




# ⊗ non-arithmetic seq. (by contrast)

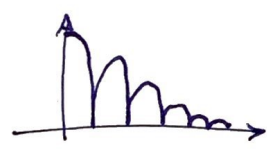
EX Analyze

$$\{4, 16, 64, 256, 1024, \dots\}$$


- How do I get from 4 to 16?  $\begin{matrix} \nearrow +12 \\ \searrow \times 4 \end{matrix}$  -or-
- How do I get from 16 to 64?  $\begin{matrix} \nearrow +48 \\ \searrow \times 4 \end{matrix}$  -or-
- How do I get from 64 to 256?  $\begin{matrix} \nearrow +192 \\ \searrow \times 4 \end{matrix}$

Q: Is this arithmetic? No we are not adding a common difference.

{ B.T.W.: this sequence is a geometric sequence since we are multiplying by a constant ratio, 4 } - 11.3



EX { 11.4, 9.3, 7.2, 5.1, 3.0, ... } Find the gen. term



• recursive form

$$a_n = a_{n-1} + d$$

$$a_n = a_{n-1} - 2.1$$

- arithmetic
- $d = -2.1$
- general term

$$a_n = a_1 + (n-1)d$$

$$a_n = 11.4 + (n-1)(-2.1)$$

$$a_n = 11.4 - 2.1(n-1)$$

2  
EX Revisit 1<sup>st</sup> exaple, write gen. term

$$\{ 2, 5, 8, 11, \dots, 2 + (n-1)3, \dots \}$$

EX Find the 24<sup>th</sup> term of the sequence  
 $n = 1, 2, 3, 4$   
 $\{-3, 0, 3, 6, \dots\}$  Strategy: get the gen. term 1<sup>st</sup>

(i) determine  $a$  &  $d$

$$a = \underline{-3}, \quad d = \underline{3}$$

(ii) general term:

$$a_n = a + (n-1)d = \boxed{-3 + (n-1)3}$$

(iii) compute:  $a_{24} = -3 + (24-1)3$

$$= -3 + (23)3$$

$$= -3 + 69$$

$$a_{24} = \boxed{66}$$



# \* C.S.I. problems

3

Q: How do we build/determine a sequence given two members of the sequence and told that the sequence is arithmetic

Ex If  $a_1 = 17$  and  $a_7 = -31$  Find  $a_{20}$

• general term  $a_n = a + (n-1)d$  ← arithmetic form

•  $\Rightarrow a = a_1$ , so  $a = 17$  ← start term

so then the form becomes  $a_n = 17 + (n-1)d$  what is  $d = ?$

• use the last piece of info:  $a_7 = -31$

$$\Rightarrow a_7 = 17 + (7-1)d$$

$$-31 = 17 + 6d \quad \left. \vphantom{-31 = 17 + 6d} \right\} \text{solve for "d"}$$

$$\frac{-31 - 17}{6} = d$$

$$\underline{\underline{d = -\frac{48}{6} = -8}}$$

• general term:  $a_n = 17 + (n-1)(-8)$

answer:  $a_{20} = 17 - 8(20-1) = 17 - 8 \cdot 19 = -135$

the question

EX

Write the 1<sup>st</sup> 3 terms of an arithmetic sequence if

$$a_{13} = -60 \text{ and } a_{33} = -160$$

Not a, like in the last example (4)

general term:  $a_n = a + (n-1)d$

•  $n = 13$ :  $a_{13} = a + (13-1)d \rightarrow -60 = a + 12d$

•  $n = 33$ :  $a_{33} = a + (33-1)d \rightarrow -160 = a + 32d$

2 eqns

2 unknowns

Solve

$$a + 12d = -60$$

$$\oplus a + 32d = -160 \quad * -1$$

$$-20d = 100$$

$$d = -5$$

insert into top eqn

$$a + 12(-5) = -60 \Rightarrow a = 0$$

• General term:

$$a_n = -5(n-1)$$

• Answer question:

$$a_1 = 0$$

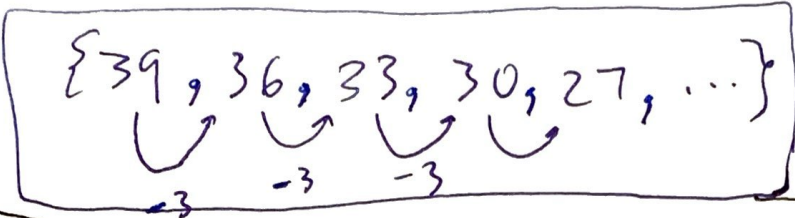
$$a_2 = -5$$

$$a_3 = -10$$

$$\{0, -5, -10, \dots, -5(n-1), \dots\}$$

\* Finally, recursive formula...

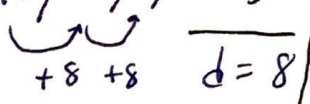
**EX** Use the given recursive formula to write the first four terms:  $\begin{cases} a_1 = 39 \\ a_n = a_{n-1} - 3 \end{cases}$  ← "d" = -3



In non-recursive form  
 $a_n = 39 - 3(n-1)$

**EX** Write a recursive relation if  $\{-15, -7, 1, \dots\}$

$a_1 = -15, a_n = a_{n-1} + 8$



seed

explicit general term

Alternatively  
Convert to  
general  
term

$a_n = -15 + 8(n-1)$

11.2 is finished