

Name: Key
Date: _____ Period: _____

Explicit Formulas – ***most commonly used***

- Used to find any term in either type of sequence
- Need to know a_1 , d (common difference for arithmetic) or r (common ratio for geometric)
- Arithmetic Formula:
 - $a_n = a_1 + d(n - 1)$
- Geometric Formula:
 - $a_n = a_1(r)^{n-1}$

Recursive Formulas

- Allows you to find the n^{th} term in a sequence if you know the value of the $(n - 1)^{\text{th}}$ term of the sequence
- Need to know a_1 , a_{n-1} , d (common difference for arithmetic) or r (common ratio for geometric)
- Arithmetic Formula:
 - $a_n = a_{n-1} + d$
- Geometric Formula:
 - $a_n = (r)a_{n-1}$

Practice (Arithmetic Sequences): Write the recursive rule for each sequence.

1. 7, 13, 19, 25, ...

$a_1 = 7$
 $13 - 7 = 6 = d$
 $a_n = a_{n-1} + 6$

Examples

$a_2 = a_{2-1} + 6$
 $a_2 = a_1 + 6$
 $a_2 = 7 + 6 = 13$

$a_5 = a_{5-1} + 6$
 $a_5 = a_4 + 6$
 $a_5 = 25 + 6 = 31$

2. 30, 26, 22, 18, ...

$a_1 = 30$
 $26 - 30 = -4 = d$

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

3. -5, -8, -11, -14, ...

$-8 - (-5) = -3 = d$

$a_n = a_{n-1} + d$
 $a_n = a_{n-1} - 3$

4. -2, 0, 2, 4, ...

$0 - (-2) = 2 = d$

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

5. 8, 6, 4, 2, ...

$6 - 8 = -2 = d$

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

Example
 $a_5 = a_{5-1} - 2$
 $a_5 = a_4 - 2$
 $a_5 = 2 - 2 = 0$

$$a_n = (r)a_{n-1}$$

Practice (Geometric Sequences): Write the recursive rule for each sequence.

6. 3, 9, 27, ...

$$\frac{9}{3} = 3 = r$$

$$a_n = (r)a_{n-1}$$
$$a_n = (3)a_{n-1}$$

7. 1, 5, 25, ...

$$\frac{5}{1} = 5 = r$$

$$a_n = (r)a_{n-1}$$
$$a_n = (5)a_{n-1}$$

8. 6, -12, 24, ...

$$\frac{-12}{6} = -2 = r$$

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

9. 5, -15, 45, -135, ...

$$\frac{-15}{5} = -3 = r$$

$$a_n = (-3)a_{n-1}$$

Examples

$$a_5 = (-3)a_{5-1}$$

$$a_5 = (-3)a_4$$

$$a_5 = (-3)(-135)$$

$$a_5 = 405$$

$$a_6 = (-3)a_{6-1}$$

$$a_6 = (-3)a_5$$

$$a_6 = (-3)(405)$$

$$a_6 = -1215$$

10. 729, -243, 81, ...

$$\frac{-243}{729} = -\frac{1}{3} = r$$

$$a_n = \left(-\frac{1}{3}\right)a_{n-1}$$

Examples

$$a_4 = \left(-\frac{1}{3}\right)a_{4-1}$$

$$a_4 = \left(-\frac{1}{3}\right)a_3$$

$$a_4 = \left(-\frac{1}{3}\right)81$$

$$a_4 = -27$$