Graphing Equations: A review from above.

Using a Table of Values:
Step 1: Choose appropriate values of 'x' to put in the table.
Step 2: Input each 'x' into the equation to find the corresponding 'y'.
Step 3: Plot the new-found 'ordered pairs'.
Step 4: Draw a line through the points. (be careful of the shape...not all are lines)

In this unit, we will be studying graphs of straight lines and their equations.

We call these **LINEAR EQUATIONS.**

An equation is said to be ***linear*** if it forms a straight line when graphed.

Equation of a Line Property:

The coordinates of every point on the line will satisfy the equation of the line.

You should REALLY memorize this!

Slope-Intercept Form:

$\boxed{y = mx + b}$

26. How many points do you need to graph a line?

at least 2.

27. To be safe, at least how many should you have?

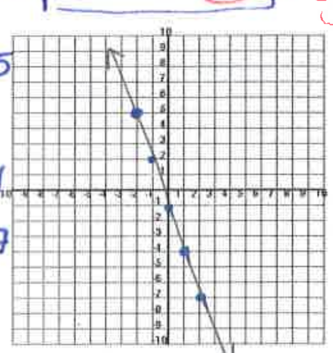
3 or more.

Graph these equations... (HW Questions are highlighted)

28. $y = -3x - 1$ ← y-intercept.

Sub-in for x?

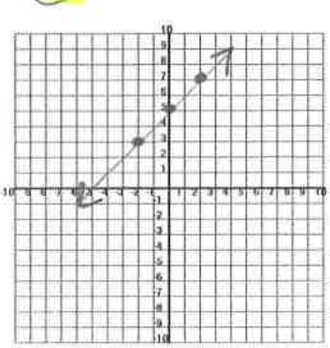
$y = -3(-2) - 1 = 5$
$y = -3(-1) - 1 = 2$
$y = -3(1) - 1 = -4$
$y = -3(2) - 1 = -7$



x	y
−2	5
−1	2
0	−1
+1	−4
+2	−7

$y = -3x - 1$ is a "linear equation"

29. $y = 5 + x$



x	y	
−2	3	5+(−2)
0	5	5+0
+2	7	5+2

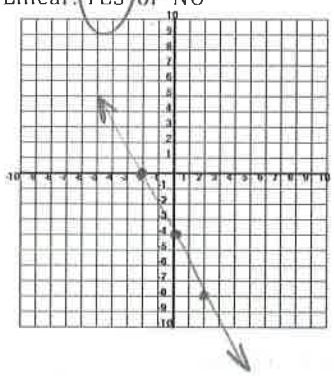
Class Example 2

Graph the following equations, then determine if they are linear or not.

30. $y = -2x - 4$

$y = -2x - 4$	
x	y
-2	0
-1	
0	-4
1	
2	-8

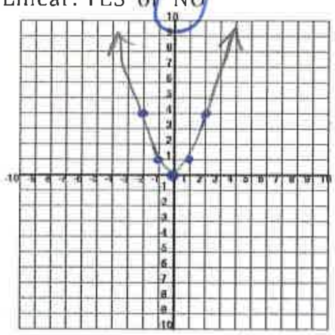
Linear: YES or NO



31. $y = x^2$

$y = x^2$	
x	y
-2	4
-1	1
0	0
1	1
2	4

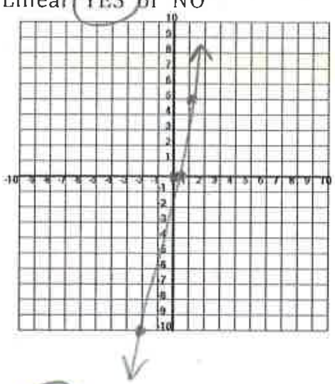
Linear: YES or NO



32. $y = 5x$

$y = 5x$	
x	y
-2	-10
0	0
1	5
4	
9	

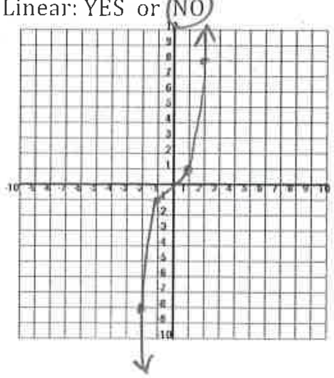
Linear: YES or NO



33. $y = x^3$

$y = x^3$	
x	y
-2	-8
-1	-1
0	0
1	1
2	8

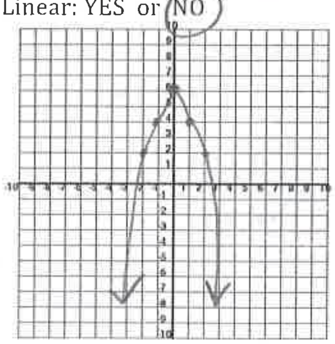
Linear: YES or NO



34. $y = -2x^2 + 6$

$y = -2x^2 + 6$	
x	y
-2	2
-1	4
0	6
1	4
2	2

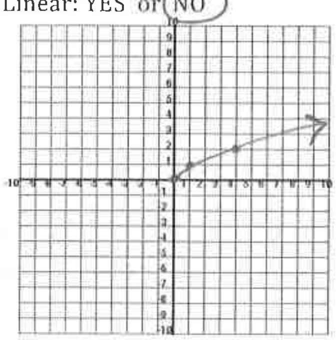
Linear: YES or NO



35. $y = \sqrt{x}$

$y = \sqrt{x}$	
x	y
-2	
-1	
0	0
1	1
2	
4	2

Linear: YES or NO



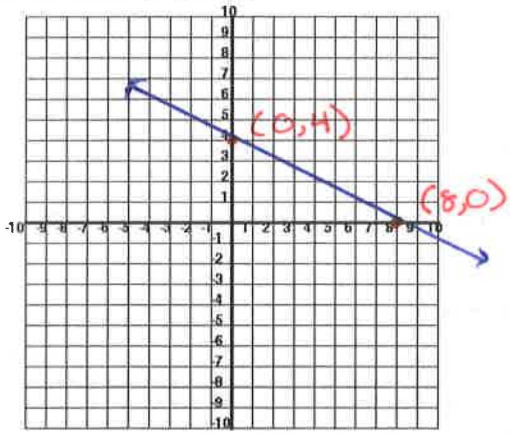
36. Can you describe a "rule of thumb" that will enable you to tell if an equation represents a linear equation or not? To determine if an equation is linear or not, we look at the exponents.

- If the highest exponent on any single variable is 1 = linear; more than 1 eg. $x^2 - 3 = y$ = not linear.
- 'single variable' means x and y are not multiplied
- multiplied variables eg. $xy = -3$ = not linear.

Challenge #3:

The equation $2x + 4y = 16$ is a **linear equation.**

$2x + 4y = 16$
$-2x \quad -2x$
$\frac{4y}{4} = \frac{16 - 2x}{4}$
$y = 4 - \frac{2}{4}x$
$y = 4 - \frac{1}{2}x$
$\boxed{\therefore y = -\frac{1}{2}x + 4}$



x	y
8	0
0	4

working below

37. Find the coordinates of the point where the line crosses the y-axis. (Think...what would be the value of 'x' here?) (y-intercept is the point where $x=0$)

$2x + 4y = 16$
$2(0) + 4y = 16$
$\frac{4y}{4} = \frac{16}{4}$
$\boxed{y = 4}$
$\therefore (x, y) \ (0, 4)$

38. What is the value of 'x' where the line crosses the y-axis?

$x = 0$

39. Find the coordinates of the point where the line crosses the x-axis. (x-intercept is the point where $y=0$)

$2x + 4(0) = 16$
$\frac{2x}{2} = \frac{16}{2}$
$\boxed{x = 8}$
$\therefore (x, y) \ (8, 0)$

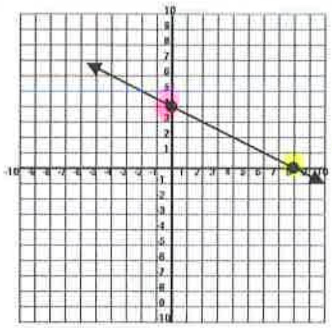
40. What is the value of "y" where the line crosses the x-axis?

$y = 0$

Intercepts

The location where a line passes through the x-axis is called the **x-intercept**. This point will have the coordinates $(x, 0)$

The location where a line passes through the y-axis is called the **y-intercept**. This point will have the coordinates $(0, y)$
Consider: $2x + 4y = 16$



This line has an x-intercept at (8, 0).
And a y-intercept at (0, 4).

You may see this written as:
x-intercept is 8
y-intercept is 4

Calculating intercepts from an equation:

The x-intercept will have coordinates $(x, 0)$. This means we can substitute 0 in for y and solve to find the x-intercept. The y-intercept will have coordinates $(0, y)$.

Eg. Find the x-intercept for

$2x + 4y = 16$
$2x + 4(0) = 16$
$2x = 16$
$x = 8$

ordered pair: (x, y)
$(8, 0)$

Find the y-intercept:

$2x + 4y = 16$
$2(0) + 4y = 16$
$4y = 16$
$y = 4$

ordered pair: (x, y)
$(0, y)$

Intercepts can be expressed as ordered pairs or simply as values.
For the example above, the x-intercept is 8 or the x-intercept is (8,0).

Some notes here…

recal; in $y = mx + b$

y-intercept

*Label the ordered pair for each intercept!

Calculate the intercepts and graph each equation using them. Fractions can be estimated on the grid.

*Show work!

$3y = 12 - 2x$

$\frac{3y}{3} = \frac{12-2x}{3}$

$y = 4 - \frac{2}{3}x$

$y = -\frac{2}{3}x + 4$

y-intercept OR set $x=0$

$2(0) + 3y = 12$

$+3y = 12$

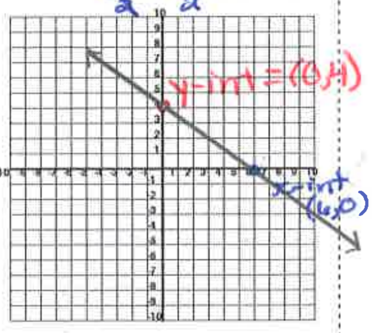
$\div 3 \quad \div 3$

$y = 4$

41. $2x + 3y = 12$

$2x + 3(0) = 12$

$\frac{2x}{2} = \frac{12}{2}$ $x = 6$



42. $3x + 5y = 30$

$3(0) + 5y = 30$

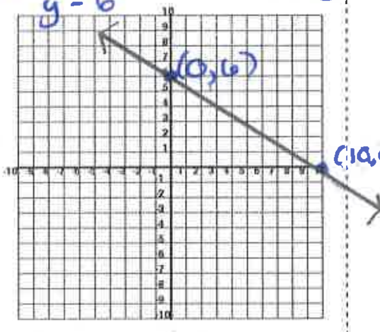
$\div 5 \; 5y = 30$

$y = 6$

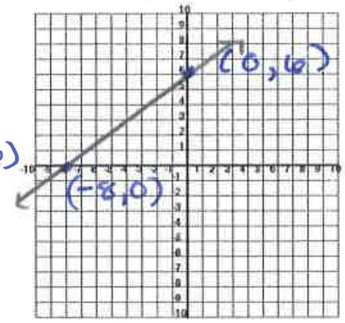
$3x + 5(0) = 30$

$\div 3, \; 3x = 30$

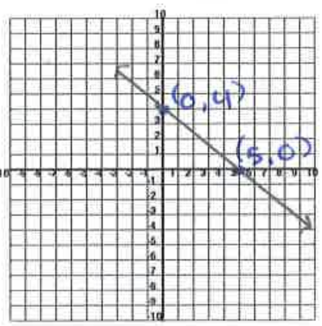
$x = 10$



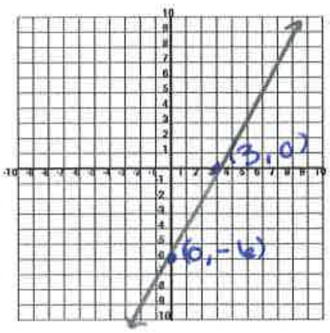
43. $3x - 4y + 24 = 0$



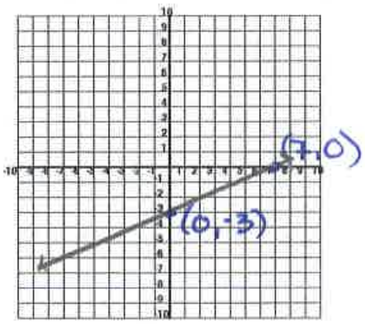
44. $4x + 5y = 20$



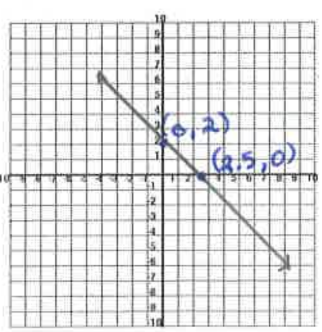
45. $6x - 3y - 18 = 0$



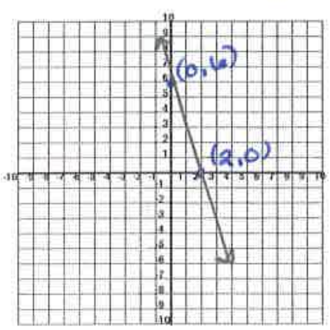
46. $3x - 7y = 21$



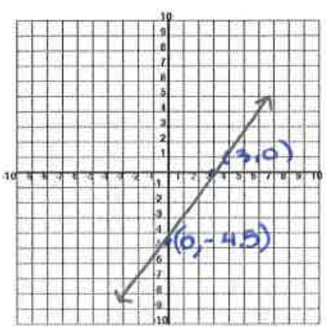
47. $4x + 5y = 10$



48. $9x + 3y - 18 = 0$



49. $3x - 2y = 9$



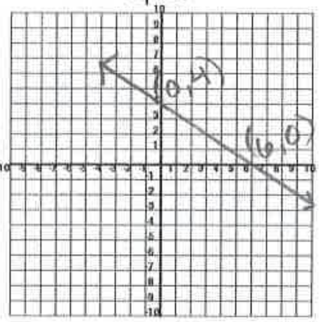
50. When do you think it would be appropriate (or the best scenario) to graph a line using the intercepts as opposed to using some other technique?

when the coefficients of 'x' and 'y' are factors of the constant term. eg. $2x + 3y = 12$. 2 and 3 are both factors of 12. This creates intercepts which are integers.

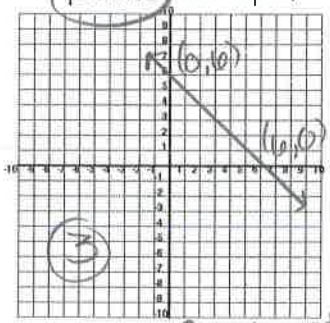
Answer the following questions about intercepts and linear relations. For these questions the domain is all real numbers.

51. Draw a graph of a linear relation that has two intercepts.

show any 2 intercepts
1 y-int (0,4)
1 x-int (6,0)

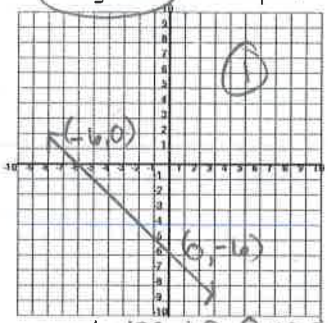


52. Draw a graph of a linear relation that has two positive intercepts.



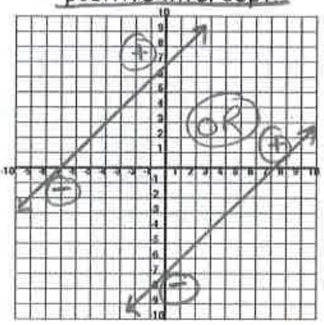
must be in Quadrants 1, 2, 4 (not 3)

53. Draw a graph of a linear relation that has two negative intercepts.

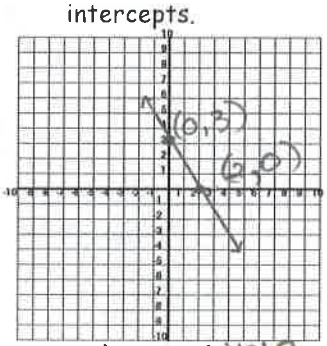


must be in Quadrants 2, 3, 4 (not 1)

54. Draw a graph of a linear relation that has one negative and one positive intercept.

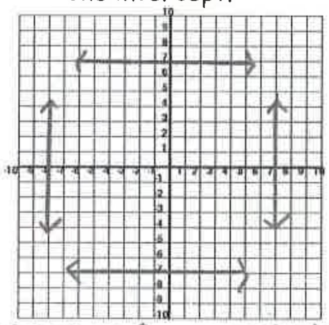


55. Draw a graph of a linear relation that has an infinite number of intercepts.



not possible.

56. Draw a graph of a linear relation that has only one intercept.



several possible answers

57. Consider your answer to the previous question. What other **type** of line could you draw that would satisfy the problem?

only horizontal or vertical lines satisfy the problem.

58. Find the intercepts of the following linear equation.

$$\frac{x}{2}+\frac{y}{3}=1$$

y-int when $x=0$

$\frac{(0)}{2}+\frac{y}{3}=1$

$0+\frac{y}{\cancel{3}}\times 3=1\times 3$

$y=3$ (0,3)

x-int when $y=0$

$\frac{x}{2}+\frac{(0)}{3}=1$

$\times 2\ \frac{x}{\cancel{2}}+0=1\times 2$

$x=2$ (2,0)

59. Find the intercepts of the following **non-linear** relation.

$$y=x^2-4$$

y-int $x=0$

$y=(0)^2-4$

$y=-4$ (0,−4)

x-int $y=0$

$(0)=x^2-\cancel{4}$

$+4 \qquad +\cancel{4}$

$\sqrt{4}=\sqrt{x^2}$

$\pm 2=x$ ∴ (2,0) and (−2,0)