Continuous Patterns
y = mx + b

Review:
Write the next two numbers in the sequence.

a. -27, -21, -15, -9, _-3_ , _3_   J-1

b. 3, -6, 12, -24, _48_ , _-96_   AD

Use the following sequence to...
34, 25, 16, 7....

SA 1) Write the next two terms.
$$-2, -11$$

LB 2) Write the next-now statement
$$next = now - 9$$

AB 3) Write the recursive form.
$$t_1 = 34 \quad t_n = t_{n-1} + 9$$

IT 4) Write the explicit form.
$$t_n = 34 + -9(n-1)$$

IT 5) Find the 50th term.
$$-407$$
$$t_{50} = 34 - 9(50-1)$$
$$t_{50} = 34 - 9(49)$$
$$t_{50} = 34 - 441$$

Review:

What are the TWO names of sequences that are formed from addition or subtraction?

Recursive
+
Explicit

New: **Goal**:   **Continuous Patterns   y = mx + b**

Let's look at a real world situation that uses arithmetic/linear sequences.

Altitude (in thousands of feet) X	0	1	2	3	4	5
Boiling Point (in oF) Y	212	210.2	208.4	206.6	204.8	203

-1.8 -1.8 -1.8 -1.8 -1.8

What is the pattern in each?

$$M = \frac{\Delta y}{\Delta x} = \frac{-1.8}{1}$$ Common Difference

What if someone lives at an altitude of 150 thousand feet? What is their boiling point?

This sequence actually represents a **continuous** function because you can have other entries on your chart other than whole numbers.

So rather than writing a recursive or explicit form of the general altitude chart, we need to write an equation that will take into account every inch between 0 feet and 1000 feet, and 2000 feet, etc.

Writing a Continuous Equation from a Sequence

1, 8, 15, 22

Step 1: Turn the sequence into a chart

x	(Term)	1	2	3	4
y	(Number)	1	8	15	22

+7

Step 2: Find the common difference: _7_

Step 3: Find the 0 term

0	(Term)	1	2	3	4
-6	(Number)	1	8	15	22

-7   +7

Step 4: Plug in the values as follows
$$y = \underline{7}\,x + \underline{-6}$$
common difference   0 term
Slope   Y-int

Altitude (in thousands of feet)	0	1	2	3	4	5
Boiling Point (in °F)	212	210.2	208.4	206.6	204.8	203

Continuous Equation: $y = C.D. \cdot x + 0 \text{ term}$

$\rightarrow y = -1.8x + 212$

What would be the boiling point at 100 thousand feet?

$y = -1.8x + 212$

$y = -1.8(100) + 212$

$y = -180 + 212$

$y = 32°F$

If the 2nd and 3rd terms are 29 and 42 and there is a common difference, find the first 5 terms and write a continuous equation.

x	1	2	3	4	5
y	16	29	42	55	68

Continuous Equation: $y = 13x + 3$

90th term?

$\left(1,173 \right)$

Try this:

Make a chart and write a continuous equation with the following stipulations:

- The common difference is -7
- The 3rd term is 22

0	x	1	2	3	4	5
.3	y	36	29	22	15	8

Continuous Equation:

50th term?

$y = C.D. \cdot x + 0 \text{ term}$

$y = -7x + 43$

$y = -7(50) + 43$

$y = -350 + 43$

$y = -307$