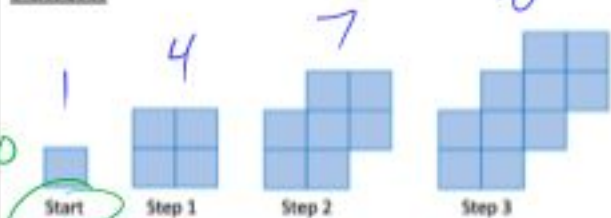


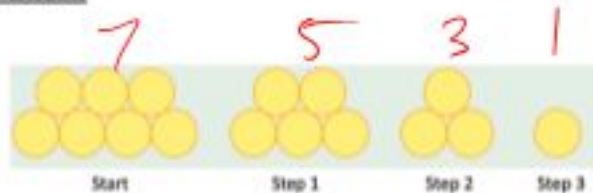
Graphs of Linear Equations

Pattern

step 0



Pattern



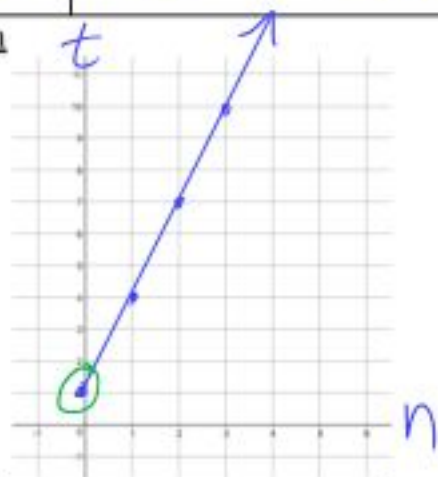
1. Table of Values and Ordered Pairs

Step number (n)	Number of squares (t)	Ordered Pairs (n, t)
0	1	(0, 1)
1	4	(1, 4)
2	7	(2, 7)
3	10	(3, 10)

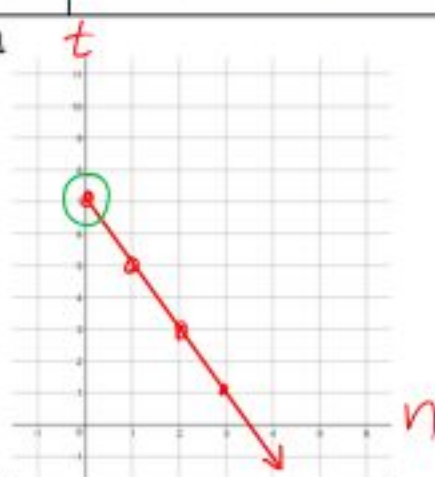
1. Table of Values and Ordered Pairs

Step number (n)	Number of circles (t)	Ordered Pairs (n, t)
0	7	(0, 7)
1	5	(1, 5)
2	3	(2, 3)
3	1	(3, 1)

2. Graph



2. Graph



3. Equation

$$1 + 3n = t$$
 (Start at 1, slope 3)

Check: $step\ 3 \Rightarrow 10$

$$1 + 3(3) = 1 + 9 = 10 \checkmark$$

3. Equation

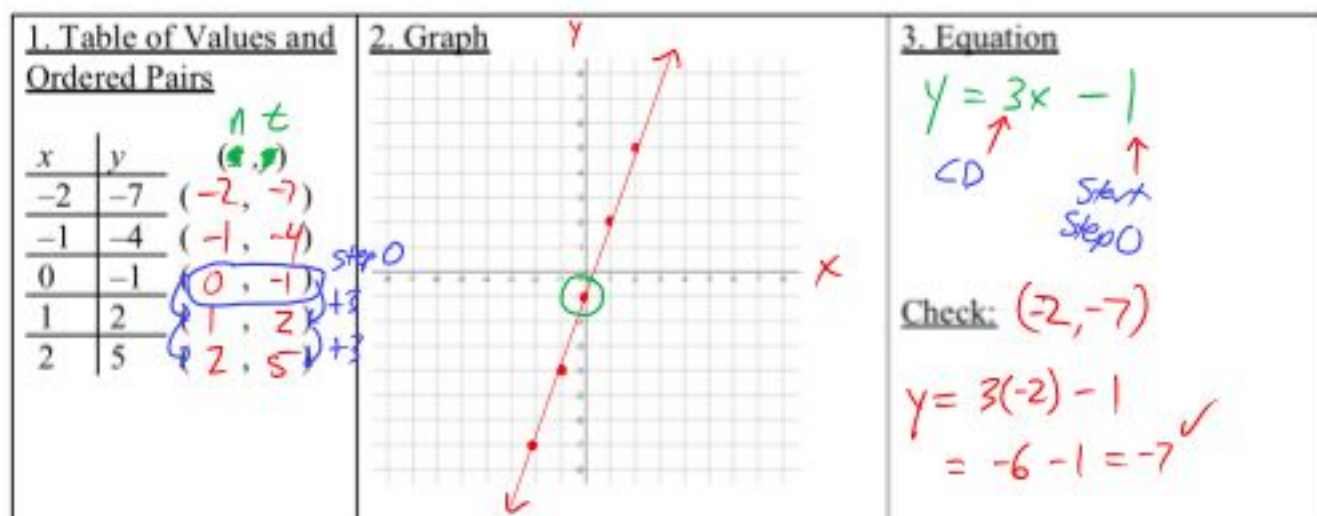
$$t = 7 - 2n$$

Check: $step\ 3 = 1$

$$t = 7 - 2(3) = 7 - 6 = 1 \checkmark$$

All 3 methods represent the SAME PATTERN!

In Section 4.1, we used a table of values to get the graph and the equation for a pattern. Let's do one more example with x and y now.



Remember: For a linear pattern, there are **two** important features:

1. Common difference
2. Start (Step 0)

When we talk about equations of lines (especially when we use x and y) we use different names for the same two things:

y -intercept: where it touches y -axis ($x=0$)

which is the same as: Start (Step 0)

slope: how much it increases/decreases when we move

which is the same as: Common difference 1 to the right (each step)

The linear equation: $y = 3x - 1$ has a y -intercept = -1 and a slope = 3

The linear equation: $y = \frac{1}{2}x + \frac{4}{3}$ has a y -intercept = $\frac{4}{3}$ and a slope = $\frac{1}{2}$

The linear equation: $y = 1x - 2$ has a y -intercept = -2 and a slope = 1

The linear equation: $y = -x + 0$ has a y -intercept = 0 and a slope = -1

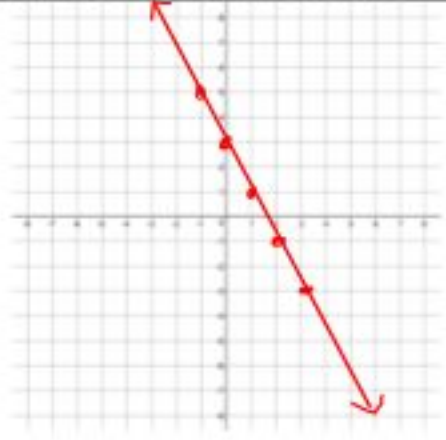
Example #1: Graph the linear equation $y = -2x + 3$

(In this example, the y-intercept = 3 and the slope = -2)

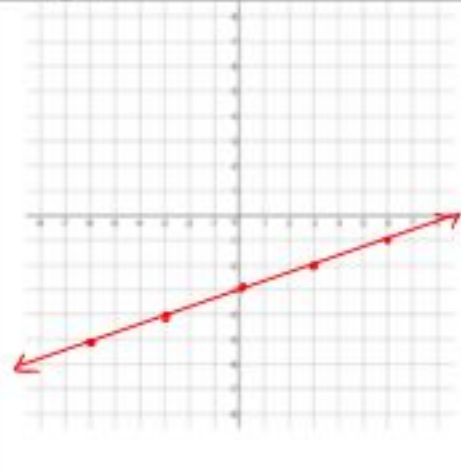
Step 1: Create a table of values and ordered pairs that match with the equation

Step 2: Plot the points on a graph and join them as a line, with arrows on both ends

(*Note: You can choose ANY values for x, then use those values to calculate y*)

1. Table of Values and Ordered Pairs	2. Graph																		
<p>Choose 5 different x values Calculate the y values that match. Write the ordered pairs!</p>	<p>Plot the points and join them as a line. Draw arrows on both ends to show it continues in both directions forever</p>																		
<p>$y = -2x + 3$</p> <table border="1"> <thead> <tr> <th>x</th> <th>y</th> <th>(x, y)</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>3</td> <td>(0, 3)</td> </tr> <tr> <td>1</td> <td>1</td> <td>(1, 1)</td> </tr> <tr> <td>2</td> <td>-1</td> <td>(2, -1)</td> </tr> <tr> <td>3</td> <td>-3</td> <td>(3, -3)</td> </tr> <tr> <td>-1</td> <td>5</td> <td>(-1, 5)</td> </tr> </tbody> </table> <p> $y = -2(0) + 3 = 3$ $y = -2(1) + 3 = 1$ $y = -2(2) + 3 = -1$ $y = -2(3) + 3 = -3$ $y = -2(-1) + 3 = 5$ </p>	x	y	(x, y)	0	3	(0, 3)	1	1	(1, 1)	2	-1	(2, -1)	3	-3	(3, -3)	-1	5	(-1, 5)	
x	y	(x, y)																	
0	3	(0, 3)																	
1	1	(1, 1)																	
2	-1	(2, -1)																	
3	-3	(3, -3)																	
-1	5	(-1, 5)																	

Example #2: $3y - x + 9 = 0$ (In this example, we need to convert into $y = mx + b$ form first!)
 (The y-intercept = -3 and the slope = 1/3)
 Find 5 ordered pairs that match with the equation, then draw the graph

<p>Convert into $y = mx + b$ form:</p> <p>$3y - x + 9 = 0$</p> <p>Isolate for y Get alone</p> <p>$3y = (x - 9) \div 3$</p> <p>$y = \frac{x}{3} - 3$</p> <p>$y = \frac{1}{3}x - 3$</p> <table border="1"> <thead> <tr> <th>x</th> <th>y</th> <th>(x, y)</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>-3</td> <td>(0, -3)</td> </tr> <tr> <td>3</td> <td>-2</td> <td>(3, -2)</td> </tr> <tr> <td>6</td> <td>-1</td> <td>(6, -1)</td> </tr> <tr> <td>-3</td> <td>-4</td> <td>(-3, -4)</td> </tr> <tr> <td>-6</td> <td>-5</td> <td>(-6, -5)</td> </tr> </tbody> </table> <p> $y = \frac{0}{3} - 3 = -3$ $y = \frac{3}{3} - 3 = 1 - 3 = -2$ $y = \frac{6}{3} - 3 = 2 - 3 = -1$ $y = \frac{-3}{3} - 3 = -1 - 3 = -4$ $y = \frac{-6}{3} - 3 = -2 - 3 = -5$ </p>	x	y	(x, y)	0	-3	(0, -3)	3	-2	(3, -2)	6	-1	(6, -1)	-3	-4	(-3, -4)	-6	-5	(-6, -5)	
x	y	(x, y)																	
0	-3	(0, -3)																	
3	-2	(3, -2)																	
6	-1	(6, -1)																	
-3	-4	(-3, -4)																	
-6	-5	(-6, -5)																	

(It makes life easier if we pick multiples of 3 so that we don't have to graph fractions)

Example #3: In January, the temperature (T) outside Lord Byng is given by the equation $T = 2h - 5$ where h is the number of hours after school starts.

In this example, we should put h on the x -axis and T on the y -axis.

The y -intercept = -5 and the slope = 2

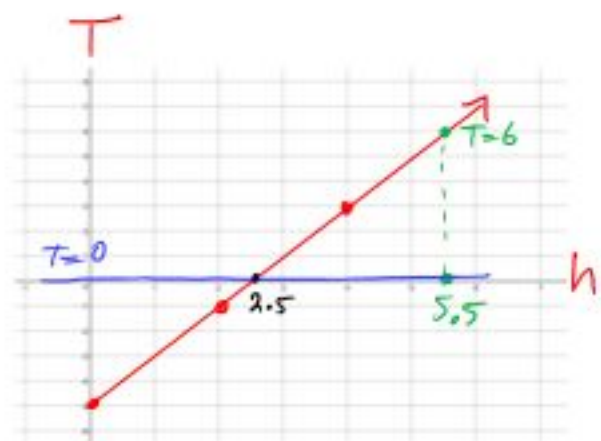
a) Find the temperature outside Byng zero, two and four hours after school starts.

$$T = 2(0) - 5 = -5 \quad (0, -5)$$

$$T = 2(2) - 5 = 4 - 5 = -1 \quad (2, -1)$$

$$T = 2(4) - 5 = 8 - 5 = 3 \quad (4, 3)$$

b) Graph the equation



c) **Using the graph**, estimate the temperature outside Byng $5\frac{1}{2}$ hours after school starts.

$$h = 5.5 \Rightarrow T = 6$$

Check $T = 2h - 5$

$$T = 2(5.5) - 5 = 11 - 5 = 6 \quad \checkmark$$

d) **Using the graph**, estimate how many hours after school starts is the temperature 0 degrees.

$$T = 0 \quad h = 2.5$$

check $T = 2h - 5$

$$T = 2(2.5) - 5 = 5 - 5 = 0 \quad \checkmark$$

Homework: Section 4.2 # 4-5all, 6all, 7left, 8 (a-f), 10, 12, 13