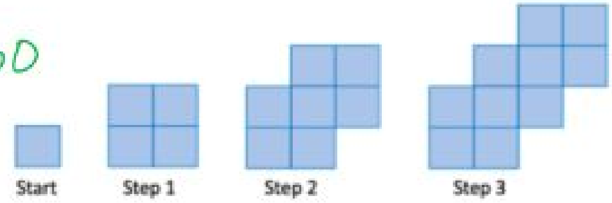
Pattern

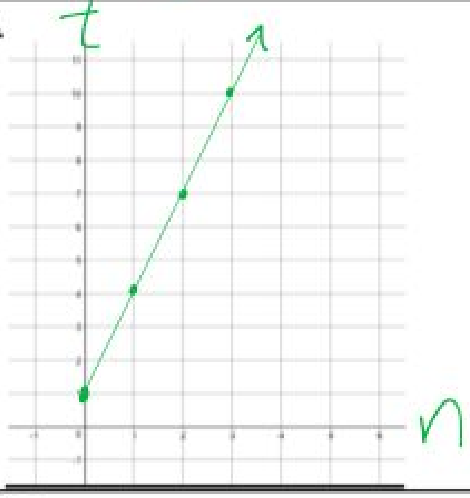
Step 0



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)

2. Graph



3. Equation

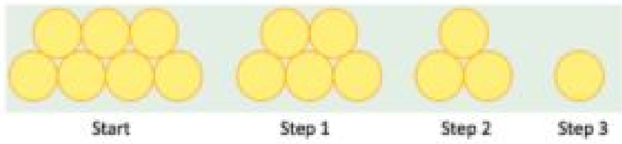
$t = 1 + 3n$

start CD

Check: Step 3 = 10

$t = 1 + 3(3) = 1 + 9 = 10$ ✓

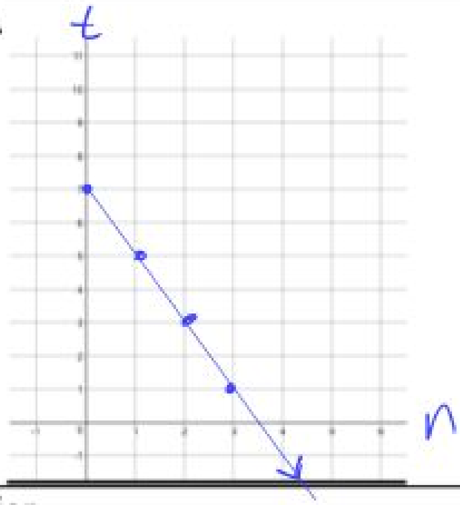
Pattern



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



3. Equation

$7 - 2n = t$

start CD

Check: Step 2 = 3

$t = 7 - 2(2) = 7 - 4 = 3$ ✓

1. Table of Values and Ordered Pairs

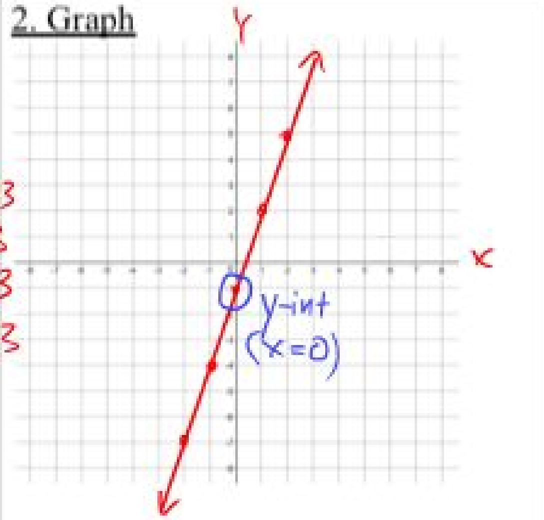
1st 2nd

n(x, y)t

n x	t y	
–2	–7	(–2 , –7)
–1	–4	(–1 , –4)
0	–1	(0 , –1)
1	2	(1 , 2)
2	5	(2 , 5)

+3 +3 +3 +3

2. Graph



3. Equation

$$\overset{t}{y} = \underset{\text{CD}}{3}\overset{n}{x} \underset{\text{Start Step0 } (n=0)(x=0)}{- 1}$$

Check: $x = -2$, $y = -7$

$y = 3(-2) - 1 = -6 - 1$
$= -7$ ✓

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

1. Start (Step0)
2. Common difference

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 the line touches the y-axis (x=0)

which is the same as: Start (Step 0)

***slope*:** how much it increases/decreases when we move 1 to the right

which is the same as: Common difference

The linear equation: $\overset{t}{\cancel{y}} = 3\overset{n}{\cancel{x}} - 1$ has a y-intercept = $\overset{\text{start}}{-1}$ and a slope = $\overset{\text{CD}}{3}$

The linear equation: $y = \frac{1}{2}x + \frac{4}{3}$ has a y-intercept = 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: $y = \underset{-1}{-}x + 0$ 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)

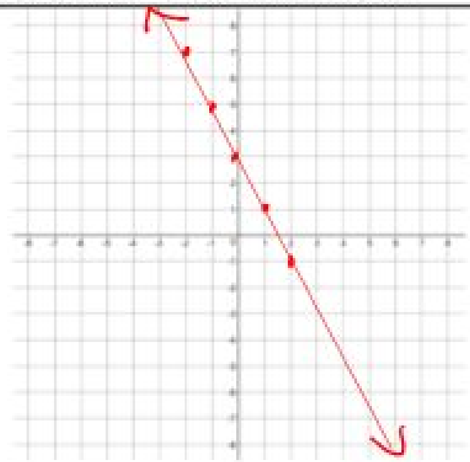
Step 1: Create a table of values and ordered pairs that match with the equation
Step 2: Plot the points on a graph and join them as a line, with arrows on both ends

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

1. Table of Values and Ordered Pairs	2. Graph
Choose 5 different x values **Calculate** the y values that match. **Write** the ordered pairs!	**Plot** the points and **join** them as a line. **Draw** arrows on both ends to show it continues in both directions forever

$y = -2x + 3$
$y = -2(-2) + 3 = 7$
$y = -2(-1) + 3 = 5$
$y = -2(0) + 3 = 3$
$y = -2(1) + 3 = 1$
$y = -2(2) + 3 = -1$

x	y	(x, y)
−2	7	(−2, 7)
−1	5	(−1, 5)
0	3	(0, 3)
1	1	(1, 1)
2	−1	(2, −1)



Example #2: $3y - x + 9 = 0$

slope y-int

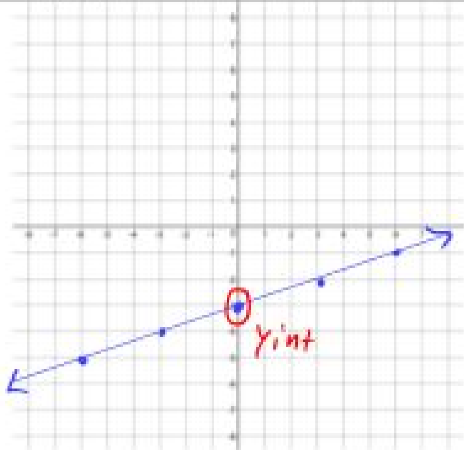
(In this example, we need to convert into $\boxed{y=mx+b}$ form first!)
(The y-intercept = −3 and the slope = $\frac{1}{3}$)
Find 5 ordered pairs that match with the equation, then draw the graph

Convert into y=mx+b form:

Isolate for y
$3y - x + 9 = 0$
$+x - 9 \quad +x - 9$
$\div 3 \quad (3y) = (x - 9) \div 3$
$y = \frac{x-3}{3}$
$y = \frac{1}{3}x - 3$

$y = \frac{0}{3} - 3 = -3$
$y = \frac{3}{3} - 3 = 1 - 3 = -2$
$y = \frac{6}{3} - 3 = 2 - 3 = -1$
$y = \frac{-3}{3} - 3 = -1 - 3 = -4$
$y = \frac{-6}{3} - 3 = -2 - 3 = -5$

(x, y)
(0, −3)
(3, −2)
(6, −1)
(−3, −4)
(−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___

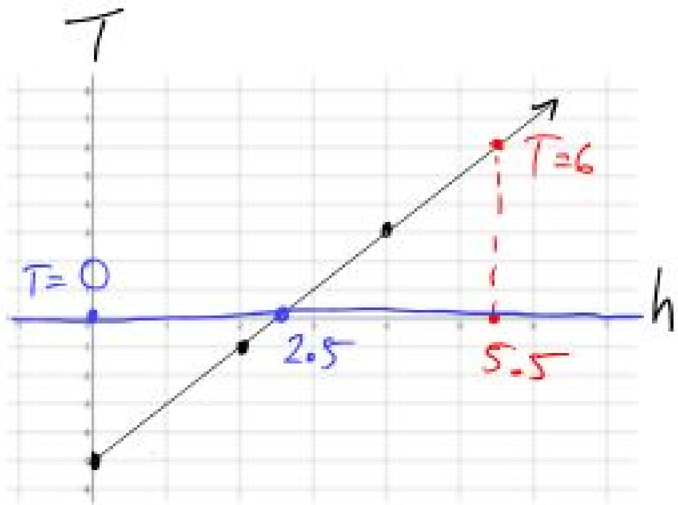
a) Find the temperature outside Byng zero, two and four hours after school starts.

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

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

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

b) Graph the equation



c) **Using the graph**, estimate the temperature outside Byng 5 ½ hours after school starts.

$h = 5.5$ $T = 6$

check $T = 2h - 5$

$T = 2(5.5) - 5 = 11 - 5 = 6$ ✓

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

$T = 0$ $h = 2.5$

check $T = 2h - 5$

$T = 2(2.5) - 5 = 5 - 5 = 0$ ✓

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