

7.1a Arithmetic Sequences

A small business sells \$10,000 worth of products during its first year. The owner of the business has set a goal of increasing annual sales by \$2000 each year for the next 9 years.

a) Find the sales in the 4th year and the 10th year.

$$y_1 = 10000$$

$$y_5 = 18000$$

$$y_8 = 24000$$

$$y_2 = 12000$$

$$y_6 = 20000$$

$$y_9 = 26000$$

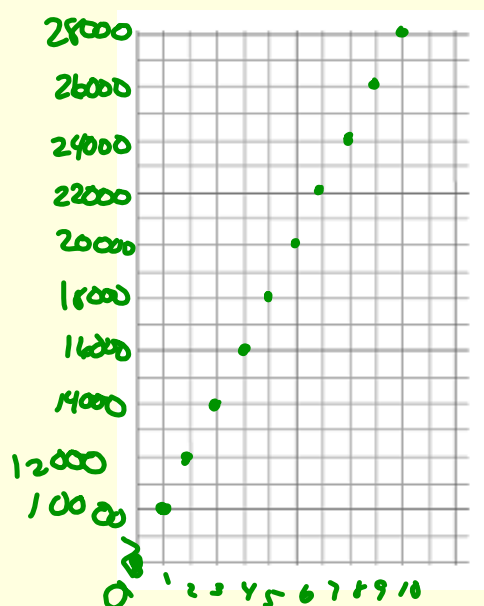
$$y_3 = 14000$$

$$y_7 = 22000$$

$$y_{10} = 28000$$

$$y_4 = 16000$$

b) Graph the sales for each year



c) What kind of function models this situation?

linear

An arithmetic sequence is a list of numbers with a common difference between each successive term

$$-5, 7, 19, \underline{31}, \underline{43}, \underline{55}, \dots$$

$$r + 15, r + 8, r + 1, \underline{r - 6}, \underline{r - 13}, \underline{r - 20}, \dots$$

Find the 20th term of $-11, -2, 7, \dots$

The general, or n th, term of an arithmetic sequence is found by

$$u_n = u_1 + (n - 1)d$$

Handwritten annotations:
- u_n : n^{th} term
- u_1 : 1^{st} term
- $(n - 1)$: term #
- d : common difference.

Why?

$-11, -2, 7, \dots$

$$u_{20} = ?$$

$$n = 20$$

$$u_1 = -11$$

$$d = 9$$

$$u_{20} = -11 + (20 - 1)(9)$$

$$u_{20} = 160$$

Find the 100th term in the sequence

1, 5, 9, 13, 17, ...

$$u_{100} = 1 + (100-1)(4)$$

$$= 397$$

Find the formula for the n th (general) term in the sequence 16, 7, -2...

What kind of function is this?

$$u_n = 16 + (n-1)(-9)$$

$$u_n = 16 - 9n + 9$$

$$u_n = -9n + 25$$

linear

Given the sequence $u_{50} = 6$, $u_{51} = 11$, $u_{52} = 16$, find u_1 .

$$d = 5$$

$$u_n = 6$$

$$n = 50$$

$$6 = u_1 + (50 - 1)(5)$$

$$6 = u_1 + 49(5)$$

$$\underline{-245}$$

$$\underline{-245}$$

$$\boxed{-239 = u_1}$$

For the arithmetic sequence $u_{10} = 25$, $u_{15} = 70$,

find the first term.

$$d = \frac{70 - 25}{15 - 10} = 9$$

$$u_{10} = 25$$

$$u_{11} = 34$$

$$u_{12} = 43$$

$$u_{13} = 52$$

$$u_{14} = 61$$

$$u_{15} = 70$$

$$d = 9$$

$$u_{10} = u_1 + (n-1)(d)$$

$$25 = u_1 + (10-1)(9)$$

$$25 = u_1 + 9(9)$$

$$-81$$

$$-81$$

$$u_1 = -56$$

How many terms are in the sequence 3, 9, 15, ..., 81, 87?

$$d=6 \quad n=?$$

$$87 = 3 + (n-1)(6)$$

$$84 = 6n - 6$$

$$90 = 6n$$

$$n = 15$$

Check for Understanding:

Consider the sequence 6 , 17 , 28 , 39 , ..., 897, 908.

- a) Show that the sequence is arithmetic.
- b) Find the formula for its general term.
- c) Find its 50th term.
- d) How many terms are in the sequence?
- e) Is 325 a member of the sequence? How do you know?
- f) Is 761 a member of the sequence? How do you know?

Homework:

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