

Warm-up!

Find the next number in the pattern

A) 3, 8, 13, 18, ...

B) 4, 8, 16, 32, ...

C) 27, -18, 12, -8, ...

D) 1, -3, 5, -7, ...

Exponential Functions Day 1:

- (2.1) Arithmetic Sequences
- (2.1) Geometric Sequences

Homework

- Intro to Arithmetic and Geometric Sequences

Your next quiz will be Day 5 of this unit

Sequence

Definition: A function whose domain is the set of nonnegative integers

Examples:

- 2, 4, 6, 8
- 200, 100, 50, 25, ...
- Monday, Tuesday, Wednesday,...

Sequence Terms: Instead of representing sequences with function notation, we use subscripts.

Instead of $f(1) = 2$, $f(2) = 4$, and $f(x) = 2x$,

We write

$$a_1 = 2$$

$$a_2 = 4$$

$$a_n = 2n$$

(we often use the letter a , but sometimes we'll use a different letter for reasons that will be clear later)

Given the general term for a sequence, find the first four terms in the sequence.

A) $a_n = 12 - 5n$

B) $a_n = 32 \left(-\frac{1}{2}\right)^n$

C) $a_n = \frac{n-1}{n+1}$

Some types of sequences get a special name

From the warm-up:

A) 3, 8, 13, 18, ...

B) 4, 8, 16, 32, ...

C) 27, -18, 12, -8, ...

D) 1, -3, 5, -7, ...

Geometric Sequence:

- Always MULTIPLY by the same amount to get from one term to the next
- Amount you multiply by = "Common Ratio" = r
- If you're ever wondering what the common ratio is, pick a random term and divide by the term before it.

A) 3, 8, 13, 18, ...

B) 4, 8, 16, 32, ...

Arithmetic Sequence

- Always ADD the same amount to get from one term to the next
- Amount you add = "Common Difference" = d
- If you're ever wondering what the common difference is, pick a random term and subtract the term before it.

C) 27, -18, 12, -8, ...

D) 1, -3, 5, -7, ...

Find the first 4 terms in the sequence. Classify the sequence as arithmetic, geometric, or neither. If it is arithmetic, find the common difference. If geometric, find the common ratio.

D) $a_n = 3 - 7n$

E) $a_n = 3 \cdot (-2)^n$

F) Find the eighth term in the following arithmetic sequence

$$a_1 = 4$$

$$a_2 = 10$$

$$a_3 = 16$$

...

G) Find the eightieth term in the following arithmetic sequence

$$a_1 = 4$$

$$a_2 = 10$$

$$a_3 = 16$$

...

When you know a term and the common difference/ratio and want to come up with another term or the general formula

Finding the nth term of an arithmetic sequence:

$$a_n = a_k + d(n - k)$$

where

a_k = term you know

d = common difference

a_n = n-th term

So,

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

$$a_n = a_2 + d(n - 2)$$

$$a_n = a_3 + d(n - 3)$$

$$a_n = a_4 + d(n - 4)$$

$$a_n = a_5 + d(n - 5)$$

...

Finding the nth term of a geometric sequence:

$$g_n = g_k(r)^{n-k}$$

where

g_k = term you know

r = common ratio

g_n = n-th term

So,

$$g_n = g_1 \cdot r^{n-1}$$

$$g_n = g_2 \cdot r^{n-2}$$

$$g_n = g_3 \cdot r^{n-3}$$

$$g_n = g_4 \cdot r^{n-4}$$

$$g_n = g_5 \cdot r^{n-5}$$

...

Given a term and a common ratio/difference, finding another term

H) Find the 20th term of the arithmetic sequence with $a_3 = 7$ and $d = 4$

I) Find the 15th term of the geometric sequence with $g_6 = 20$ and $r = \frac{1}{3}$. You may leave your answer unsimplified.

Given a term and a common ratio/difference, finding another term

J) Find the 85th term of the arithmetic sequence with $a_3 = 300$ and $d = -2$

K) Find the n th term of the geometric sequence with $g_4 = 10$ and $r = 3$.

Finding General Formulas

L) Find a formula for the n th term of the arithmetic sequence with $a_5 = 15$ and $d = 4$.

M) Find a formula for the n th term of the geometric sequence with $a_3 = 10$ and $r = -\frac{2}{3}$

Finding the common difference or ratio when given only two terms

For Arithmetic Sequences

- Subtract the terms
- Divide by the difference in the indices
- (make sure you subtract in the right order)

N) Find the common difference of an arithmetic sequence with $a_1 = -4$ and $a_5 = 16$

For Geometric Sequences

- Divide the terms
- Root by the difference in the indices

O) Find the common ratio of a geometric sequence with $g_2 = 56$ and $g_5 = 7$

P) Given the following terms from an arithmetic sequence, find the common difference. Then, find a general formula for the n th term in the sequence.

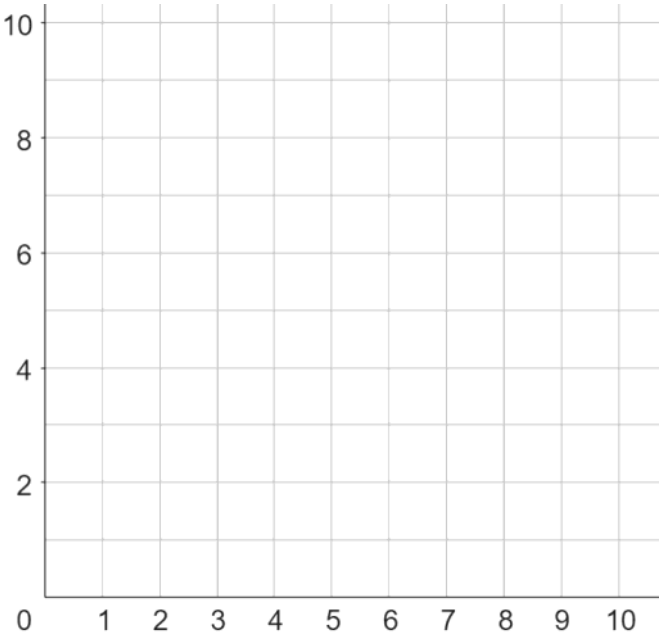
$$a_5 = 190 \text{ and } a_{10} = 115$$

Q) Given the following terms from a geometric sequence, find the common ratio. Then, find a general formula for the n th term in the sequence.

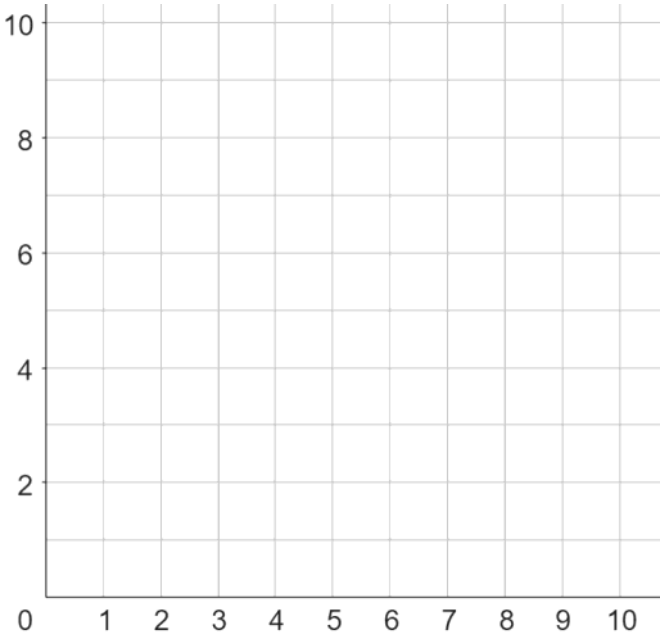
$$g_{10} = -5 \text{ and } g_{15} = 160$$

Graphing Sequences

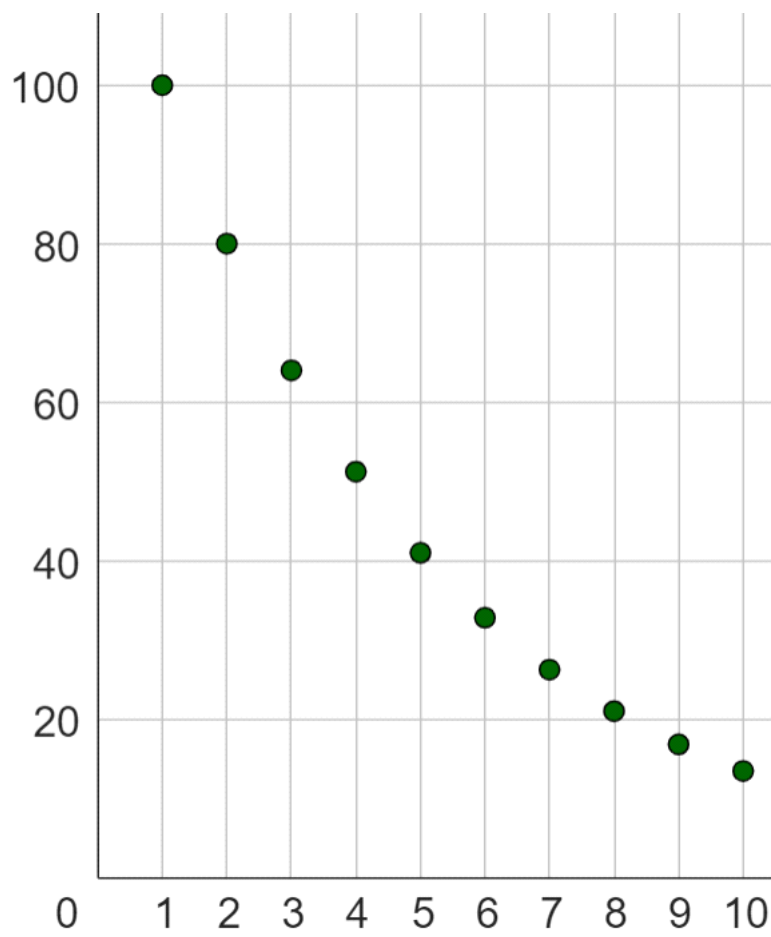
$$f(x) = 2x + 1$$



$$a_n = 2n + 1$$



R) Find g_{10} for the sequence graphed



S) Find the first term of an arithmetic sequence with...

$$a_4 = 16, a_{10} = 46$$

T) Write a formula for the general term (nth term) of the geometric sequence. Then, find the 10th term.

4, 8, 16, 32, ...

U) Find the 10th number in the geometric sequence

$$a_4 = 54, r = \frac{2}{3}$$

V) Find the 7th term of the geometric sequence

$$g_3 = \frac{16}{3} \text{ and } g_5 = \frac{64}{27}$$