Warmup 11/2[2²]

1) Try to figure out how many snowflakes would be in pattern #43. (The patterns shown are pattern #1, #2, and #3)
2) If "n" is the pattern number, write an equation to tell how many snowflakes would be in pattern "n".

Return of the Quizzes

NEW UNIT: SEQUENCES

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OBJECTIVE:

- Identify arithmetic sequences and write rules for them

Sequences and Functions

- A ***sequence*** is a list of numbers in a specific order.
- Each element in a sequence is called a ***term***
- Each term has a ***position number***

term in the fourth position

7, 9, 11, 13, 15, 17, 19, 21, 23, …

term in the first position

Differences between sequences and regular functions

- A sequence has **NO ZEROTH TERM.** A sequence starts with the first term.
  - This is different than functions, when we usually think of the "original value" as the value when x is 0.
- There are **no decimal** terms. You have the 1st term, 2nd term, 3rd term, with nothing in between
  - With functions, the "input" can be anything, including decimals
- If you were to graph a sequence (we usually don't), you would **NEVER** connect the points

Can you find the next 3 terms?

1. **8, 15, 22, 29, …**
2. **10, 20, 40, 80, …**
3. **5, 6, 8, 11, 15, …**
4. **5.4, 4.2, 3, 1.8, …**
5. $0, \frac{3}{4}, 1\frac{1}{2}, 2\frac{1}{4}, \ldots$
6. $10, 5, \frac{5}{2}, \ldots$

#1, #4, and #5 are called arithmetic sequences (Today)

#2, and #6 are called geometric sequences (Later)

#3 is neither one

Ok…but what is an arithmetic sequence?

- **Arithmetic Sequence:** When the terms in the sequence have a **common difference (d)**
  - (Basically, a sequence that is linear)
- Can you give an example of an arithmetic sequence?

Determine whether the sequence appears to be an **arithmetic sequence.** If so, find the common difference and the next three terms.

9, 13, 17, 21,…

yes
common difference: 4
next three terms: 25, 29, 33

Determine whether the sequence appears to be an **arithmetic sequence.** If so, find the common difference and the next three terms.

10, 8, 5, 1,…

no common difference between terms

Determine whether the sequence appears to be an **arithmetic sequence.** If so, find the common difference and the next three terms.

8, 2, -4, -10…

yes
common difference: -6
next three terms: -16, -22, -28

Determine whether the sequence appears to be an **arithmetic sequence.** If so, find the common difference and the next three terms.

$$-\frac{3}{4}, -\frac{1}{4}, \frac{1}{4}, \frac{3}{4} \ldots$$

yes
common difference: 2/4 or 1/2
next three terms: 5/4 , 7/4, 9/4

Determine whether the sequence appears to be an **arithmetic sequence.** If so, find the common difference and the next three terms.

–4, –2, 1, 5, …

no common difference between terms

Determine whether the sequence appears to be an **arithmetic sequence.** If so, find the common difference and the next three terms.

$$\frac{2}{3}, \frac{1}{3}, -\frac{1}{3}, -\frac{2}{3}, \ldots$$

no common difference between terms

Find the indicated term of the arithmetic sequence.

16th term: 4, 8, 12, 16, …

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Sequence Notation

- We often use the letter "a" with a subscript to label terms of a sequence
- **a_1 = 1st term**
- **a_{13} = 13th term**
- **a_n = nth term**

Find the indicated term of the arithmetic sequence.

Find a_{25}: $a_1 = -5$; $d = -2$

-53

Explicit Rule

- ***Explicit rule:*** a rule that tells you how to get the **nth** term of the sequence without having to find the previous terms

- **Let's say my sequence is 7, 11, 15, 19, …**
- **The first term is 7, and the common difference is 4.**
- **Suppose I am trying to find the 3rd term.**
- **If the 1st term is 7, how many more "fours" would I have to add to get the 3rd term?**
- **How many fours would I have to add to 7 to get the 10th term?**
- **How many fours would I have to add to 7 to get the 47th term?**
- **To get the nth term, you must add the common difference (n – 1) times.**

Find the indicated term of the arithmetic sequence.

The 8th term: $a_1 = 11$; $d = 3$

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Find the indicated term of the arithmetic sequence.

Find a_{60}: 11, 5, −1, −7, …

-343

Find the indicated term of the arithmetic sequence.

12th term: $a_1 = 4.2$; $d = 1.4$

19.6

If we start with 3 and we add two each time to create a sequence of numbers, what would the 25th term be?

Let's make a chart and see if we can find a pattern…

Words	Numbers	Algebra
1st term	3	a_1
2nd term	$3 + (1)2 = 5$	$a_1 + 1d$
3nd term	$3 + (2)2 = 7$	$a_1 + 2d$
4th term	$3 + (3)2 = 9$	$a_1 + 3d$
⋮	⋮	⋮
nth term	$3 + (n - 1)2$	$a_1 + (n - 1)d$

Explicit Formula for Arithmetic Sequences:

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

- a_1 is the first term
- d is the common difference
- n is the position number

Write the Explicit Formula for the Sequence

9, 13, 17, 21,…

$a_n = 9 + 4(n - 1)$

Write the Explicit Formula for the Sequence

10, 8, 6, 4,…

$a_n = 10 - 2(n - 1)$

Homework

½ SHEET