4.4 – System of Linear Inequalities

Linear Inequalities

Slope-Intercept form $y = mx + b$

Linear inequality → describes a region of a coordinate plane that has a boundary line.

- **solution of a linear inequality** – are the coordinates of pts that make the inequality True!
- **Shading and Type of Line Rules:**
  - To use these rules → inequality must be solved for "y" and "y" must be on the LEFT SIDE!

✳ Remember → If MULTIPLY or DIVIDE by a NEGATIVE #, you must switch ineq. symbol

a.) $>$ → shade above line and have a dotted line

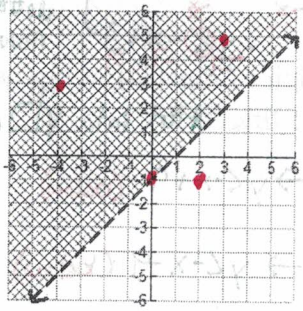
b.) $\geq$ → shade above line and have a solid line

c.) $<$ → shade below above line and have a dotted line

d.) $\leq$ → shade below above line and have a solid line

Example 1: Determine the points that could represent solutions for each graphed linear inequality.

a.)



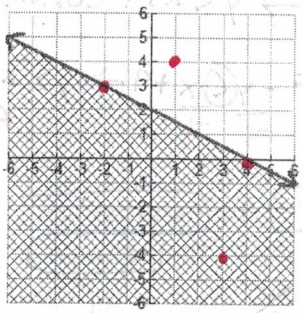
(2 , – 1) → solution? Circle one: Yes (No) Explain: Pt is NOT in Shaded region.

(– 4 , 3) → solution? Circle one: (Yes) No Explain: Pt is IN the Shaded region.

(0 , – 1) → solution? Circle one: Yes (No) Explain: Pt is on a DOTTED line

(3 , 5) → solution? Circle one: (Yes) No Explain: Pt is IN the Shaded region.

b.)



(– 2 , 3) → solution? Circle one: (Yes) No Explain: Pt is on a SOLID line

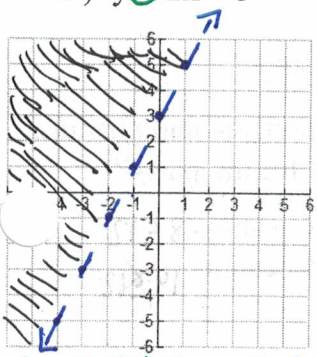
(1 , 4) → solution? Circle one: Yes (No) Explain: Pt is NOT in the Shaded regi

(3 , – 4) → solution? Circle one: (Yes) No Explain: Pt is IN the Shaded region

(4 , 0) → solution? Circle one: (Yes) No Explain: Pt is on a SOLID line.

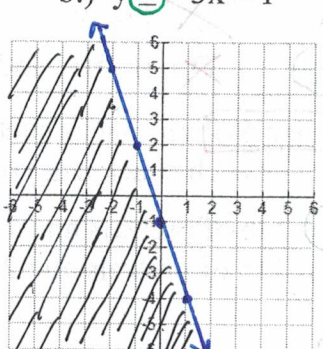
Example 2: Graph each linear inequality. Make sure to have the correct type of line and shading.

a.) $y > 2x + 3$



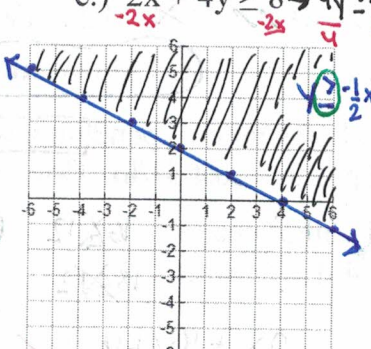
$>$ - shaded Above m = 2
- dotted line b = 3

b.) $y \leq -3x - 1$



$\leq$ - shaded below m = -3
- solid line b = -1

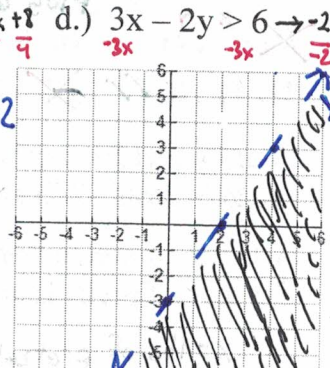
c.) $2x + 4y \geq 8 \rightarrow 4y \geq -2x + 8$ (÷4)



$y \geq -\frac{1}{2}x + 2$

$\geq$ - shade above m = $-\frac{1}{2}$
- solid line b = 2

d.) $3x - 2y > 6 \rightarrow -2y > -3x + 6$ (÷ −2)



$y < \frac{3}{2}x - 3$

$<$ shade below m = $\frac{3}{2}$
dotted line

System of Linear Inequalities

- **system of linear inequalities** → two or more linear inequalities that are grouped together.

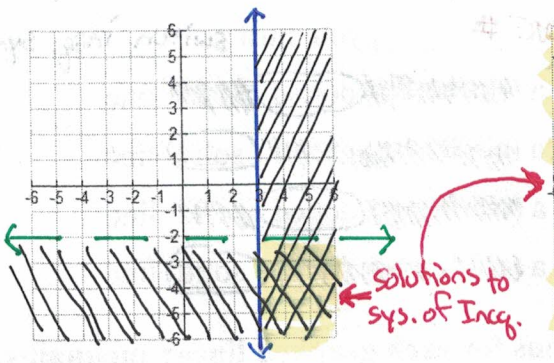
- **solution of a system of linear inequalities** – after graphing each linear inequality from the system, the region where the SHADING OVERLAPS represents the "solution"

Example 3: Graph each system of linear inequalities. Draw an arrow labeling the solution.

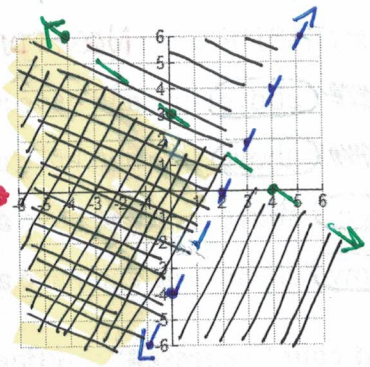
a.) $\begin{cases} x \geq 3 \\ y < -2 \end{cases}$ Vertical, Horizontal; $x \geq 3$ solid line, above; $y < -2$ dotted line, below

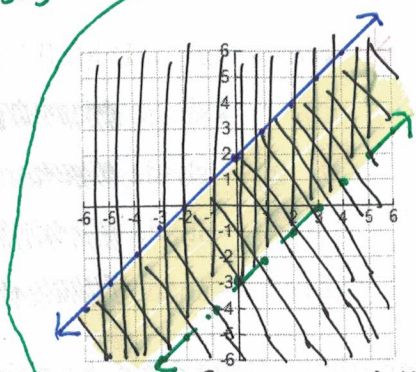
b.) $\begin{cases} y > 2x - 4 \\ y < -\frac{3}{4}x + 3 \end{cases}$ $y > 2x-4$ dotted, above, $m=2$ $b=-4$; $y < -\frac{3}{4}x+3$ dotted, below, $m=-\frac{3}{4}$ $b=3$

c.) $\begin{cases} y \leq x + 2 \\ x - y < 3 \end{cases}$ $y \leq x+2$ solid, below, $m=1$ $b=2$



Solutions to sys. of Ineq.





$x - y < 3$

$-x \quad -x$

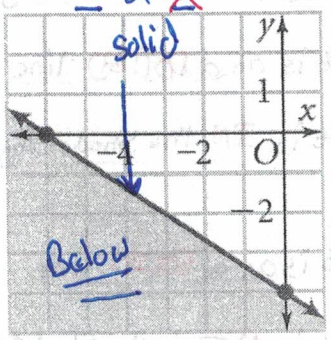
$-y < -x + 3$

$-1 \quad -1 \quad -1$

$y > x - 3$ dotted, Above, $m=1$, $b=-3$

Examples: Answer each multiple choice question.

4.) Which linear inequality describes the graph below?



< or ≤; solid; Below

A.) $y < -\frac{2}{3}x - 4$

B.) $y > -\frac{2}{3}x - 4$

C.) $y \leq -\frac{2}{3}x - 4$

D.) $y \geq -\frac{2}{3}x - 4$ Above

5.) The graph of which of the following is shaded above the line? *Put into $y \square mx+b$

A.) $x + y < 9 \xrightarrow{-x} y < -x + 9$ (below)

B.) $x + y < -9 \xrightarrow{-x} y < -x - 9$ (below)

C.) $y - x < 9 \xrightarrow{+x} y < x + 9$ (below)

D.) $x - y < 9 \xrightarrow{-x} -y < -x + 9 \xrightarrow{\div -1} y > x - 9$ Above

6.) Which inequality models the following situation? < 20

You want to spend less than $20 on asparagus and bananas. Asparagus is $3/lb and bananas are $0.50/lb. Let a represent the weight of the asparagus and b represent the weight of the bananas.

A.) $3a + 0.5b < 20$ B.) $3a + 0.5b > 20$ C.) $0.5a + 3b < 20$ (↑ bananas) D.) $3a + 0.5b \leq 20$

7.) Which point is a solution of the following system of linear inequalities?

$\begin{cases} y < x \\ y > 3x - 4 \end{cases}$

Plug each ordered pair into system.

I. $(-5, 2)$ II. $(-2, -4)$ ✓✓ III. $(1, 0)$ ✓✓ IV. $(2, 2)$

A.) II and IV only B.) I only C.) II and III only D.) II, III, and IV only

8.) Your budget for a party allows you to spend no more than $12 on snacks such as pretzels and peanuts. Pretzels costs $2/lb and peanuts cost $4/lb. How much of each snack can you get for the party?

A.) 2 lb of pretzels and 3 lb of peanuts $16 \not\leq 12$ B.) 2 lb of pretzels and 1 lb of peanuts $8 \leq 12$

C.) 1 lb of pretzels and 4 lb of peanuts $18 \not\leq 12$ D.) 3 lb of pretzels and 2 lb of peanuts $14 \not\leq 12$

x = lbs of pretzels

y = lbs of peanuts

$2x + 4y \leq 12$