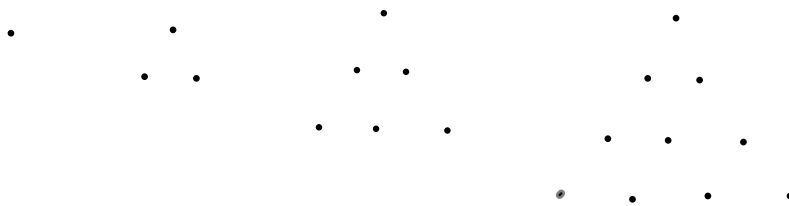


CREATING QUADRATIC FUNCTIONS

A quadratic function is represented as:
 $y = ax^2 + bx + c, a \neq 0.$

We can use this equation to create a quadratic function from a given sequence.

ex. The number of dots in successive triangular numbers creates a sequence.



$$t_1 = 1, t_2 = 3, t_3 = 6, t_4 = 10$$

$$1, 3, 6, 10, \dots$$

What type of sequence is this? How do you know?

We can use the common difference (D2) and the equation for a quadratic function to find the equation of this function.

From our previous investigation, we know that each term in D2 is equal to 2a, therefore $a = \frac{D2}{2}$

$$D2 = 1, \text{ therefore } a = 1/2$$

$$t_n = an^2 + bn + c$$

$$t_1 = 1 = 1/2(1)^2 + b(1) + c$$

$$t_2 = 3 = 1/2(2)^2 + b(2) + c$$

$$1 = 1/2 + b + c$$

$$3 = 2 + 2b + c$$

$$1/2 = b + c$$

$$1 = 2b + c$$

Using simultaneous equations, we can solve for b and c.

A quadratic function is represented as:

$$y = ax^2 + bx + c, a \neq 0.$$

We can use this equation to create a quadratic function from a given sequence.

$$\begin{array}{r}
 D_1 \rightarrow 10, 28, 56, 94, 142 \\
 \quad \quad \quad \vee \quad \quad \vee \quad \quad \vee \quad \quad \vee \\
 \quad \quad \quad 18 \quad 28 \quad 38 \quad 48 \\
 D_2 \rightarrow \quad \quad \vee \quad \quad \vee \quad \quad \vee \\
 \quad \quad \quad 10 \quad 10 \quad 10
 \end{array}
 \quad D_2 = 10$$

We can use the common difference (D2) and the equation for a quadratic function to find the equation of this function.

$$\begin{aligned}
 D_2 &= 2a \\
 10 &= 2a \\
 5 &= a
 \end{aligned}$$

$$y = 5x^2 + bx + c$$

$$\begin{aligned}
 t_1 &= 10 \\
 t_1 &= 5n^2 + bn + c \\
 10 &= 5 + b + c \\
 5 &= b + c
 \end{aligned}$$

$$\begin{aligned}
 t_2 &= 28 \\
 t_2 &= 5n^2 + bn + c \\
 28 &= 5(2)^2 + b(2) + c \\
 28 &= 20 + 2b + c \\
 8 &= 2b + c
 \end{aligned}$$

* elimination

$$\begin{array}{r}
 2b + c = 8 \\
 - (b + c = 5) \\
 \hline
 \end{array}$$

$$\begin{aligned}
 b + c &= 5 \\
 3 + c &= 5 \\
 c &= 2
 \end{aligned}$$

$$\begin{aligned}
 b &= 3 \\
 a &= 5 \\
 c &= 2
 \end{aligned}
 \quad \boxed{y = 5x^2 + 3x + 2}$$