

7.1 Part2

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7.1 Arithmetic Sequences (Part 2)

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

Example 1: The 3rd term of an arithmetic sequence is 4 and the 8th term is 34. Determine:

a) d $t_3 = 4$

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

$$4 = t_1 + (3-1)d$$

$$\textcircled{1} \quad 4 = \underline{t_1} + \underline{2d}$$

$$t_8 = 34$$

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

$$34 = t_1 + (8-1)d$$

$$\textcircled{2} \quad 34 = \underline{t_1} + \underline{7d}$$

Elimination

$$\textcircled{1} \quad -1(4) = (-1)t_1 + (-1)2d$$

$$\textcircled{1} \quad -4 = -t_1 - 2d$$

$$\textcircled{2} \quad 34 = t_1 + 7d$$

$$\frac{30}{5} = \frac{5d}{5}$$

$$6 = d$$

common difference = 6

b) t_1

$$4 = t_1 + 2d$$

$$4 = t_1 + 2(6)$$

$$4 = t_1 + 12$$

-12

-12

$$-8 = t_1$$

First term = -8

c) t_n

General term (formula)

$$d = 6 \quad t_1 = -8$$

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

$$t_n = -8 + (n-1)6$$

$$t_n = \underline{-8} + 6n - \underline{6}$$

$$t_n = 6n - 14$$

Example 2: The 2nd term of an arithmetic sequence is 24 and the 12th term is -16. Determine:

a) d

$$t_2 = 24$$

↑
 $n=2$

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

$$24 = t_1 + (2-1)d$$

$$\textcircled{1} \quad 24 = t_1 + 1d$$

$$\textcircled{2} \quad 16 = -t_1 - 11d$$

$$\frac{40}{-10} = \frac{-10d}{-10}$$

$$t_{12} = -16$$

↑
 $n=12$

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

$$-16 = t_1 + (12-1)d$$

$$\textcircled{2} \quad -16 = t_1 + 11d \quad \leftarrow \text{mult by } (-1)$$

$d = -4$ common difference

b) t_1

$$24 = t_1 + d$$

$$24 = t_1 + (-4)$$

$$24 = t_1 - 4$$

$+4$ $+4$

$$28 = t_1$$

First term is 28

c) t_n

← General term (formula)

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

$$t_n = 28 + (n-1)(-4)$$

$$t_n = 28 - 4n + 4$$

$$t_n = -4n + 32$$

or

$$t_n = 32 - 4n$$

Example 3: The expressions x , $0.5x + 7$, and $3x - 1$ are consecutive terms of an arithmetic sequence. Determine:

a) x $t_1 = x$ $t_2 = 0.5x + 7$ $t_3 = 3x - 1$

$$d = t_2 - t_1$$

$$d = 0.5x + 7 - x$$

$$d = -0.5x + 7$$

$$d = t_3 - t_2$$

$$d = 3x - 1 - (0.5x + 7)$$

$$d = 3x - 1 - 0.5x - 7$$

$$d = 2.5x - 8$$

$$-0.5x + 7 = 2.5x - 8$$

$$7 = 3x - 8$$

$$\frac{15}{3} = \frac{3x}{3} \quad x = 5$$

b) values of the three terms

$$t_1 = x$$

$$t_1 = 5$$

$$t_2 = 0.5x + 7$$

$$t_2 = 0.5(5) + 7$$

$$t_2 = 2.5 + 7$$

$$t_2 = 9.5$$

$$t_3 = 3x - 1$$

$$t_3 = 3(5) - 1$$

$$t_3 = 15 - 1$$

$$t_3 = 14$$

$$5, 9.5, 14 \dots$$

$\overset{\text{+4.5}}{\curvearrowright}$ $\overset{\text{+4.5}}{\curvearrowright}$

Example 4: A student has a part-time job at the grocery store. He must create a cereal box display. The numbers of boxes in each row form an arithmetic sequence. There are 16 boxes in the third row from the bottom and 6 boxes in the eighth row from the bottom.

a) How many boxes are there in the bottom row?

b) Determine the general term, t_n , of the sequence.