

## Curriculum Outcomes:

(PR1) Generalize a pattern arising from a problem-solving context using linear equations and verify by substitution.

(PR2) Graph linear relations, analyze the graph and interpolate or extrapolate to solve problems.

**Student Friendly:** Looking at a graph or t-table and determining if they are linear or non-linear or discrete or continuous



# Grade 9 Warm Up



A local company offers a cell phone plan that has a fixed cost per month and a cost related to the number of text messages sent. The fixed cost is \$20 and each message sent cost 15 cents.

i) Write an equation that relates the total cost,  $C$ , to the number of text messages sent,  $t$ .

ii) How much would your bill be if you sent 123 text messages in one month?



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i) Write an equation that relates the total cost,  $C$ , to the number of text messages sent,  $t$ .

$x$ $t$	$y$ $C$
1	20.15
2	20.30
3	20.45

+1 ( ) + 0.15  
+1 ( ) + 0.15

$$y = \frac{\Delta y}{\Delta x} x + \#$$

$$C = \frac{0.15}{1} t + 20$$

ii) How much would your bill be if you sent 123 text messages in one month?

$$C = 0.15t + 20$$

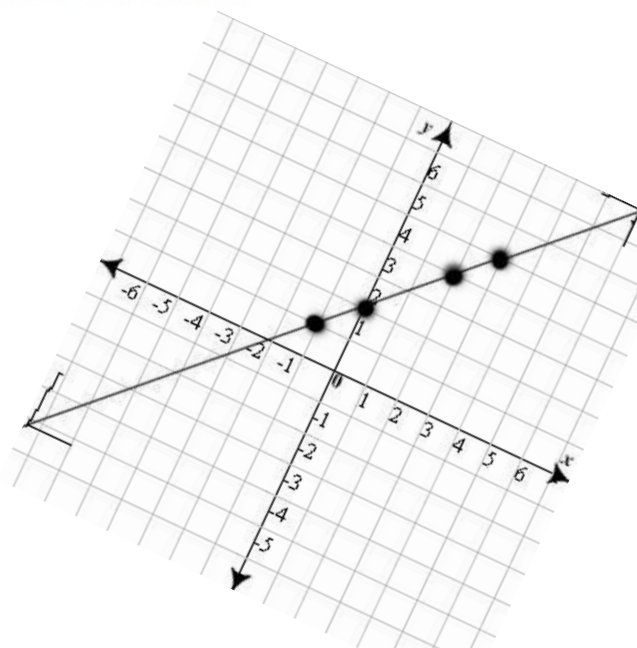
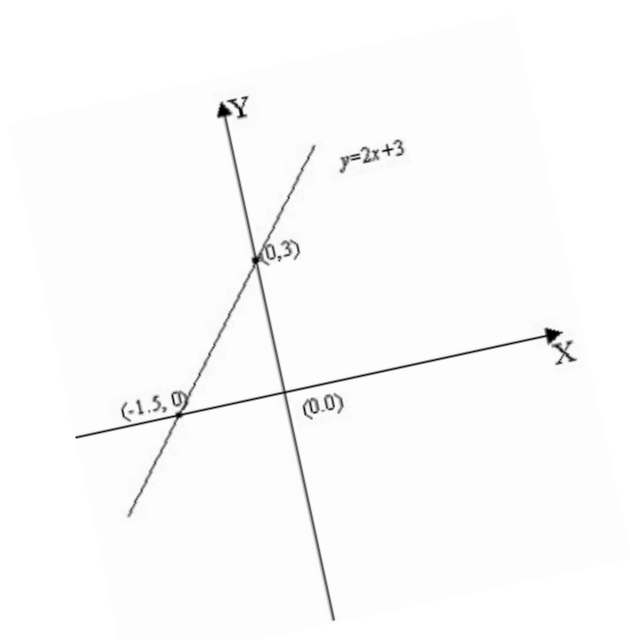
$$C = 0.15(123) + 20$$

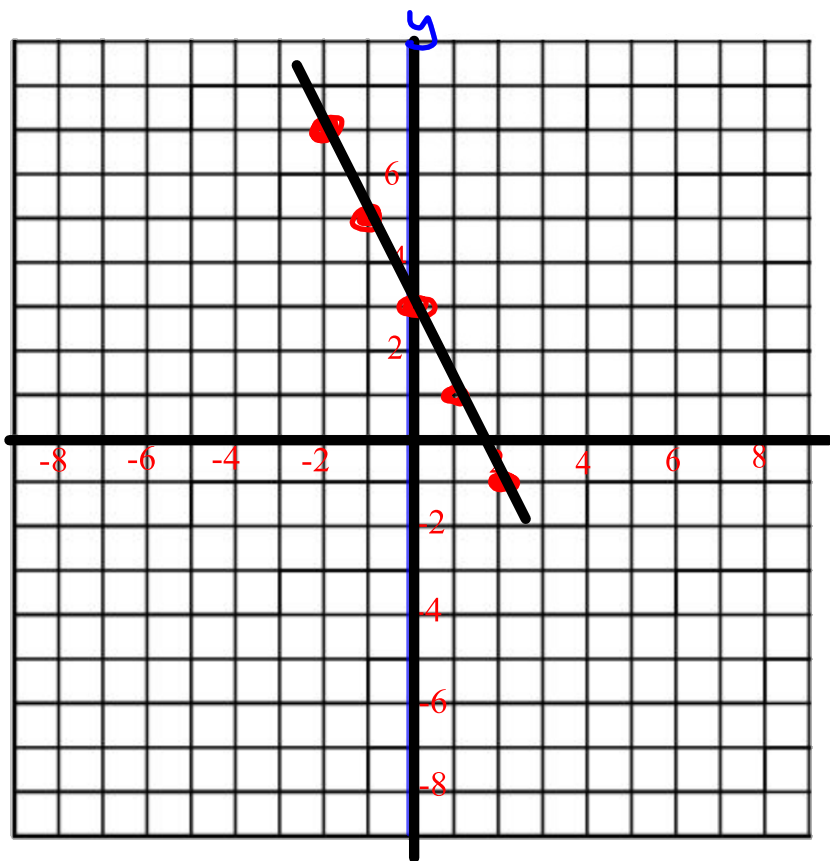
$$C = 18.45 + 20$$

$$C = \$38.45$$

# Section 4.2

## Linear Relations





	x	y
+1	-2	7
+1	-1	5
+1	0	3
+1	1	1
+1	2	-1

$$y = -2x + 3$$

**Remember ME**

Let's look at it again.

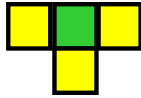


Figure 1

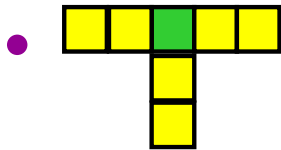


Figure 2

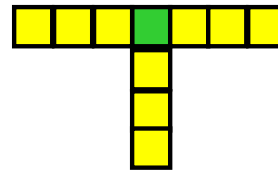
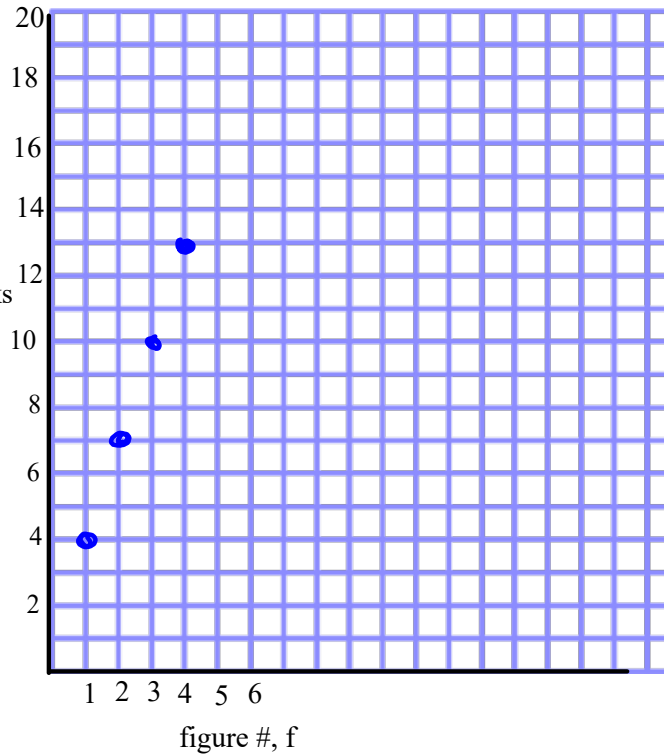


Figure 3

Figure #	# of Blocks
1	4
2	7
3	10
4	13
5	16
6	19

Handwritten notes: A blue 'X' with a downward arrow and 'F' is next to the first column. A blue 'y' with a downward arrow and 'B' is next to the second column. Purple annotations show the difference between rows: +3 between 1 and 2, +3 between 2 and 3, +3 between 3 and 4, and +3 between 4 and 5.



$B = 3f + 1$

THUS

For figure  $f$ , the number of blocks will be  $3f + 1$

If  $n$  is the number of blocks then the equation is:  $n = 3f + 1$

What changes the value of  $n$ ???

So the value of \_\_\_\_\_ depends on the value of \_\_\_\_\_.

# Dependent VS. Independent

Dependent variable is always plotted  
on vertical axis (y-axis)



Independent variable is always plotted on  
the horizontal axis (x-axis)



$$y = \frac{\Delta y}{\Delta x} x \pm \#$$

examples:  $y = -5x + 7$

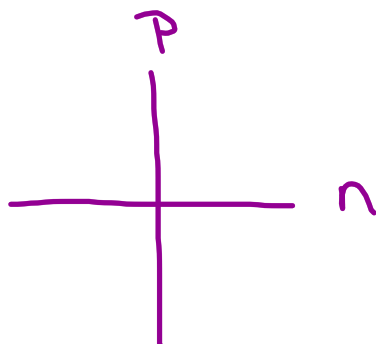
# Dependent VS. Independent

•  $y = \frac{\Delta y}{\Delta x} x \pm b$

If the equation is:  $P = 2n + 4$

P is the dependent variable

n is the independent variable





# Linear Relation

- is when the graph is a straight line
- a constant change in 'x' causes a constant change in 'y'
- if you can rearrange an equation to  $y = ?x + \#$



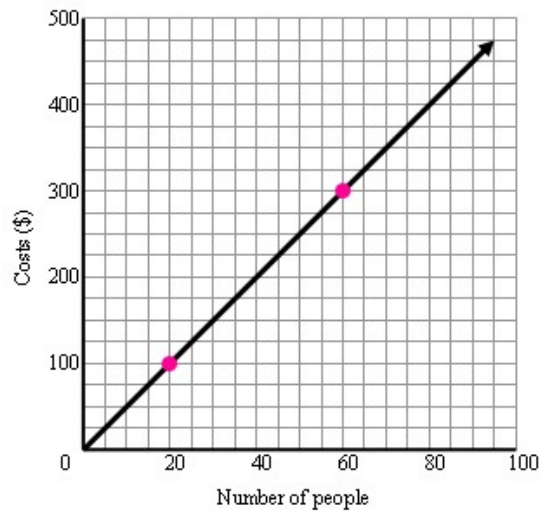
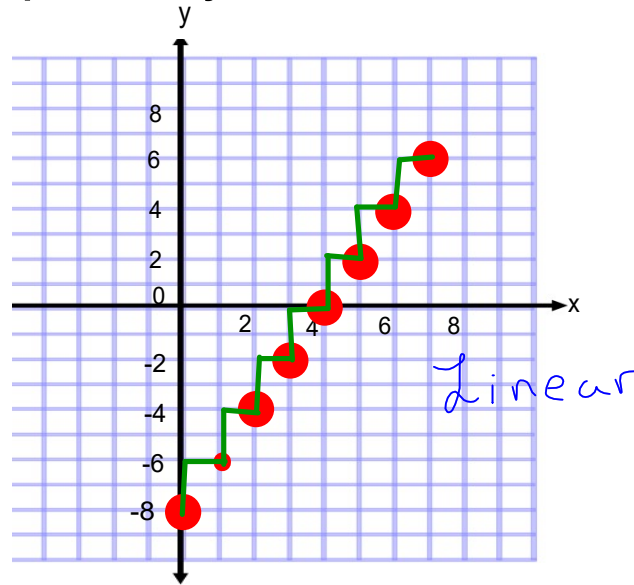
Table of Values

$\Delta x = 1$        $\Delta y = 2$

x	y
0	-6
1	-4
2	-2
3	0

Handwritten notes:  $+1$  in the x column and  $+2$  in the y column for each row transition.

Linear  
 $\Delta x, \Delta y$



# Continuous vs. Discrete

Discrete: Dots

Continuous: Connected (line)



Think about the two situations



## Cost of video games

$x$ Number of Video games	Cost, C(\$)
1	25
2	50
3	75

Can you buy 1.5 video games?

So would you connect the dots???

No

## Babysitting Job

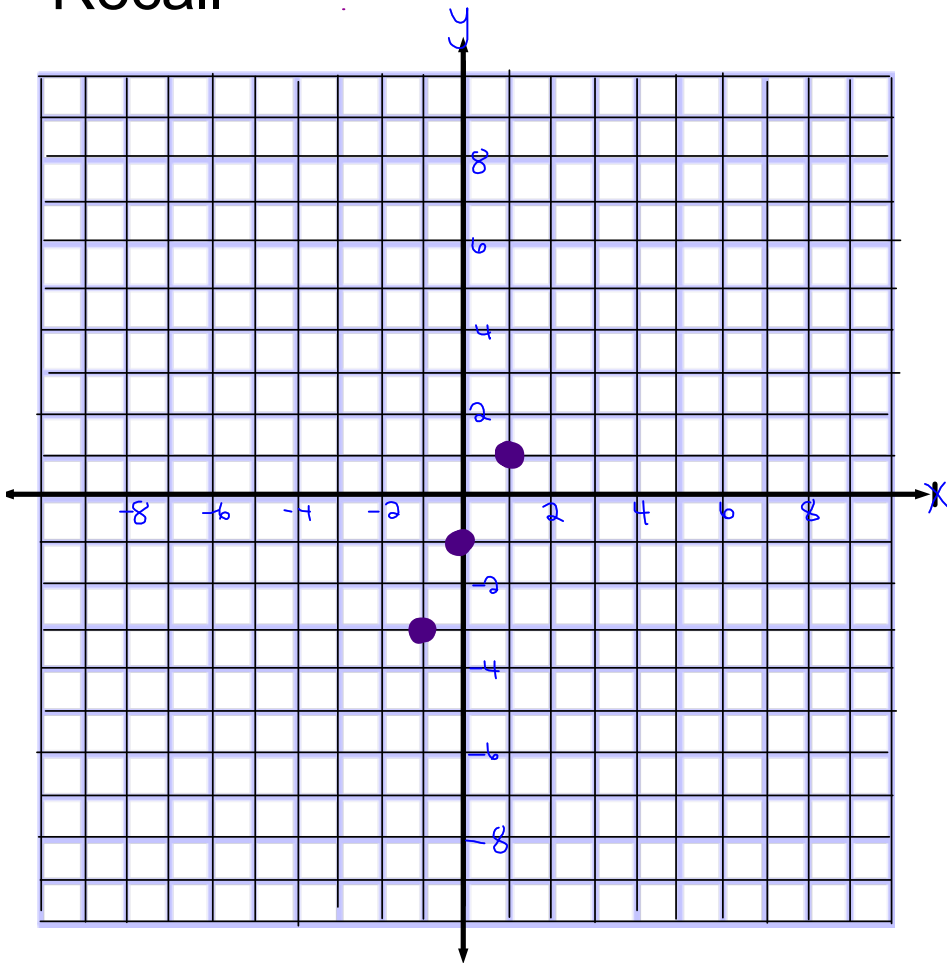
$x$ Number of Hours	Earnings, C(\$)
1	10
2	20
3	30

Can you work 1.5 hours?

So would you connect the dots???

Yes

Recall



$$y = \frac{\Delta y}{\Delta x} x + \#$$

$$y = 2x - 1$$

$x$	$y$
-1	-3
0	-1
1	1

$\Delta x = 1$        $\Delta y = 2$

    ) +2

    ) +2

$$y = 2x - 1$$

$$x = -1$$

$$y = 2(-1) - 1$$

$$y = -3$$

$$x = 0$$

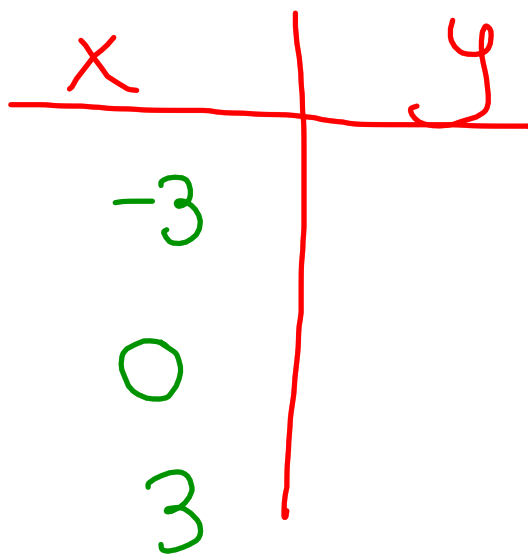
$$y = 2(0) - 1$$

$$y = -1$$

$$y = \frac{2}{3}x + 5$$

$$\Delta x = 3$$

$$\Delta y = 2$$



# Class/Homework



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#4 Write a sentence for each

#5 a, b, c (i, ii, iii)

Write out the chart and show the common change in  $x$  any in  $y$  if it exist.

# 7 a,d

