

Arithmetic Sequences (Day 5)

• Sequence: ordered progression of numbers

• Arithmetic Sequence: the terms have a common difference
(add to get to next #)

(ex) $5, 10, 15, 20, \dots$

common difference, $d = 5$

• $n =$ index number

→ This means that whatever n equals, is the placement of a_n in the sequence → location
↑ "a sub n"

(ex) $5, 10, 15, 20, 25$

• when $n=1$, $a_n = a_1 = 5$
↳ "first term"

• when $n=4$, $a_n = a_4 = 20$
↳ "fourth term"

• Recursive formulas: they are used to find the next term, using the previous term

$$a_1 = ?$$
$$a_n = a_{n-1} + d$$

↓ term in the seq ↓ the term before it

(ex) $1, 5, 9, 13, \dots$

$$a_1 = 1$$
$$a_n = a_{n-1} + 4$$

(ex) $-4, -3.99, -3.98, \dots$

$$\begin{aligned} a_1 &= -4 \\ a_n &= a_{n-1} + .01 \end{aligned}$$

(ex) $a_1 = -18, a_n = a_{n-1} + 6$ (1st 6 terms?)

$$-18, -12, -6, 0, 6, 12$$

(ex) $a_1 = 35$
 $a_n = a_{n-1} - 4$ (1st 6 terms)

$$35, 31, 27, 23, 19, 15$$

$$a_n = -4$$

$$a_0 = 39$$

Explicit Formulas

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

(ex) $3, 5, 7, 9, \underline{11}, \underline{13}, \underline{15}$

$$a_1 = 3$$

$$d = 2$$

$$\rightarrow a_n = 3 + 2(n-1)$$

$$a_n = 3 + 2n - 2$$

$$a_n = 1 + 2n$$

The 10th term?

$$\rightarrow a_{10} = 1 + 2(10) = 21$$

$$\cdot a_{17} = 35$$

$$\cdot a_{97} = 195$$

ex) 10, 7, 4, 1, -2, -5, -8

$$a_n = 13 + -3n = 13 - 3n$$

$$a_{10} = -17$$

$$a_n = 10 + -3(n-1)$$

$$a_n = 10 - 3n + 3$$

$$a_n = 13 - 3n$$

ex) -2, 3, 8, 13, 18, 23, 28

$$a_n = -2 + 5(n-1)$$

$$-2 + 5n - 5 \rightarrow \boxed{a_n = -7 + 5n}$$

$$a_{14} = 63$$

ex) $a_n = \frac{11}{8} + \frac{1}{2}n$

$$\frac{15}{8} \quad \frac{19}{8} \quad \frac{23}{8} \quad \frac{27}{8} \quad \frac{31}{8}$$

$$a_{23} = \frac{103}{8}$$

ex) $a_1 = -38, d = -100$

$$\underline{-38} \quad \underline{-138} \quad \underline{-238} \quad \underline{-338} \quad \underline{-438}$$

Explicit: $a_n = 62 + -100n \rightarrow \boxed{a_n = 62 - 100n}$

$$a_{12} = -1138$$

(e) $a_{21} = -1.4$, $d = 0.6$

• Next 3 terms: $\frac{-0.8}{a_{22}}$, $\frac{-0.2}{a_{23}}$, $\frac{+0.4}{a_{24}}$

• Recursive Rule:

$$a_1 = -13.4$$

$$a_n = a_{n-1} + 0.6$$

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

$$~~-1.4 + 0.6(21)~~$$

$$-1.4 = a_1 + 0.6(21-1)$$

$$a_1 = -12.4$$

$$-1.4 = a_1 + 12$$

$$a_1 = -13.4$$

• Explicit Rule:

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

$$a_n = -13.4 + 0.6(n-1)$$

$$a_n = \underline{-13.4} + 0.6n - \underline{0.6}$$

$$a_n = -14 + 0.6n$$