

Example

The eighth term of an arithmetic sequence is 179.

The twelfth term of the same arithmetic sequence is 131.

What is the fifty-sixth term of the arithmetic sequence?

$$t_8 = 179 \quad \text{and} \quad t_{12} = 131$$

Find t_{56}

We want to use

$$t_n = t_1 + d(n - 1)$$

We will need to find the difference (d) and the first term (t_1).

Step 1 – Find the difference (d) using the idea of slope

$$t_8 = 179 \quad \text{and} \quad t_{12} = 131$$

is a lot like

$$f(8) = 179 \quad \text{and} \quad f(12) = 131$$

The difference (d) is a constant rate of change, just like slope,
so...

$$d = \frac{131 - 179}{12 - 8} = \frac{-48}{4} = -12$$

$$d = -12$$

Step 2 – Find the first term (t_1)

Choose either t_8 or t_{12} – it doesn't matter (we'll use $t_8 = 179$ in this example, which means $n = 8$) and use it in

$$t_n = t_1 + d(n - 1)$$

$$t_8 = t_1 + (-12)(n - 1)$$

$$179 = t_1 + (-12)(8 - 1)$$

$$179 = t_1 + (-12)(7)$$

$$179 = t_1 - 84$$

$$263 = t_1$$

Step 3 – Write rule/formula for the arithmetic sequence

Put d and t_1 in $t_n = t_1 + d(n - 1)$

$$t_n = 263 + (-12)(n - 1)$$

$$t_n = 263 - 12n + 12$$

$$t_n = 275 - 12n$$

Step 4 – Find any term you desire!

We want t_{56} , so we will make $n = 56$

$$t_{56} = 275 - 12(56) = 275 - 672 = -397$$

$$t_{56} = -397$$