

Algebra 1

Unit 11: Comparing Linear, Quadratic, &amp; Exponential Functions

Notes

Figure 6

- a. Create an explicit rule for finding the number of triangles.

## Day 2 – Recursive Formulas & More with Sequences

Information	Arithmetic	Geometric
<b>Recursive Formula</b> (allows you to find next term)	$a_1 = \text{first number}$ $a_n = a_{n-1} + d$ $a_n: n^{\text{th}} \text{ term}$ $a_{n-1}: \text{previous}$ $d: \text{common diff}$	$a_1 = \text{first number}$ $a_n = r(a_{n-1})$ $a_n: n^{\text{th}} \text{ term}$ $a_{n-1}: \text{previous}$ $r: \text{constant ratio}$

### Generating a Sequence from a Recursive Formula

For each of the following recursive formulas, generate the first five terms.

a.  $a_1 = 7$   
 $a_n = a_{n-1} + 4$   $\therefore$

b.  $a_1 = -54$   $\therefore$   
 $a_n = \frac{1}{3}(a_{n-1})$   $\therefore$

c.  $a_1 = -3.5$   
 $a_n = a_{n-1} + 9$   $\therefore$

$7 \xrightarrow{+4} 11 \xrightarrow{+4} 15 \xrightarrow{+4} 19 \xrightarrow{+4} 23$

$-54 \xrightarrow{-\frac{1}{3}} -18 \xrightarrow{-\frac{1}{3}} -6 \xrightarrow{-\frac{1}{3}} -2 \xrightarrow{-\frac{1}{3}} -\frac{2}{3}$

$-3.5 \xrightarrow{+9} 5.5 \xrightarrow{+9} 14.5 \xrightarrow{+9} 23.5 \xrightarrow{+9} 32.5$

d.  $a_1 = 4$   
 $a_n = 2(a_{n-1})$

e.  $a_1 = -7$   
 $a_n = a_{n-1} - 6$

f.  $a_1 = 1025$   
 $a_n = \left(\frac{1}{5}\right)(a_{n-1})$

$4 \xrightarrow{\cdot 2} 8 \xrightarrow{\cdot 2} 16 \xrightarrow{\cdot 2} 32 \xrightarrow{\cdot 2} 64$

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### Creating Explicit and Recursive Formulas

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For each of the following sequences, define the first term and common difference/constant ratio. Then create a simplified explicit formula and recursive formula.

a. $1, 8, 15 \dots$ Type: $\begin{matrix} +7 \\ +7 \end{matrix}$ $a$	b. $4, 0, -4 \dots$ Type: $\begin{matrix} -4 \\ -4 \end{matrix}$ $a$	c. $400, 200, 100 \dots$ Type: $\begin{matrix} \div 2 \\ \div 2 \end{matrix}$ $g$
Explicit: $a_n = a_1 + d(n-1)$ $a_n = 1 + 7(n-1)$	Explicit: $a_n = a_1 + d(n-1)$ $a_n = 4 + -4(n-1)$	Explicit: $a_n = a_1 \cdot r^{n-1}$ $a_n = 400 \left(\frac{1}{2}\right)^{n-1}$
Recursive: $a_n = a_{n-1} + d$ $a_n = a_{n-1} + 7$ d. $3, 6, 12 \dots$	Recursive: $a_n = a_{n-1} - 4$ e. $-5, 3, 11 \dots$	Recursive: $a_n = r \cdot a_{n-1}$ $a_n = \left(\frac{1}{2}\right) a_{n-1}$ f. $40, 10, \frac{5}{2} \dots$
Type:	Type:	Type:
Explicit:	Explicit:	Explicit:

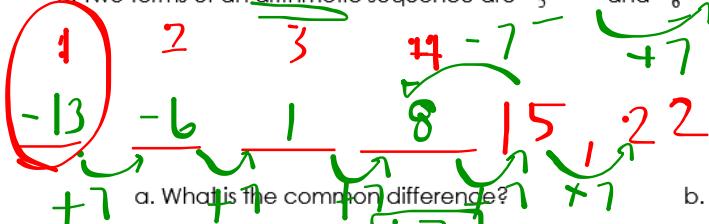
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Recursive:	Recursive:	Recursive:

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Challenge

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a. Two terms of an arithmetic sequence are  $a_5 = 15$  and  $a_6 = 22$ .



$$\begin{array}{c} a \\ +/- \\ \boxed{d := 7} \end{array}$$

a. What is the common difference?

b. What are the first four terms of this sequence?

$$-13, -6, 1, 8$$

c. Write the EXPLICIT and RECURSIVE rules for this sequence.

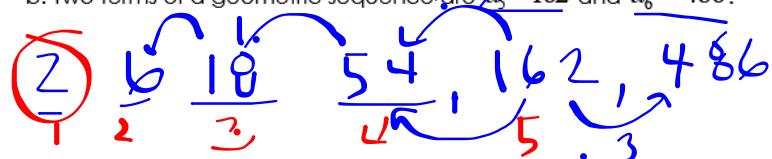
$$E: a_n = a_1 + d(n-1)$$

$$a_n = -13 + 7(n-1)$$

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

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

b. Two terms of a geometric sequence are  $a_5 = 162$  and  $a_6 = 486$ .



a. What is the constant ratio?

$$3$$

b. What are the first four terms of this sequence?

$$2, 6, 18, 54$$

c. Write the EXPLICIT and RECURSIVE rules for this sequence.

$$E: a_n = a_1 \cdot r^{n-1}$$

$$a_n = 2 \cdot 3^{n-1}$$

$$R: a_n = r \cdot a_{n-1}$$

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

c. Given  $a_{10} = 16$  and  $d = 5$ , write the EXPLICIT and RECURSIVE rules for this sequence.