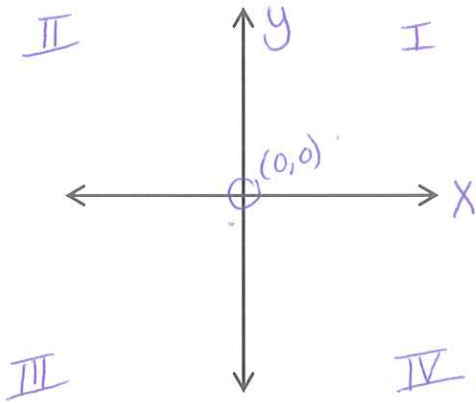


Section 1.1: Points and Lines

Essential Question: ^① How do you graph a linear equation?
^② How do you solve a system? ^③ How do you find midpoint and distance between 2 points?

The Coordinate Plane



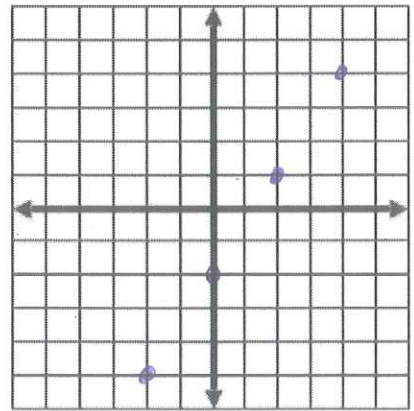
- Label...
- x and y axis
 - 4 Quadrants
 - Origin

LINEAR EQUATIONS

Standard or General Form: $Ax + By = C$

Slope-intercept Form: $y = mx + b$

Slope = $m = \frac{\text{rise}}{\text{run}}$ positive \uparrow negative \downarrow



$y = \frac{3}{2}x - 2$ $b = -2$
 $m = \frac{3}{2} \uparrow$

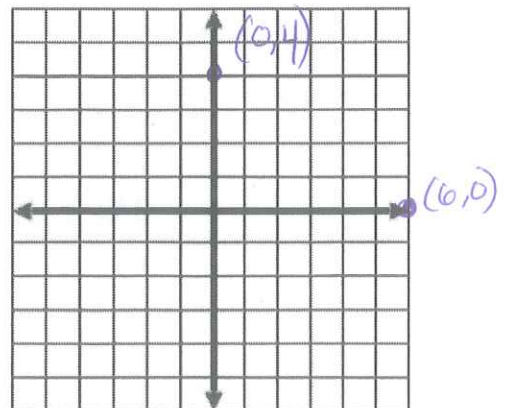
INTERCEPTS of a LINEAR EQUATION

x - intercept: where the line crosses the x-axis $(x, 0)$
every x-int. has y-value = 0

y - intercept: where the line crosses the y-axis $(0, y)$
every y-int has x-value = 0

Example:
Graph $2x + 3y = 12$ using intercepts

$x\text{-int}$ $y\text{-int}$
 $y = 0$ $2x = 12$ $x = 0$ $3y = 12$
 $x = 6$ $y = 4$ $(6, 0)$ $(0, 4)$

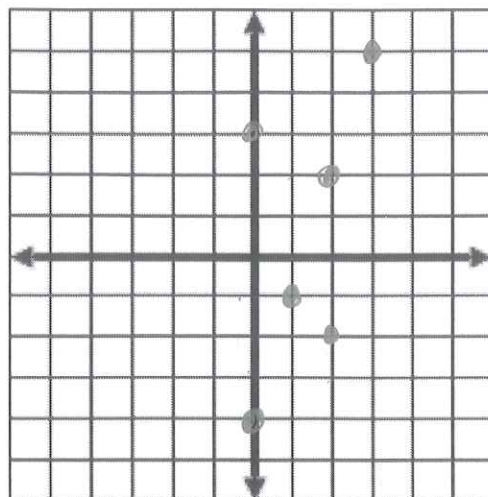


To solve a SYSTEM of LINEAR EQUATIONS

To solve a system means to find the point of intersection, which is a coordinate (x,y)

Ways to solve a system:

- 1) Graphing
- 2) Substitution
- 3) Linear Combination (AKA: Elimination)



$$3(3x - y = 4) \rightarrow 9x - 3y = 12$$

$$5x + 3y = 9 \rightarrow 5x + 3y = 9$$

$$14x = 21$$

$$x = \frac{21}{14} = \frac{3}{2} = 1.5$$

$$3x - y = 4$$

$$3(1.5) - y = 4$$

$$4.5 - y = 4$$

$$-y = -.5$$

$$y = .5$$

* Graph $3x - y = 4$ & $3y = -5x + 9$
 $y = 3x - 4$ $y = \frac{-5}{3}x + 3$
 (hard to see/know intersectionpt)

Answer as
 (x, y)

$$\boxed{\begin{matrix} (1.5, .5) \\ x \quad y \end{matrix}}$$

SPECIAL CASES for Systems of Linear Equations

No solution: Graphs are **parallel**, slopes are equal

Infinitely many solutions: Graphs overlap each other, same equation if reduced

REVIEW of Geometric information

Area of a triangle = $\frac{1}{2}(\text{base})(\text{height}) = \frac{1}{2}(b)(h)$

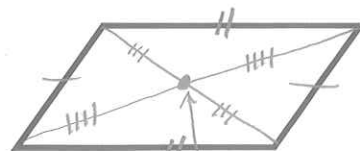
Parallelogram

Has 2 pairs of // sides

Opposite sides congruent \cong

Diagonals bisect each other

show using distance



show using midpoint

DISTANCE and MIDPOINT FORMULAS

Given two points (x_1, y_1) and (x_2, y_2)

Midpoint:

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

Distance:

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2} \text{ units}$$

EXAMPLES:

Find the coordinates of the midpoint and the length of \overline{NM} .
N(-1, 8) and M(3, 13)

$$\begin{aligned} \text{mdpt. } (\overline{NM}) &= \left(\frac{-1+3}{2}, \frac{8+13}{2} \right) \\ &= \left(\frac{2}{2}, \frac{21}{2} \right) \end{aligned}$$

$$\text{mdpt. } (\overline{NM}) = (1, 10.5)$$

distance = MN

$$\begin{aligned} MN &= \sqrt{(-1-3)^2 + (8-13)^2} \\ &= \sqrt{(-4)^2 + (-5)^2} \\ &= \sqrt{16+25} = \sqrt{41} \end{aligned}$$

$$\begin{aligned} MN &= \sqrt{41} \text{ un} \\ MN &\approx 6.4 \text{ un} \end{aligned}$$

Section 1.1 Summary:

EQ ① To graph use

$$y = mx + b$$

OR

$$Ax + By = C$$

1st graph

y-int (0, b)

2nd count slope = m

pos \uparrow neg \downarrow
 \rightarrow \rightarrow

1st x-int plug y=0
(x, 0)

2nd y-int plug x=0
(0, y)

EQ ② Solving System

→ Graphing

→ Substitution

→ Linear Comb. (Elimination)

Finding pt. of intersection
so answer is (x, y)

EQ ③

$$\text{Midpoint} = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

$$\text{Distance} = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2} \text{ units}$$