DELTA Academies Trust

# Y9 Route 2

**We do!**

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623

**Q1.**

$\mathbf{a} = \begin{pmatrix} 3 \\ -7 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} 4 \\ 2 \end{pmatrix}$

(a) Work out **a** + **b** as a column vector.

$a + b = \begin{pmatrix} 3 \\ -7 \end{pmatrix} + \begin{pmatrix} 4 \\ 2 \end{pmatrix} = \begin{pmatrix} 3+4 \\ -7+2 \end{pmatrix} = \begin{pmatrix} 7 \\ -5 \end{pmatrix}$

Simply add each row

$\begin{pmatrix} 7 \\ -5 \end{pmatrix}$

**(2)**

(b) Work out 2**a** as a column vector.

$2a = 2 \times a = 2 \times \begin{pmatrix} 3 \\ -7 \end{pmatrix} = \begin{pmatrix} 2 \times 3 \\ 2 \times -7 \end{pmatrix} = \begin{pmatrix} 6 \\ -14 \end{pmatrix}$

$\begin{pmatrix} 6 \\ -14 \end{pmatrix}$

**(2)**

(c) Work out **b** − 2**a** as a column vector.

$2a = 2 \times \begin{pmatrix} 3 \\ -7 \end{pmatrix} = \begin{pmatrix} 6 \\ -14 \end{pmatrix}$

$b - 2a = \begin{pmatrix} 4 \\ 2 \end{pmatrix} - \begin{pmatrix} 6 \\ -14 \end{pmatrix} = \begin{pmatrix} 4-6 \\ 2--14 \end{pmatrix} = \begin{pmatrix} -2 \\ 16 \end{pmatrix}$ $\begin{pmatrix} -2 \\ 16 \end{pmatrix}$

**(2)**

**(Total for question is 6 marks)**

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**Q2.** **623**

$\mathbf{a} = \begin{pmatrix} 1 \\ 4 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$

(a) Write down as a column vector

(i) **a + b**

$\begin{pmatrix} 4 \\ 6 \end{pmatrix}$

(1)

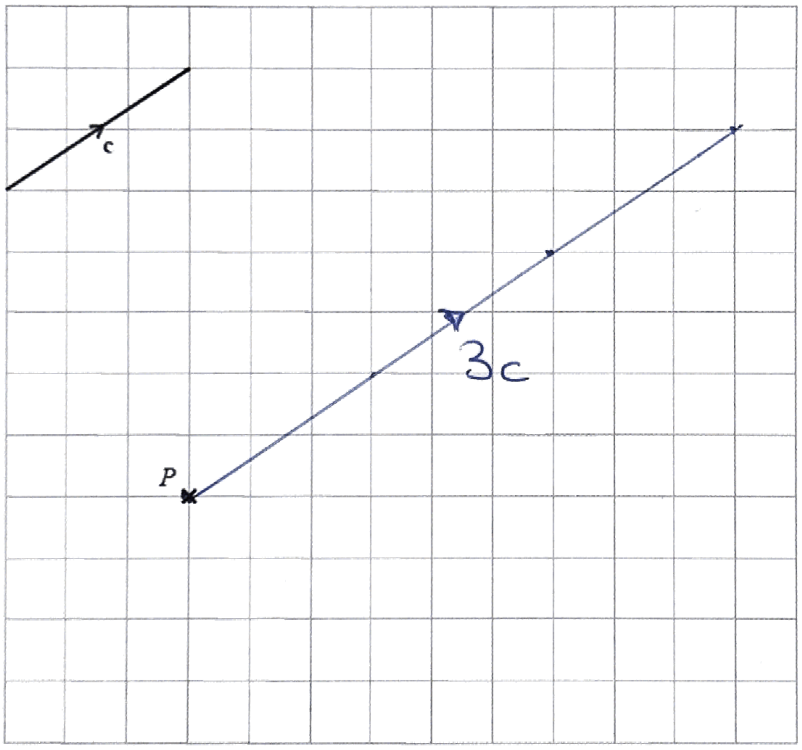
(ii) **2a + 3b**

$2\mathbf{a} = \begin{pmatrix} 2 \\ 8 \end{pmatrix}$ $3\mathbf{b} = \begin{pmatrix} 9 \\ 6 \end{pmatrix}$

$\begin{pmatrix} 11 \\ 14 \end{pmatrix}$

(2)

The vector **c** is drawn on the grid.




(b) From the point *P*, draw the vector **3c**

(1)

3 times as big as c.

**(Total for question = 4 marks)**

**Q3.** **298**

(a) Complete the table of values for $y = x^3 - 3x + 1$

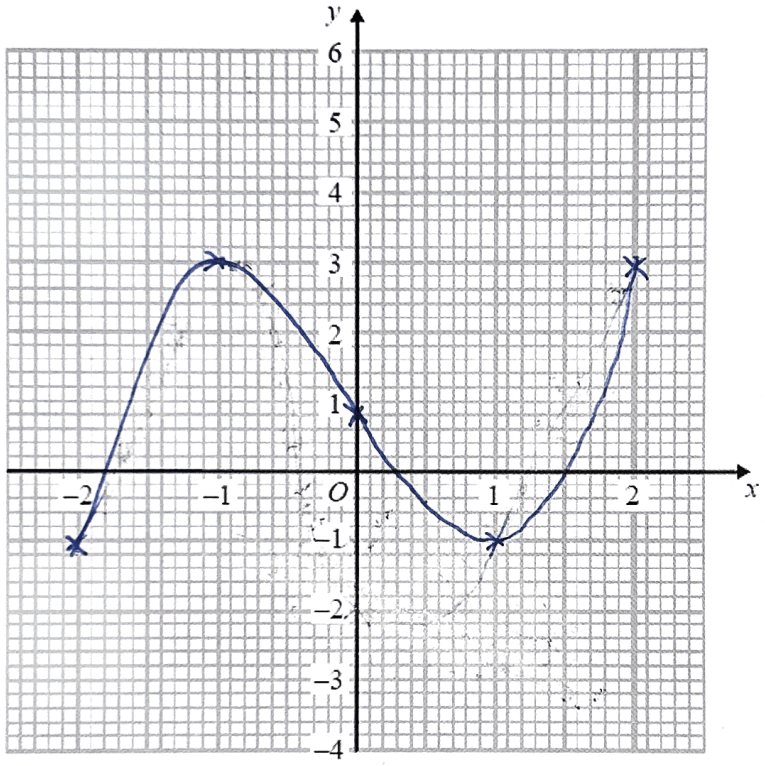
| $x$ | −2 | −1 | 0 | 1 | 2 |
|---|---|---|---|---|---|
| $y$ | −1 | 3 | 1 | −1 | 3 |

$x = 1$ $y = 1^3 - (3 \times 1) + 1 = 1 - 3 + 1 = -1$

$x = 0$ $y = 0^3 - (3 \times 0) + 1 = 0 - 0 + 1 = 1$

$x = -2$ $y = (-2)^3 - (3 \times -2) + 1 = -8 - -6 + 1 = -1$ (2)

(b) On the grid, draw the graph of $y = x^3 - 3x + 1$ for values of $x$ from −2 to 2




(2)

**(Total for question = 4 marks)**

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**Q4.** **298**

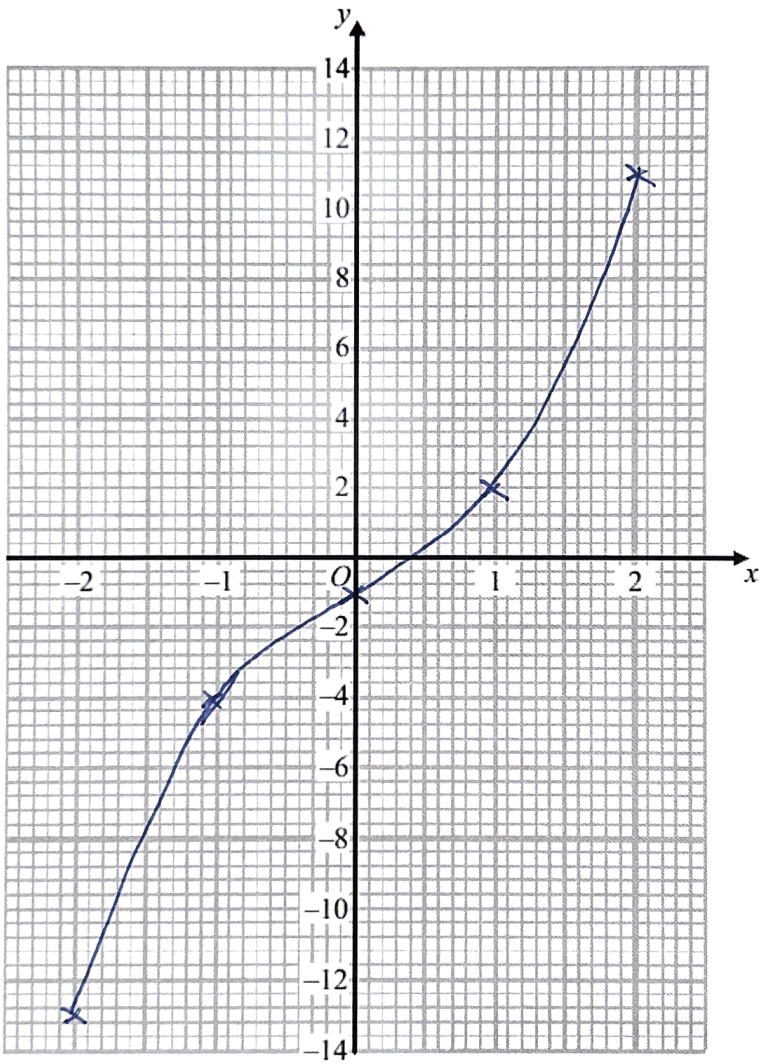
(a) Complete this table of values for $y = x^3 + 2x - 1$

| $x$ | $-2$ | $-1$ | $0$ | $1$ | $2$ |
|---|---|---|---|---|---|
| $y$ | $-13$ | $-4$ | $-1$ | $2$ | $11$ |

$x = 1 \quad y = 1^3 + (2 \times 1) - 1 = 1 + 2 - 1 = 2$
$x = 0 \quad y = 0^3 + (2 \times 0) - 1 = 0 + 0 - 1 = -1$
$x = -2 \quad y = (-2)^3 + (2 \times -2) - 1 = -8 - 4 - 1 = -13$

(2)

(b) On the grid, draw the graph of $y = x^3 + 2x - 1$




(2)

**(Total for Question is 4 marks)**

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**Q5.** **156, 170, 160, 162**

(a) Simplify $3y + 2x - 4 + 5x + 7$

$3y + 7x + 3$

(1)

(b) Factorise $2x^2 - 4x$

2 and x are common factors of both terms

$2x(x - 2)$

(2)

(c) Expand and simplify $11 - 3(x + 2)$

$11 - 3x + 6$

$17 - 3x$

(2)

(d) Expand and simplify $(x - 6)(3x + 7)$

| x | $3x$ | $+7$ |
|---|---|---|
| $x$ | $3x^2$ | $+7x$ |
| $-6$ | $-18x$ | $-42$ |

$3x^2 - 11x - 42$

(2)

**(Total for Question is 7 marks)**

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**156, 170, 160, 162**

**Q6.**

(a) Simplify $7y + 4x - 10 + 3y - 2$

$10y + 4x - 12$

(1)

(b) Factorise $4x^3 - 8x$

$4x(x^2 - 2)$

(2)

(c) Expand and simplify $7 - 5(2x + 2)$

$7 - 10x - 10$

$-3 - 10x$

(2)

(d) Expand and simplify $(x - 2)(4x + 4)$

| | $4x$ | $+4$ |
|---|---|---|
| $x$ | $4x^2$ | $+4x$ |
| $-2$ | $-8x$ | $-8$ |

$4x^2 - 4x - 8$

(2)

**(Total for Question is 7 marks)**

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We do!

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**Q7.**

**570**

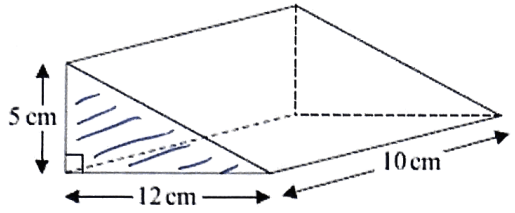


Diagram **NOT** accurately drawn

(a) Work out the volume of the triangular prism.

V = area of cross-section × length

↑

The shaded triangle

Area of triangle = $\frac{5 \times 12}{2}$

$= \frac{60}{2} = 30 \text{ cm}^2$

$V = 30 \times 10 = 300 \text{ cm}^3$

.....300..... $\text{cm}^3$

**(Total for Question is 2 marks)**

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**Q8.** **570**

Here is a triangular prism.

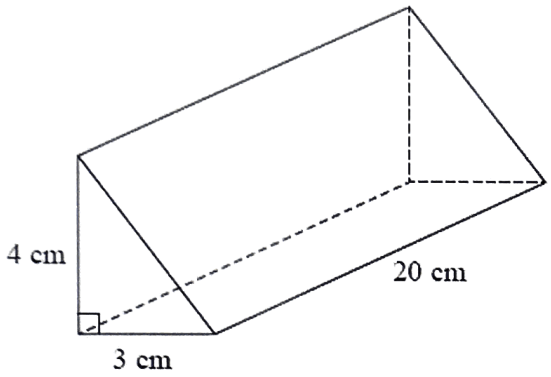


Diagram **NOT** accurately drawn

Work out the volume of this triangular prism.

Area of Cross-section $= \frac{4 \times 3}{2} = 6\text{cm}^2$

$V = 6 \times 20 = 120\text{cm}^3$

120 $\text{cm}^3$

**(Total for Question is 4 marks)**

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**Q9.** **36**

Buses to Ashby leave a bus station every 24 minutes.
Buses to Barford leave the same bus station every 20 minutes.

A bus to Ashby and a bus to Barford both leave the bus station at 7 30 am.

When will a bus to Ashby and a bus to Barford next leave the bus station at the same time?

We need the LCM of 24 & 20

24 = 24, 48, 72, 96, (120), 144, ....

20 = 20, 40, 60, 80, 100, (120), 140, ....

LCM = 120 mins
= 2 hours

9:30 am

**(Total for question = 3 marks)**

7:30 am + 2 hours = 9:30 am

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**You do!**

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**Q10.** **36**

Tom and Amy set the alarms on their phones to sound at 6.45 am.

Both alarms sound together at 6.45 am.
Tom's alarm then sounds every 9 minutes.
Amy's alarm then sounds every 12 minutes.

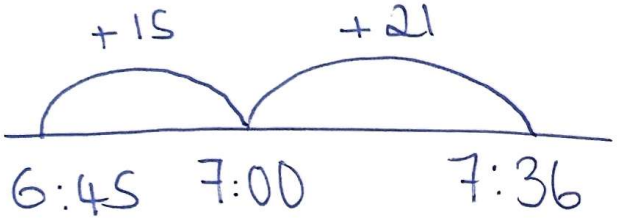
At what time will both alarms next sound together?

9 - 9, 18, 27, (36) 45, 54, 63, 72 ...

12 - 12, 24, (36), 48, 60 ...

6.45am + 36 mins

7:36 am




**(Total for question = 3 marks)**

**Q11.**

Work out an estimate for $\frac{31 \times 9.87}{0.509}$

Round each number to 1 significant figure.

$\frac{30 \times 10}{0.5} = \frac{300}{0.5}$

$\frac{300^{\times 10}}{0.5_{\times 10}} = \frac{3000}{5} = 600$

600

**(Total for Question is 3 marks)**

(Alternative method = dividing by ½ is the same as multiplying by 2.)

**You Do!**



**Q12.** **131**

Work out an estimate for the value of $\frac{43.2 \times \sqrt{99.05}}{0.193}$

$$\frac{40 \times \sqrt{100}}{0.2}$$

$$= \frac{40 \times 10}{0.2}$$

$$= \frac{400}{0.2} \quad \times 10 \quad \times 10$$

$$= \frac{4000}{2} = 2000$$

2000

**(Total for question = 3 marks)**