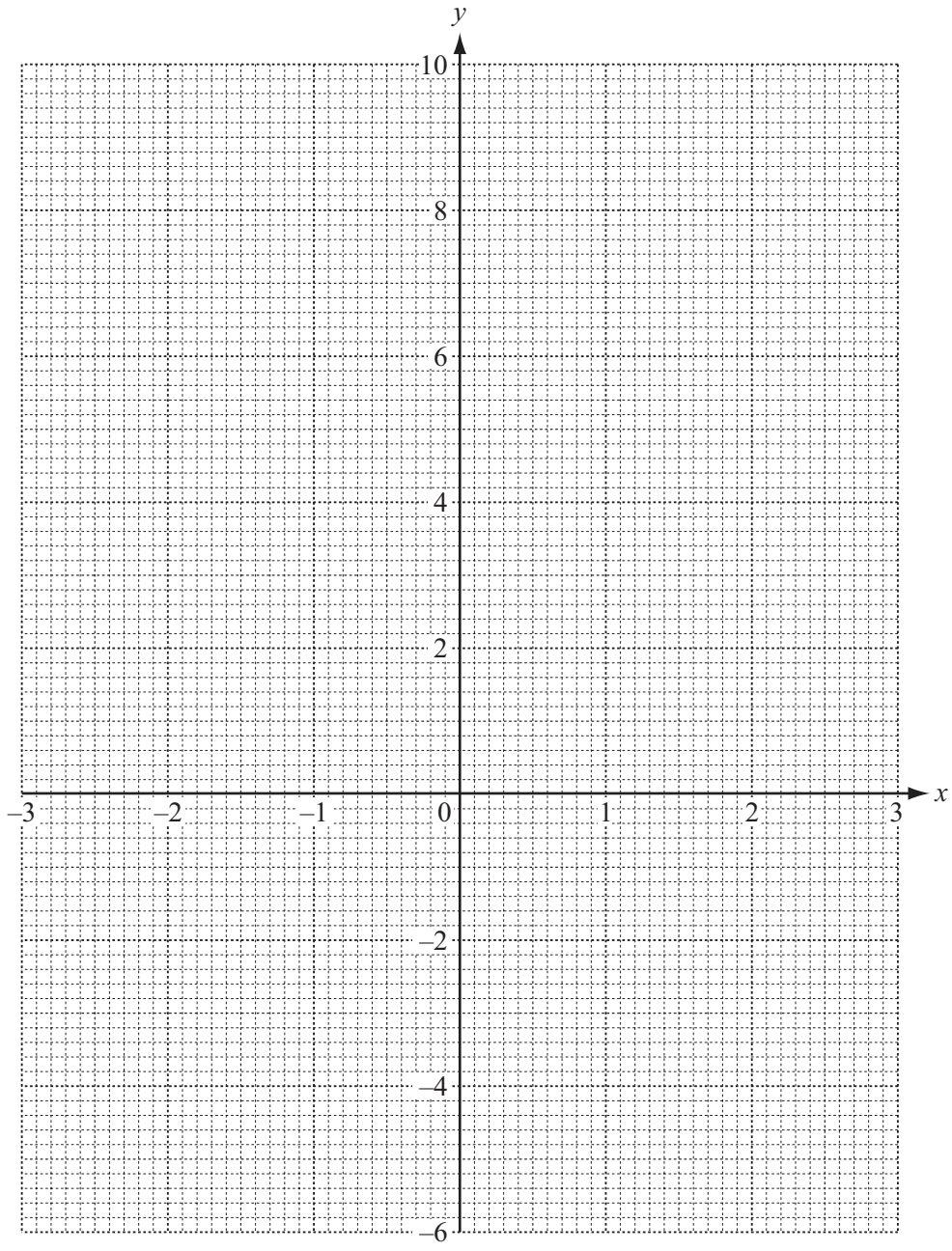
View solution

x	–3	–2	–1	–0.5		0.4	0.6	1	1.5	2	3
y	8	2.5		–5.8		7.7	5.4	4	4.3		10

[2]

(b) Draw the graph of $y = x^2 + \frac{3}{x}$ for $-3 \leqslant x \leqslant -0.5$ and $0.4 \leqslant x \leqslant 3$.

View solution



[5]

(c) Use your graph to solve the equation $x^2 + \frac{3}{x} = 5$.

View solution

Answer(c) $x =$ ..... or $x =$ ..... or $x =$ ..... [3]

(d) By drawing a suitable straight line, solve the equation $x^2 + \frac{3}{x} = x + 5$.

View solution

Answer(d) $x =$ ..... or $x =$ ..... or $x =$ ..... [4]

6 A company tested 200 light bulbs to find the lifetime, T hours, of each bulb.
The results are shown in the table.

Lifetime (T hours)	Number of bulbs
$0 < T \leqslant 1000$	10
$1000 < T \leqslant 1500$	30
$1500 < T \leqslant 2000$	55
$2000 < T \leqslant 2500$	72
$2500 < T \leqslant 3500$	33

View solution

(a) Calculate an estimate of the mean lifetime for the 200 light bulbs.

Answer(a) ..... hours [4]

View solution

(b) (i) Complete the cumulative frequency table.

Lifetime (T hours)	$T \leqslant 1000$	$T \leqslant 1500$	$T \leqslant 2000$	$T \leqslant 2500$	$T \leqslant 3500$
Number of bulbs					

[2]

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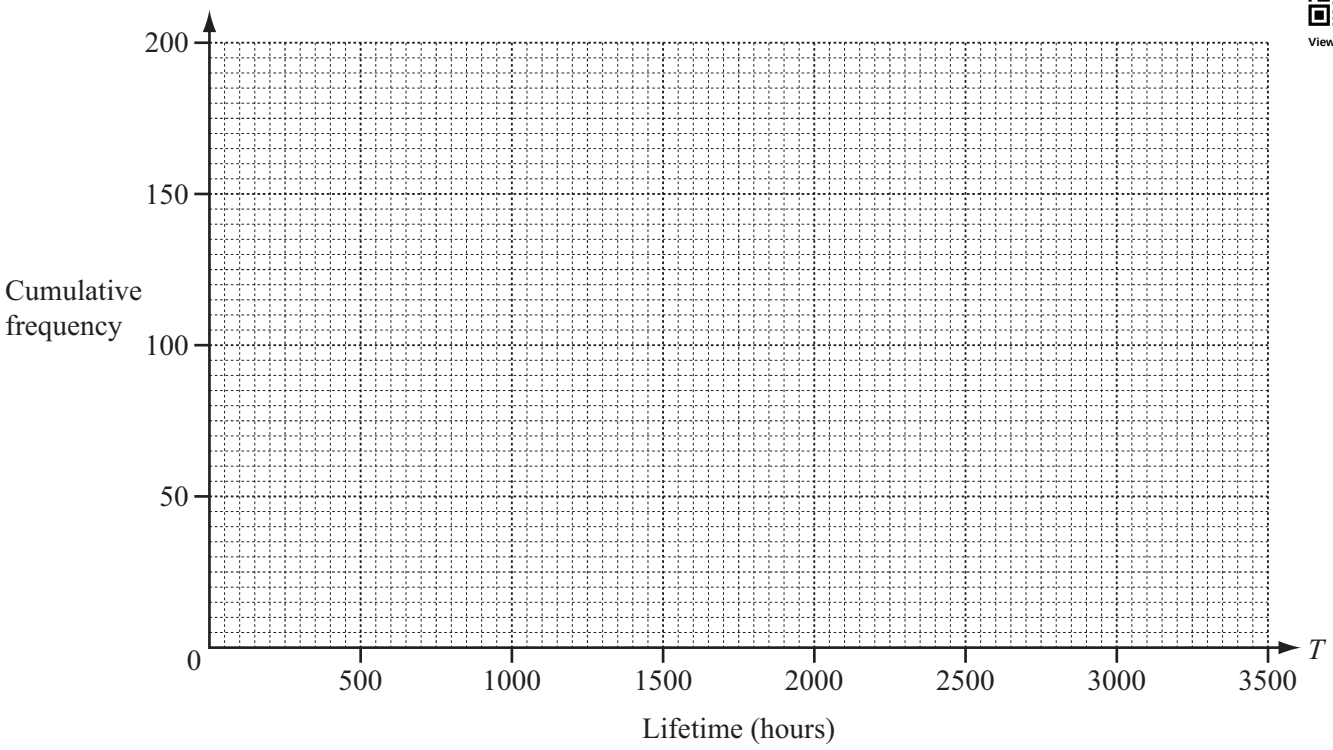
(ii) On the grid, draw a cumulative frequency diagram to show this information.

View solution



[3]

(iii) The company says that the average lifetime of a bulb is 2200 hours.

View solution

Estimate the number of bulbs that lasted longer than 2200 hours.

Answer(b)(iii) ..... [2]

(c) Robert buys one energy saving bulb and one halogen bulb.

View solution

The probability that the energy saving bulb lasts longer than 3500 hours is $\frac{9}{10}$.

The probability that the halogen bulb lasts longer than 3500 hours is $\frac{3}{5}$.

Work out the probability that exactly one of the bulbs will last longer than 3500 hours.

Answer(c) ..... [4]

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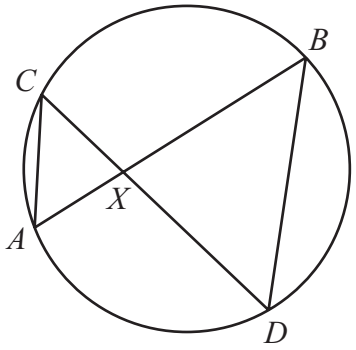
7 **(a)** The diagram shows a circle with two chords, AB and CD, intersecting at X.

View solution



NOT TO SCALE

(i) Show that triangles ACX and DBX are similar.

Answer(a)(i)

[2]

View solution

(ii) $AX = 3.2$ cm, $BX = 12.5$ cm, $CX = 4$ cm and angle $AXC = 110°$.

(a) Find DX.

Answer(a)(ii)(a) $DX =$ ..... cm [2]

(b) Use the cosine rule to find AC.

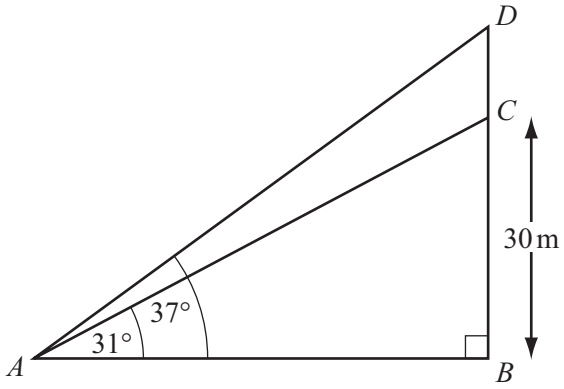
Answer(a)(ii)(b) $AC =$ ..... cm [4]

(c) Find the area of triangle *BXD*.

Answer(a)(ii)(c) ..... cm^2 [2]

View solution

(b)



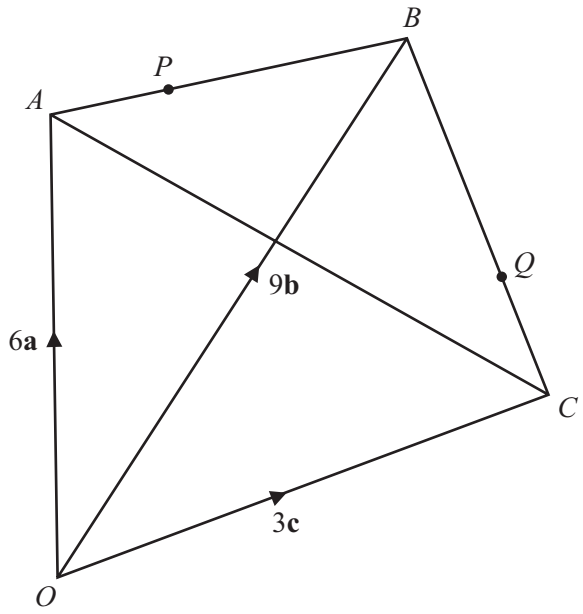
NOT TO SCALE

In the diagram, *BC* represents a building 30 m tall.
A flagpole, *DC*, stands on top of the building.
From a point, *A*, the angle of elevation of the top of the building is 31°.
The angle of elevation of the top of the flagpole is 37°.

Calculate the height, *DC*, of the flagpole.

Answer(b) ..... m [5]

8



NOT TO SCALE

In the diagram, O is the origin and $\overrightarrow{OA} = 6\mathbf{a}$, $\overrightarrow{OB} = 9\mathbf{b}$ and $\overrightarrow{OC} = 3\mathbf{c}$.
The point P lies on AB such that $\overrightarrow{AP} = 3\mathbf{b} - 2\mathbf{a}$.
The point Q lies on BC such that $\overrightarrow{BQ} = 2\mathbf{c} - 6\mathbf{b}$.

(a) Find, in terms of **b** and **c**, the position vector of Q.
Give your answer in its simplest form.

View solution

Answer(a) ..... [2]

(b) Find, in terms of **a** and **c**, in its simplest form

View solution

(i) $\overrightarrow{AC}$,

Answer(b)(i) $\overrightarrow{AC}$ = ... [1]

View solution

(ii) $\overrightarrow{PQ}$.

Answer(b)(ii) $\overrightarrow{PQ}$ = ... [2]

View solution

(c) Explain what your answers in **part (b)** tell you about PQ and AC.

Answer(c) .....

..... [2]

9

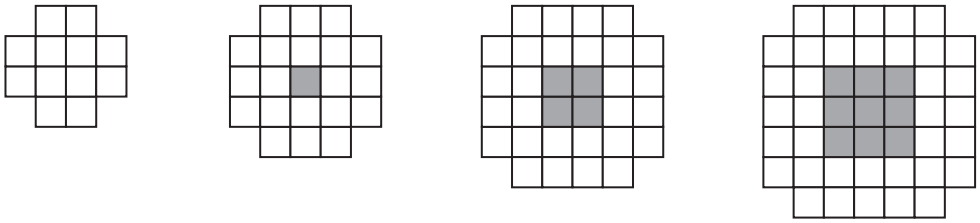


Diagram 1 Diagram 2 Diagram 3 Diagram 4

The first four diagrams in a sequence are shown above.
The diagrams are drawn using white squares ☐ and grey squares ■.

(a) Complete the columns in the table for Diagram 4 and Diagram n.

View solution

Diagram	1	2	3	4		n
Number of white squares	12	20	28			
Number of grey squares	0	1	4			
Total number of squares	12	21	32			$(n + 1)(n + 5)$

[6]

(b) Work out the number of the diagram which has a total of 480 squares.

View solution

Answer(b) ..... [2]

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(c) The **total** number of squares in the **first *n* diagrams** is

View solution

$$\frac{1}{3}n^3 + pn^2 + qn.$$

(i) Use $n = 1$ in this expression to show that $p + q = 11\frac{2}{3}$.

Answer(c)(i)

[1]

View solution

(ii) Use $n = 2$ in the expression to show that $4p + 2q = 30\frac{1}{3}$.

Answer(c)(ii)

[2]

View solution

(iii) Find the values of p and q.

Answer(c)(iii) p = ...

q = ... [3]

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