



m is inversely proportional to $\sqrt{r}$

The value of r is multiplied by 4

Circle what happens to the value of m .

$\times 2$

$\times 16$

$\div 2$

$\div 16$

$$m = \frac{k}{\sqrt{r}}$$

$$= \frac{k}{\sqrt{4r}} = \frac{k}{\sqrt{4}\sqrt{r}} = \frac{k}{2\sqrt{r}}$$

$$\text{new } m = \frac{1}{2} \times \frac{k}{\sqrt{r}}$$

$$\text{new } m = \frac{1}{2} \times m$$

Question 4: For each n^{th} term, work out the first five terms of the sequence.

(a) $n^2 + n$ (b) $n^2 + 2n$ (c) $n^2 - n$ (d) $n^2 - 3n$

(e) $n^2 + n + 2$ (f) $n^2 - 2n + 5$ (g) $n^2 + 4n - 10$ (h) $2n^2 + n$

(i) $3n^2 - n + 6$ (j) $10n^2 + 5n - 7$

Question 5: For each n^{th} term, work out the first five terms of the sequence.

(a) $-n^2$ (b) $-2n^2$ (c) $-4n^2 + 2$ (d) $-n^2 + 3n$

(e) $50 - n^2$ (f) $6n - n^2$ (g) $-n^2 - 7n - 2$

* 9, 20, 35, 54, 77 ...

$$\begin{array}{ccccccc}
 a+b+c = 9 & 20 & 35 & 54 & 77 \\
 & \nearrow & \nearrow & \nearrow & \nearrow \\
 3a+b = +11 & +15 & +19 & +23 \\
 & \nearrow & \nearrow & \nearrow \\
 2a = +4 & +4 & +4
 \end{array}$$

$$2a = 4$$

$$3a + b = 11$$

$$a + b + c = 9$$

$$a = 2$$

$$6 + b = 11$$

$$2 + 5 + c = 9$$

$$b = 5$$

$$c = 2$$

$$n^{\text{th}} \text{ term} = an^2 + bn + c$$

$$= 2n^2 + 5n + 2$$

$$\textcircled{*} \quad 2n^2 + 5n + 2 = 500$$

$$\quad \quad \quad -500$$

$$2n^2 + 5n - 498 = 0$$

$$a=2, \quad b=5, \quad c=-498$$

$$n = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-5 \pm \sqrt{5^2 - (4 \times 2 \times -498)}}{2(2)}$$

$$= \frac{-5 \pm \sqrt{4009}}{4}$$

$\oplus$ ↙

$$n = 14.6$$

↘ $\ominus$

$$n = -17.1 \quad \times$$

→ 15th t. > 500

→ 14th t. < 500

→ 500 is not in seq.

* $-17, -30, -49, -74, -105 \dots$

$$\begin{array}{ccccccc}
 a+b+c & = & -17 & & -30 & & -49 & & -74 \\
 & & \nearrow & & \nearrow & & \nearrow & & \\
 3a+b & = & -13 & & -19 & & -25 & & \\
 & & \nearrow & & \nearrow & & & & \\
 2a & = & -6 & & -6 & & & &
 \end{array}$$

$$a = -3$$

$$-9 + b = -13$$

$$-3 - 4 + c = -17$$

$$b = -4$$

$$c = -17 + 7$$

$$c = -10$$

$$n^{\text{th}} \text{ } t = -3n^2 - 4n - 10$$

* The first 4 terms of a sequence are: 400, 390, 375, 355 ...
Which term is the first to be negative?

$$\begin{array}{ccccccc}
 400 & & 390 & & 375 & & 355 \\
 & \nearrow & & \nearrow & & \nearrow & \\
 & -10 & & -15 & & -20 & \\
 & & \nearrow & & \nearrow & & \\
 & & -5 & & -5 & &
 \end{array}$$

$$a = -2.5$$

$$3(-2.5) + b = -10$$

$$b = -2.5$$

$$-2.5 - 2.5 + c = 400$$

$$\cancel{-5} + c = 400$$

$$+5$$

$$c = 405$$

$$n^{\text{th}} \text{ t.} = -2.5n^2 - 2.5n + 405$$

$$-2.5n^2 - 2.5n + 405 = 0$$

$$a = -2.5, b = -2.5, c = 405$$

$$n = \frac{2.5 \pm \sqrt{(-2.5)^2 - (4 \times -2.5 \times 405)}}{2(-2.5)}$$

$$n = -13.2 \times$$

$$n = 12.2$$



The n^{th} term of a quadratic sequence is $n^2 + 4n$
 Two **consecutive terms** have a difference of 25.
 Work out the two terms.

Let 'n' be the 1st term,

$$(n+1)$$

$$(n+1)^{\text{th}} \text{ t.} - n^{\text{th}} \text{ t.} = 25$$

$$(n+1)^2 + 4(n+1) - (n^2 + 4n) = 25$$

$$n^2 + 2n + 1 + 4n + 4$$

$$\cancel{n^2} + 6n + 5 - \cancel{n^2} - 4n = 25$$

$$2n + 5 = 25$$

$$2n = 20$$

$$n = 10^{\text{th}}$$

* Prove every term in the sequence $n^2 - 8n + 21$ is positive

$$n^2 - 8n + 21$$

$$\begin{array}{c} \div 2 \downarrow \\ (n-4)^2 - 16 + 21 \end{array}$$



square

$$(n-4)^2 + 5$$

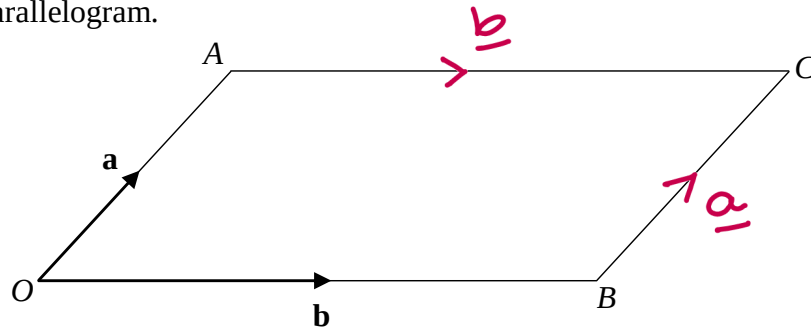
$n \rightarrow$ always +ve

$(n-4)^2 \rightarrow$ always +ve

$(n-4)^2 + 5 \rightarrow$ always +ve

Vectors

- 1 $OACB$ is a parallelogram.



$$\vec{OA} = \mathbf{a} \quad \vec{OB} = \mathbf{b}$$

Work out the following vectors in terms of $\mathbf{a}$ and $\mathbf{b}$.

(a) $\vec{AO} = -\mathbf{a}$ $\vec{AO} = \cancel{\mathbf{b}} - \mathbf{a} - \cancel{\mathbf{b}} = -\mathbf{a}$

(1)

(b) $\vec{BC} = \mathbf{a}$

(1)

(c) $\vec{AB} = \mathbf{b} - \mathbf{a}$

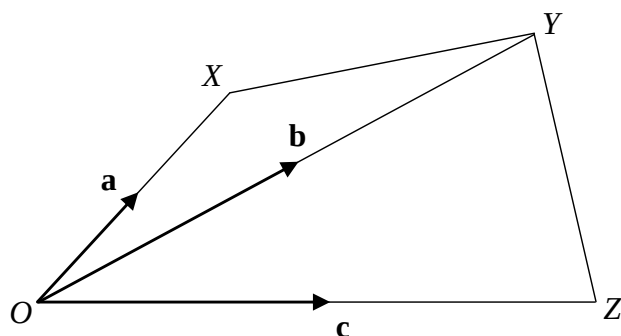
(1)

(d) $\vec{CO} = -\mathbf{a} - \mathbf{b}$

(1)

(Total for Question 1 is 4 marks)

2 $OXYZ$ is a quadrilateral.



$$\vec{OX} = \mathbf{a} \quad \vec{OY} = \mathbf{b} \quad \vec{OZ} = \mathbf{c}$$

Work out the following vectors in terms of $\mathbf{a}$ and $\mathbf{b}$.

(a) $\vec{ZO} = -\underline{\underline{c}}$

(1)

(b) $\vec{XY} = \underline{\underline{b - a}}$

(1)

(c) $\vec{ZY} = \underline{\underline{b - c}}$

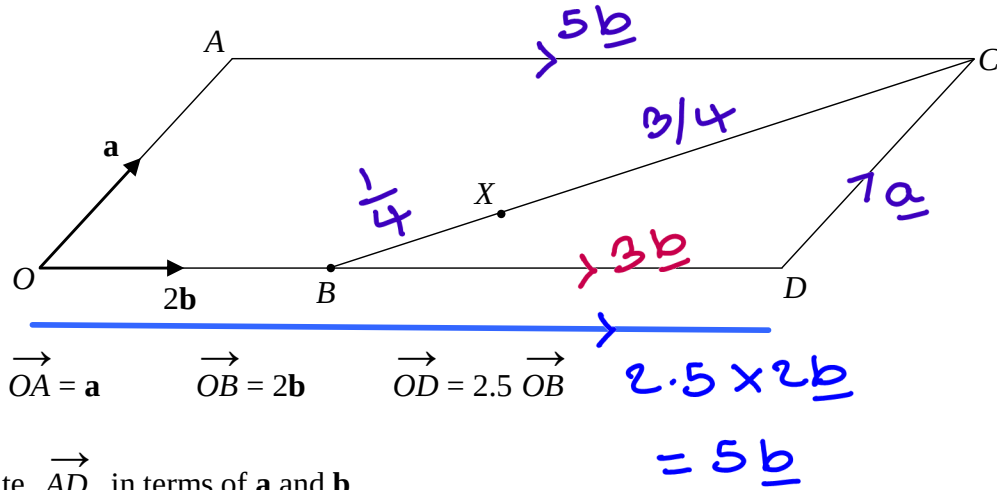
(1)

(d) $\vec{XZ} = \underline{\underline{c - a}}$

(1)

(Total for Question 2 is 4 marks)

5 $OACD$ is a parallelogram.



(a) Write $\overrightarrow{AD}$ in terms of $\mathbf{a}$ and $\mathbf{b}$.

$$= 5\underline{b} - \underline{a}$$

(b) Write $\overrightarrow{BC}$ in terms of **a** and **b**.

$$= 3\underline{b} - \underline{a}$$

$$\vec{p}_X = \frac{1}{4} (3\underline{b} - \underline{a}) = \frac{3}{4}\underline{b} - \frac{1}{4}\underline{a}$$

$$BX : XC = 1 : 3$$

(c) Write $\vec{OX}$ in terms of **a** and **b**.

$$\vec{OX} = 2\underline{b} + \frac{3}{4}\underline{b} - \frac{1}{4}\underline{a}$$

$$\vec{OX} = \frac{1}{4}\vec{b} - \frac{1}{4}\vec{a}$$

(Total for Question 5 is 6 marks)