

# Writing Sequences in Recursive + Explicit Form

1)  $2, 4, 6, 8, 10, \dots$

a) Recursive

$$a_1 = 2$$

$$a_n = a_{n-1} + 2$$

b) Explicit

$$2, 4, 6, 8, 10$$

$n=1$   $n=2$   $n=3$   $n=4$   $n=5$

$$a_n = 2n$$

$+2$

n	$a_n$
1	2
2	4 $\downarrow +2$
3	6 $\downarrow +2$
4	8 $\downarrow +2$
5	10 $\downarrow +2$

c)  $a_6 = 2(6)$

$a_7 = 2(7)$

d)  $a_{10} = 2(10)$

$a_6 = 12$

$a_7 = 14$

$a_{10} = 20$

2)  $4, 11, 18, 25, 32, \dots$

a) Recursive

$$a_1 = 4$$

$$a_n = a_{n-1} + 7$$

b) Explicit

$$4, 11, 18, 25, 32$$

$$a_n = 7n - 3$$

c)  $a_6 = 7(6) - 3 = 39$

$a_7 = 7(7) - 3 = 46$

d)  $a_{10} = 7(10) - 3 = 67$

n	$7n$	Adjustment	$a_n$
1	7	-3	4
2	14	-3	11 $\downarrow +7$
3	21	-3	18 $\downarrow +7$
4	28	-3	25 $\downarrow +7$
5	35	-3	32 $\downarrow +7$

3)  $1, 2, 4, 8, 16$

*(Note: Above the sequence, there are four dots '2' with arrows pointing to the gaps between 1-2, 2-4, 4-8, and 8-16, indicating a constant multiplier of 2.)*

a) Recursive

$$a_1 = 1$$

$$a_n = 2a_{n-1}$$

b) Explicit

$$a_n = 2^{n-1}$$

n	$a_n$
1	1
2	2
3	4
4	8
5	16

*(Note: Red arrows and text show the recursive calculation: 1 to 2 (+1) \* 2, 2 to 4 (+2) \* 2, 4 to 8 (+4) \* 2, 8 to 16 (+8) \* 2. An arrow points to the '2' in the first step with the label 'base'.)*

c)  $a_6 = 2^6$

$$a_6 = 2^6$$

$$a_6 = 32$$

$a_7 = 2^7$

$$a_7 = 2^7$$

$$a_7 = 64$$

d)  $a_{10} = 2^{10-1}$

$$a_{10} = 2^9$$

$$a_{10} = 512$$

4)  $13, -2, -17, -32, -47$

*(Note: Above the sequence, there are four dots '-15' with arrows pointing to the gaps between 13-2, 2-17, 17-32, and 32-47, indicating a constant difference of -15.)*

a) Recursive

$$a_1 = 13$$

$$a_n = a_{n-1} - 15$$

b) Explicit

$$a_n = -15n + 28$$

n	-15n	+	28	$a_n$
1	-15	+	28	13
2	-30	+	28	-2
3	-45	+	28	-17
4	-60	+	28	-32
5	-75	+	28	-47

*(Note: A red arrow points from the '28' in the explicit formula to the '+28' column in the table.)*

c)  $a_6 = -62$   $a_7 = -77$

d)  $a_{10} = -122$



$$5) \overset{-5}{\curvearrowright} 125, \overset{-5}{\curvearrowright} 120, \overset{-5}{\curvearrowright} 115, 110, 105$$

A) Recursive

$$a_1 = 125$$

$$a_n = a_{n-1} - 5$$

b) Explicit

$$a_n = -5n + 130$$

n	-5n	+130	$a_n$
1	-5	+130	125
2	-10	+130	120
3	-15	+130	115
4	-20	+130	110
5	-25	+130	105

c)  $a_6 = 100$

$$a_7 = 95$$

d)  $a_{10} = 80$

Ex:

$$1, \frac{3}{4}, \frac{5}{9}, \frac{7}{16}, \frac{9}{25}$$

$$\overset{+2}{\curvearrowright} \frac{1}{1}, \overset{+2}{\curvearrowright} \frac{3}{4}, \overset{+2}{\curvearrowright} \frac{5}{9}, \overset{+2}{\curvearrowright} \frac{7}{16}, \frac{9}{25}$$

$$a_n = \frac{2n-1}{n^2}$$

$n=1 \quad n=2 \quad n=3 \quad n=4 \quad n=5$