Classroom Key

Chapter 5 Lesson #1 (3-3 & 3-4)

Objective: Solve Multi-Step Inequalities.

- Addition or Subtraction: you can add or subtract the same quantity from both sides of an inequality, and the statement will still be true.
- Multiplication or Division: if you multiply or divide by a negative, then you must Reverse (switch / flip) the inequality symbol in order for the statement to remain true.
- When graphing, if you use the: < (less than) or > (greater than) symbol, leave the circle open.
  ≤ ("equal to") or ≥ symbol, close (fill in) the circle.

Examples: In #1-11, solve each inequality and graph the solution set.

1. $x+9>15$

$-9 \quad -9$

$x>6$ ∞ (all values greater than 6)

2. $\frac{3x}{3}>\frac{-27}{3}$

$x>-9$

3. $\frac{2}{3}r<6$

4. $7-2x\geq 21$

$-7 \quad -7$

$-2x\geq 14$

$\frac{-2x}{-2}\geq\frac{14}{-2}$

$x\leq -7$

5. $-3(3-x)>16$

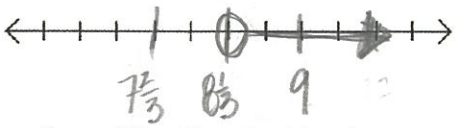
$-9+3x>16$

$+9 \quad +9$

$3x>25$

$\frac{3x}{3}>\frac{25}{3}$

$x>8\frac{1}{3}$

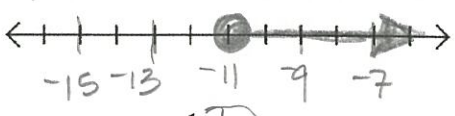


6. $\frac{x+5}{-2}\leq 3$ (-2)

$x+5\geq -6$

$-5 \quad -5$

$x\geq -11$



7. $6x-1\geq 3x+5$

8. $2(k-3)>6+3k-3$

9. $\frac{1}{4}(p-10)>6-4p$

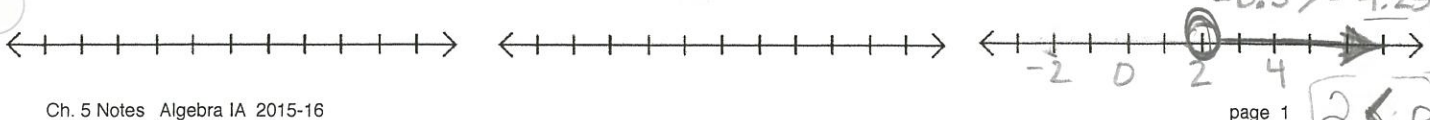
$\frac{1}{4}p-\frac{10}{4}>6-4p$

$-\frac{1}{4}p \quad -\frac{1}{4}p$

$-\frac{10}{4}>6-4\frac{1}{4}p$

$-6 \quad -6$

$-8.5>-4.25p$



$2<p$

10. $2(3y-2)-4 \geq 3(2y+7)$

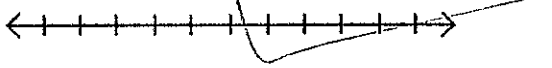
$6y-4-4 \geq 6y+21$

$-6y \quad -6y$

$-8 \not\geq 21$

NOT true

NO solutions



11. $\frac{1}{2}(2x-7) \leq 10+x$

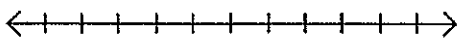
$X-3.5 \leq 10+X$

$-X \quad -X$

$-3.5 \leq 10$

true

- all Real #'s
- infinite solutions



12. To rent a car, Enterprise charges $55/day with unlimited miles. The cost of renting a similar car at Hertz is $25/day plus $0.20/mile. When is Enterprise less expensive?

$E < H$

$55 < 25 + .20x$

$-25 \quad -25$

$30 < .2x$

$\frac{30}{.2} < \frac{.2x}{.2}$ $\quad 150 < x$

Enterprise is less expensive at mileage greater than 150 miles

13. Paula raised $325 for her softball team's fundraiser. She wants to raise at least $605. How much more money Paula must raise to reach her goal?

$325 + x \geq 605$

$-325 \quad -325$

$x \geq 280$

Paula must raise at least $280 more.

14. The average of Jim's two test scores must be at least 90 to make an A in the class. Jim got a 95 on his first test. What grades can Jim get on his second test to make an A in the class?

$2 \cdot \frac{95+x}{2} \geq 90.2$

$95+x \geq 180$

$-95 \quad -95$

$x \geq 85$

Jim must get a score of 85 or higher to get an A.

15. The USA Today charges a fee of $650 plus $80/wk to run an ad. The Grand Rapids Press charges $145/wk. For how many weeks will the total cost at the USA Today be less expensive than the cost at the Grand Rapids Press?

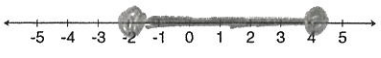
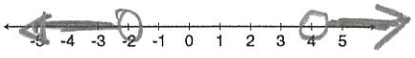
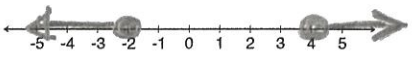
16. Henry has a job paying $31,000 and expects to receive a $1500 raise each year. Larry has a job paying $18,000 and expects to receive a $2500 raise each year. For how long will Larry be making more money than Henry?

Chapter 5 Lesson #2 (3-6)

Objective: Understand and able to work with compound inequalities.

Vocabulary:

(A) Compound Inequalities - inequality formed by joining 2 inequalities with "and" / "or"

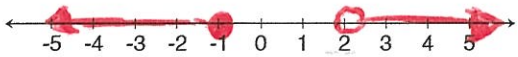
Words	Algebra	Graph
ℝ greater than -2 AND less than 4. (set of values)	$x > -2$ and $x < 4$ $-2 < x < 4$	
ℝ greater than or equal to -2 AND less than or equal to 4.	$x \geq -2$ and $x \leq 4$ $-2 \leq x \leq 4$	
ℝ less than -2 OR greater than 4.	$x < -2$ or $x > 4$	
ℝ less than or equal to -2 OR greater than or equal to 4.	$x \leq -2$ or $x \geq 4$	

Examples: In #1-4, graph the compound inequality.

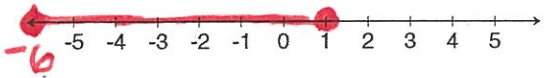
"and"

1. $-3 < x \leq 4$

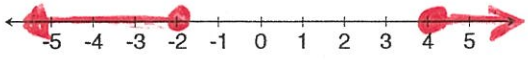
2. $x \leq -1$ OR $x > 2$



3. $-6 \leq x \leq 1$

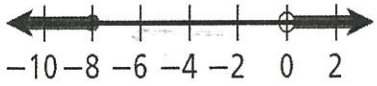


4. $x \leq -2$ OR $x \geq 4$



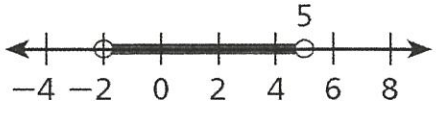
#5-8, write the compound inequality shown by the graph.

5.



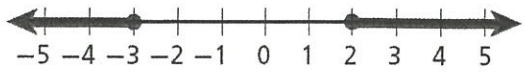
$x \leq -8$ OR $x > 0$

6.



$-2 < x < 5$

7. 

8. 

9. A local company is hiring trainees with less than 1 year of experience or managers with 5 or more years of experience. Write a compound inequality that represents this situation.

$x < 1$ OR $x \geq 5$

10. The free chlorine in a pool should be between 1.0 and 3.0 parts per million inclusive. Write a compound inequality to show that the levels are within this range.

"inclusive" = "includes"

$1 \leq x \leq 3$

Vocabulary:

(B) Intersection - "and"; shows #'s that are solutions of both inequalities

(C) Union - "OR"; shows #'s that are solutions of either inequality

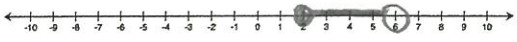
In #11-14, solve each compound inequality and graph the solutions. Tell whether each one is an intersection or union.

11. $4 \leq x+2 < 8$

$-2 \quad -2 \quad -2$

$2 \leq x < 6$

intersection



12. $-4+a > 1$ OR $-4+a < -3$

$+4 \quad +4 \qquad +4 \quad +4$

$a > 5 \qquad a < 1$

$a > 5$ OR $a < 1$

union

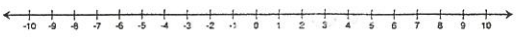
13. $8 < 3x-1 \leq 11$

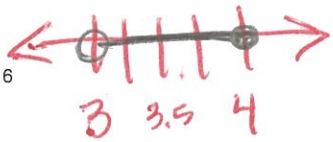
$+1 \quad +1 \quad +1$

$\frac{9}{3} < \frac{3x}{3} \leq \frac{12}{3}$

$3 < x \leq 4$

intersection





14. $2x \leq 6$ OR $3x > 12$

$\frac{2x}{2} \leq \frac{6}{2} \qquad \frac{3x}{3} > \frac{12}{3}$

$x \leq 3$ OR $x > 4$

union

Chapter 5 Lesson #3 (not in textbook)

Objective: Understand and able to work with absolute value inequalities.

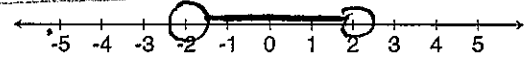
Vocabulary:

(A) Absolute Value Inequalities an inequality that contains an absolute value expression

1. Solve and graph $|x|<2$.

$x<2$
$x>-2$

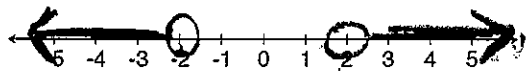
$-2<x<2$



2. Solve and graph $|x|>2$.

any value less than -2 and greater than 2

$x<-2$ OR $x>2$



"and" "between" "intersection"

To solve $|ax+b|<c$ for $c>0$, solve the compound inequality

$ax+b>-c$ and $ax+b<c$. $-c<ax+b<c$

To solve $|ax+b|>c$ for $c>0$, solve the compound inequality

"OR" "union" "beyond"

$ax+b<-c$ or $ax+b>c$.

#3-10, solve each inequality. Graph each solution if possible.

"and"

3. $|x+7|\leq 2$

$x+7\leq 2$ and $x+7\geq -2$

$-7\ \ -7$ $\quad -7\ \ -7$

$x\leq -5$ $\quad x\geq -9$

$-2\leq x+7\leq 2$

$-7\ \ -7\ \ -7$

$-9\leq x\leq -5$

4. $|8x-11|<5$

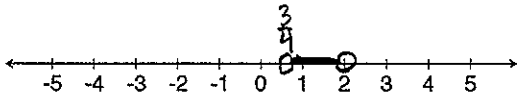
$-5<8x-11<5$

$+11\ \ +11\ \ +11$

$6<8x<16$

$\frac{6}{8}<\frac{8x}{8}<\frac{16}{8}$

$\frac{3}{4}<x<2$



"and"

5. $|k-1|<-1$

NO Solutions

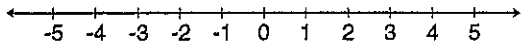
6. $|2w-1|<11$

$-11 < 2w-1 < 11$

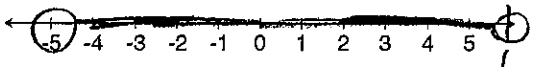
$+1 \quad +1 \quad +1$

$\frac{-10}{2} < \frac{2w}{2} < \frac{12}{2}$

$\boxed{-5 < w < 6}$



"OR"



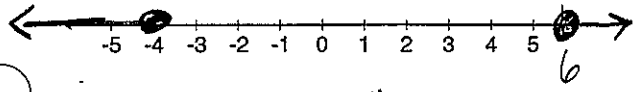
"OR"

7. $|c-1| \geq 5$

$c-1 \geq 5$ OR $c-1 \leq -5$

$+1 \quad +1 \qquad +1 \quad +1$

$\boxed{c \geq 6 \text{ OR } c \leq -4}$



"OR"

8. $|10-m| \geq -2$

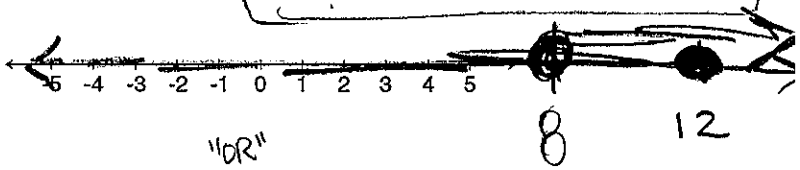
$10-m \geq -2$ OR $10-m \leq 2$

$-10 \quad -10 \qquad -10 \quad -10$

$-m \geq -12 \qquad -m \leq -8$

$\boxed{m \leq 12 \text{ OR } m \geq 8}$

all real numbers



"OR"

9. $4|2x-5|+1 > 21$

$-1 \quad -1$

$\frac{4|2x-5|}{4} > \frac{20}{4}$

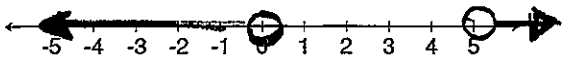
$|2x-5| > 5$

$2x-5 > 5$ OR $2x-5 < -5$

$+5 \quad +5 \qquad +5 \quad +5$

$2x > 10 \qquad 2x < 0$

$\boxed{x > 5 \text{ OR } x < 0}$



10. $3|d+1|-7 \geq -1$

$+7 \quad +7$

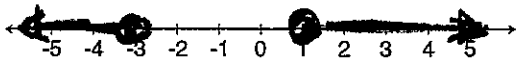
$\frac{3|d+1|}{3} \geq \frac{6}{3}$

$|d+1| \geq 2$

$d+1 \geq 2$ OR $d+1 \leq -2$

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

$\boxed{d \geq 1 \text{ OR } d \leq -3}$



11. The normal body temperature of a camel is 37° C. This temperature varies by up to 3°C throughout the day. Write and solve an absolute value inequality that represents the range of normal body temperatures (in degree Celsius) of a camel throughout the day.

"and" $|x-37| \leq 3$

$-3 \leq x-37 \leq 3$

$+37 \quad +37 \quad +37$

$34 \leq x \leq 40$

the normal body temperature of a camel is at least 34°C but no more than 40°C.

*Show "Shade It" video

Chapter 5 Lesson #4 (6-5)

Objective: Graphing Linear Inequalities on a Coordinate Plane.

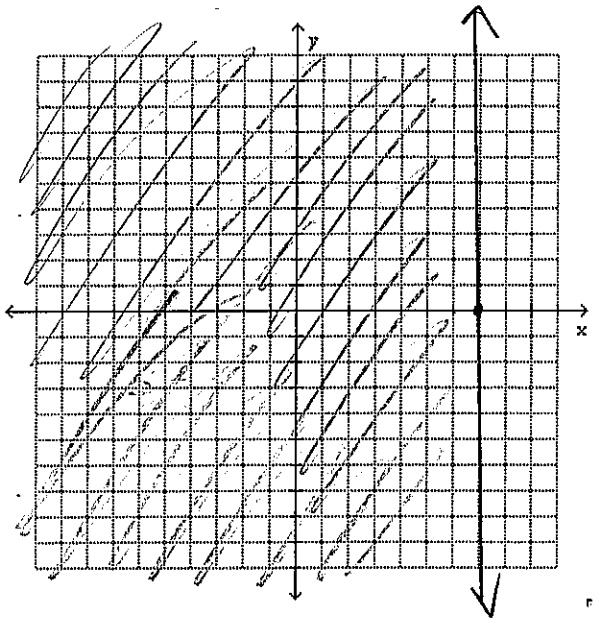
1. Is (4,5) a solution to $y \le x+1$? $5 \le 4+1$ yes

2. Is (1,1) a solution to $y > x+7$? $1 > 1+7$ N

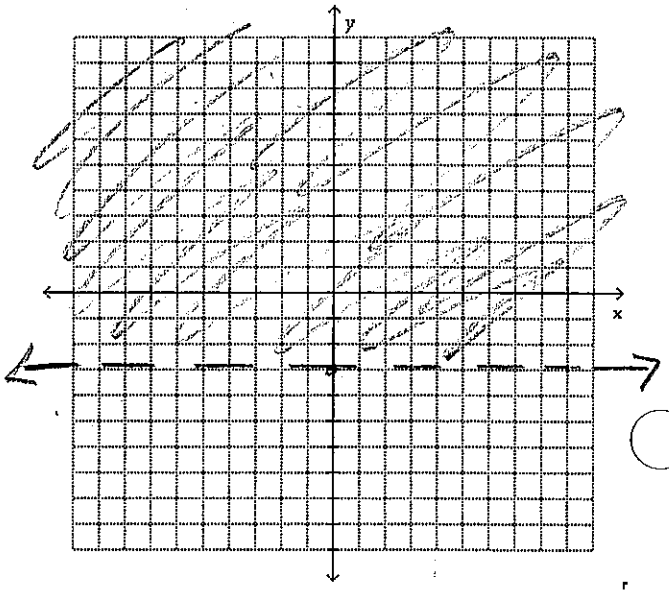
Graphing: $>$ or $<$ dashed line $\ge$ or $\le$ solid line "Boundary Line" "shading shows the solutions"

#3-8, Graph each inequality.

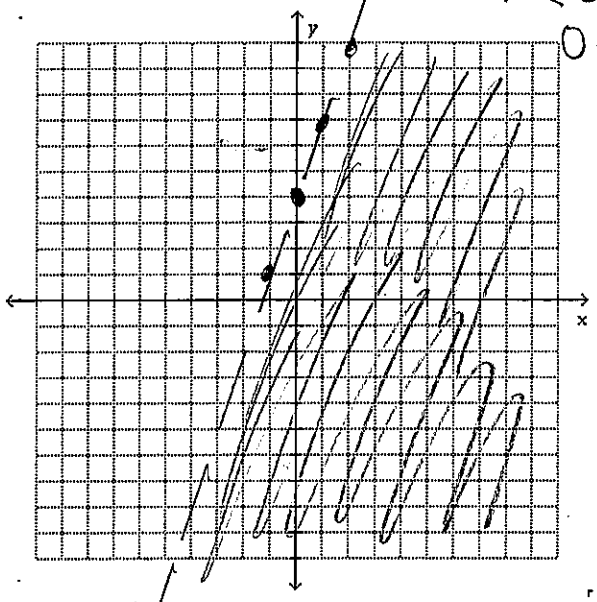
3. $x \le 7$



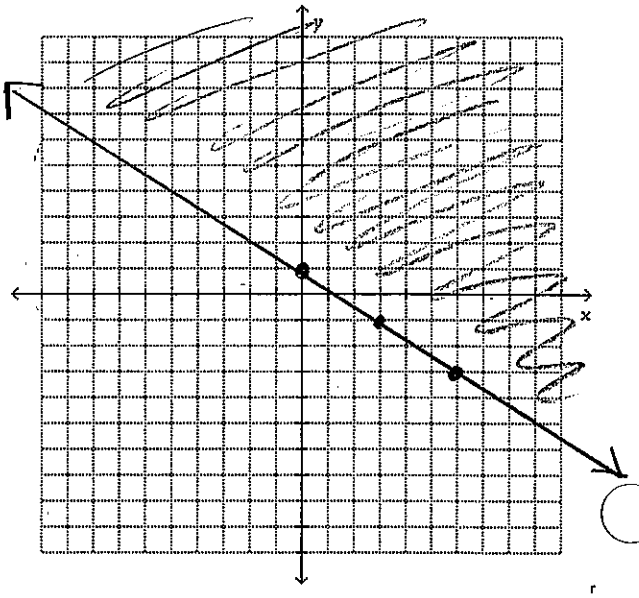
4. $y > -3$



5. $y < 3x+4$ Test (0,0) Is $0 < 3(0)+4$ $0 < 4$ yes! Shade (0,0)



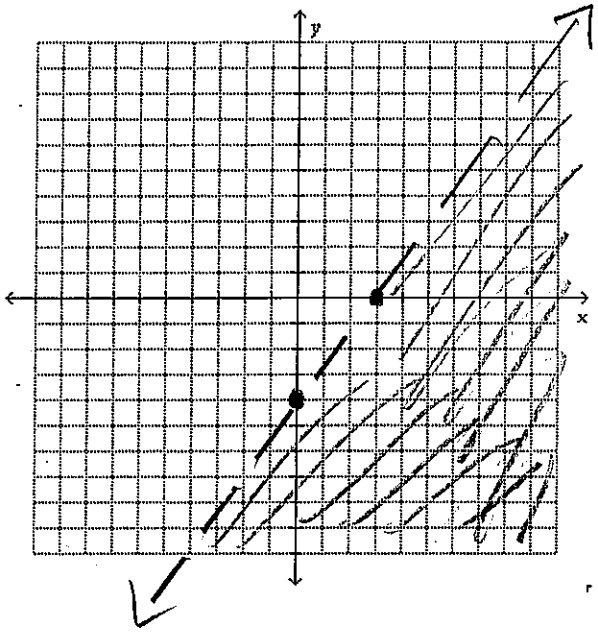
6. $y \ge -\frac{2}{3}x+1$? $0 \ge 1$? NO



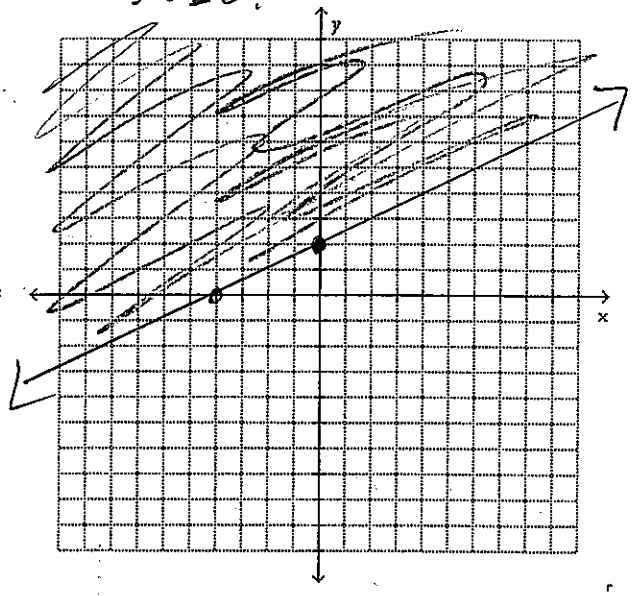
(0,-4) (3,0)

(0,2) (-4,0)

7. $4x-3y>12$ Is $0>12$? NO

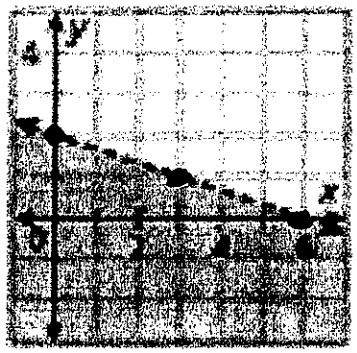


8. $-2x+4y\geq 8$
Is $0\geq 8$? NO

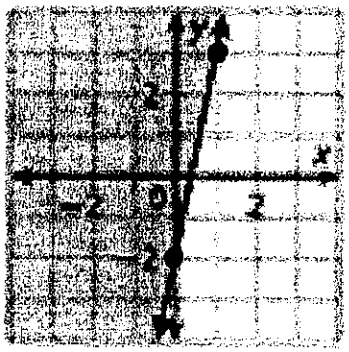


#9-12, write inequalities to represent the given graphs.

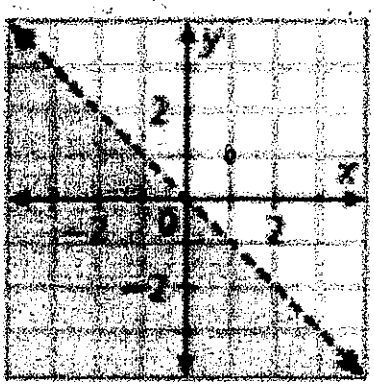
9. $y<-\frac{1}{3}x+2$



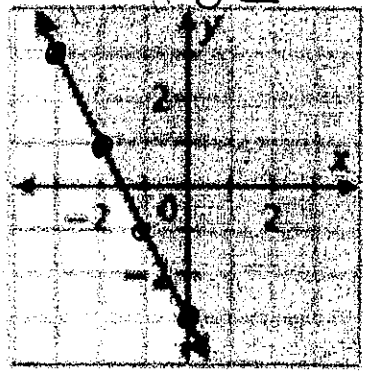
10. $y\geq 5x-2$



11. $y?-x$
$0?1$
test a pt in shaded
$(-1,0)$
$y<-x$



12. $y\geq 2x-3$



13. Dave is going to bring two types of candy to a meeting and can spend no more than $6. Gummy worms cost $3 per pound and jelly beans cost $2.50 per pound.

a. Write an inequality to represent this situation.

X = amount of G. worms

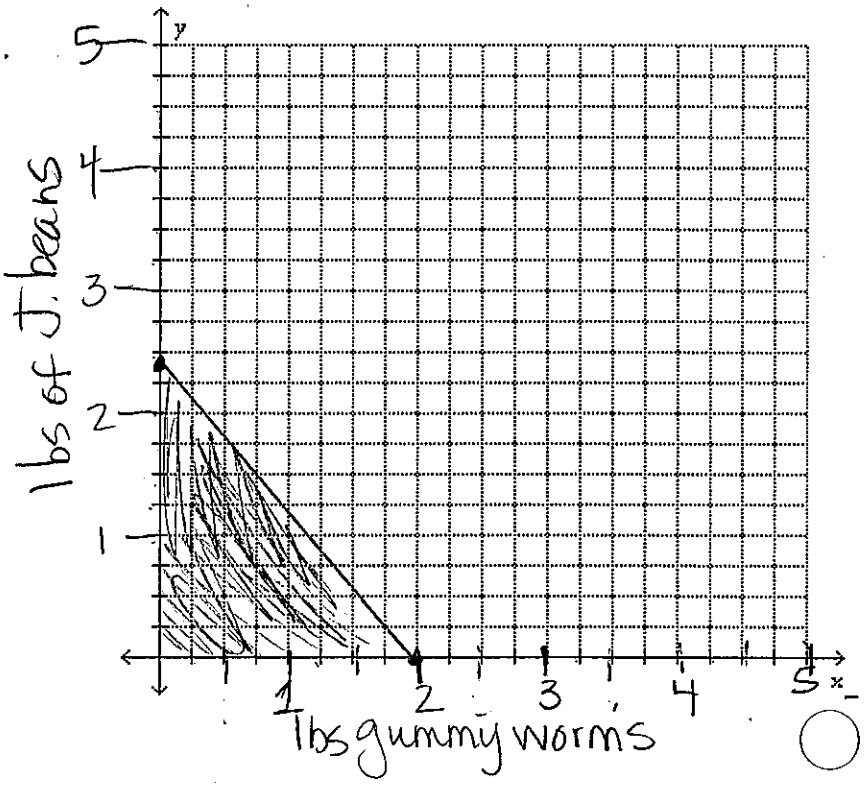
y = amount of J. Beans

$3x + 2.5y \leq 6$

b. Graph the inequality.

(2, 0)

(0, 2.4)



c. Give two combinations of candy that Dave could buy.

(1 lb of gummy worms w/ ½ lb, Jelly Beans)

(½ lb gummy worms and ½ lb jelly beans

$3x + 2.5y = 6$

$2.5y = -3x + 6$

$y = -1.2x + 2.4$

$y = -\frac{6}{5}x + 2.4$

Chapter 5 Lesson #5 (6-6)

Objective: Graphing More Linear Inequalities on a Coordinate Plane.

1. Is (2,1) a solution to $\begin{cases} y < -x+4 \\ y \le x+1 \end{cases}$?

$1 < -2+4$ yes
$1 \le 2+1$ yes

yes

2. Is (-6,8) a solution to $\begin{cases} y > -x+1 \\ y > x-1 \end{cases}$?

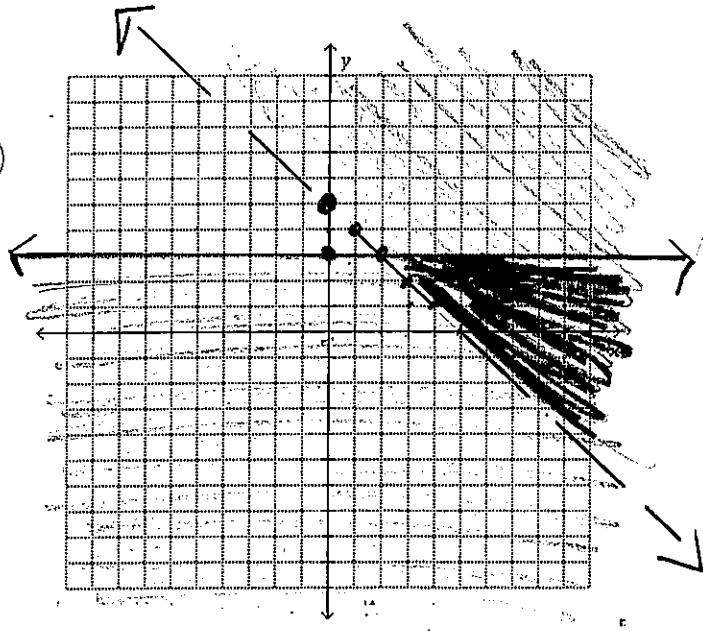
$8 > 6+1$ yes
$8 \ge 6-1$

yes

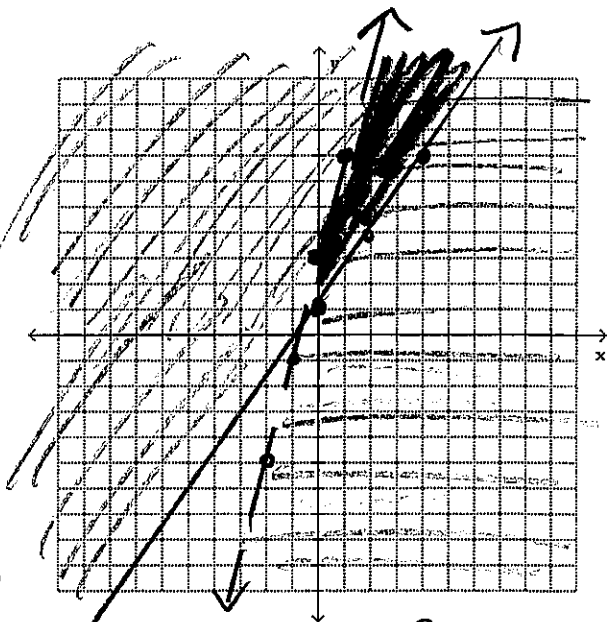
*graph 1 line then shade
*graph & shade 2nd line
Double shaded area is the solution set.

In #3-6, (a) Graph the system, and (b) darken the solution area.

3. $\begin{cases} y \le 3 \\ y > -x+5 \end{cases}$



4. $\begin{cases} -3x+2y \ge 2 \\ y < 4x+3 \end{cases}$



$-3x+2y \ge 2$
$+3x \quad +3x$

$\frac{2y}{2} \ge \frac{3x+2}{2}$

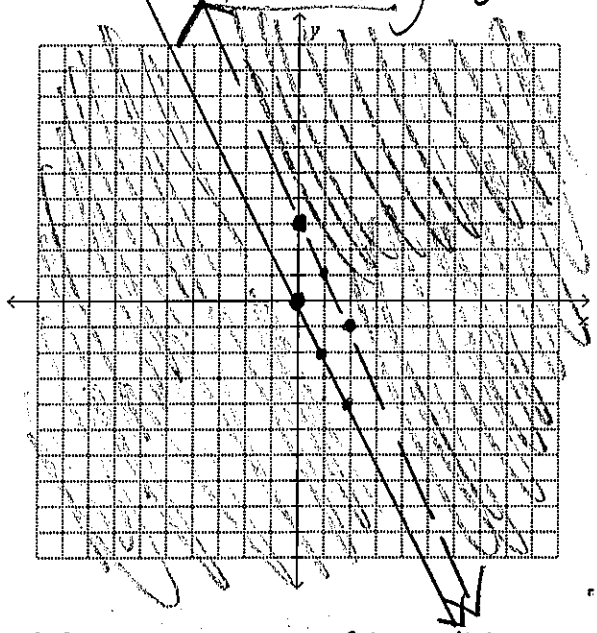
$y \ge \frac{3}{2}x + 1$

NO Solution (1, 1) $2+1 \leq 0$? NO $3 \leq 0$

5. $\begin{cases} y \geq -2x+3 \\ 2x+y \leq 0 \end{cases}$

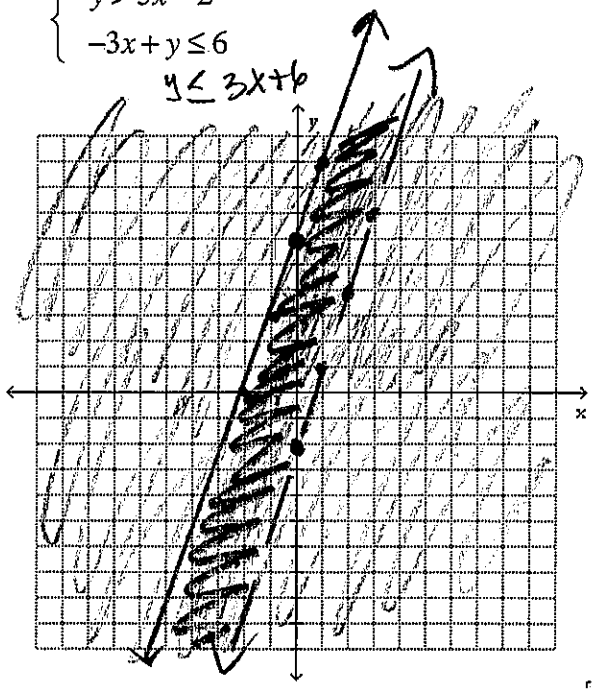
$-2x \quad -2x$

$y \leq -2x$



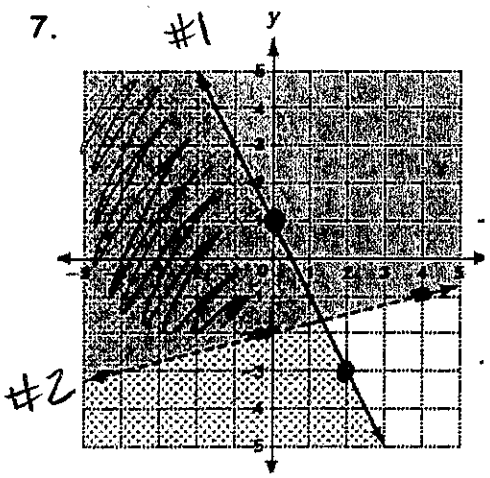
6. $\begin{cases} y > 3x-2 \\ -3x+y \leq 6 \end{cases}$

$y \leq 3x+6$



#7 & 8, write a system of inequalities to represent the graphs.

7.

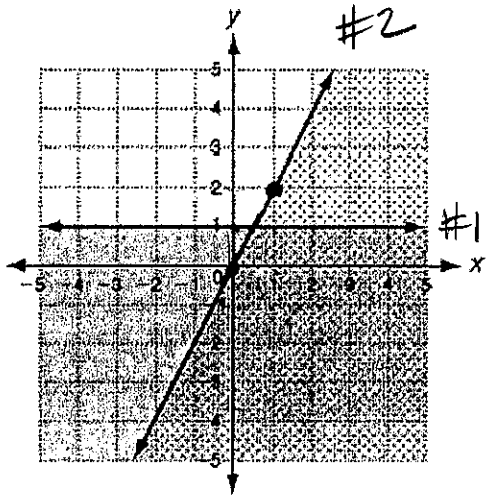


$\begin{cases} y \boxed{\leq} -2x+1 \\ y \boxed{>} \frac{1}{4}x-2 \end{cases}$

$0 \boxed{\geq} -2$

thinking

8.



$\begin{cases} y \boxed{\leq} 1 \\ y \boxed{\leq} 2x \end{cases}$

$(1, 0)$

$0 \boxed{?} 2(1)$

$0 \leq 2$

x = # dolls y = # trains

9. Ryan has at most \$150 to spend on restocking dolls and trains at his toy store. Dolls cost \$7.50 and trains cost \$5.00. Ryan needs no more than 10 trains and he needs at least 8 dolls.

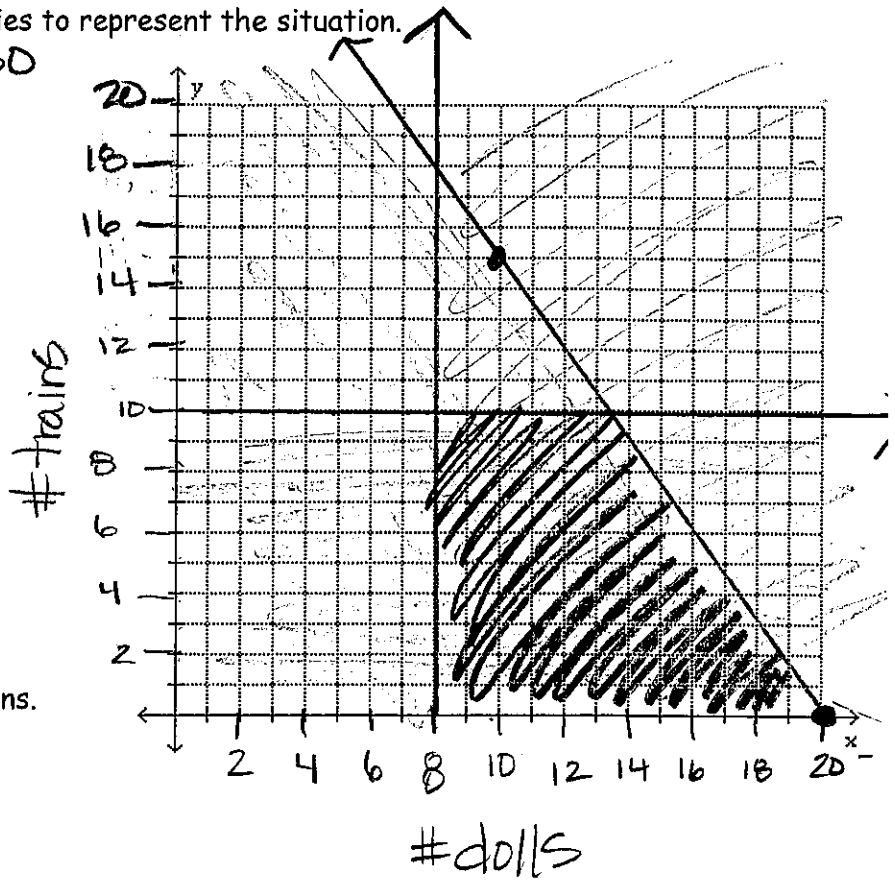
a. Write a system of inequalities to represent the situation.

$7.5x + 5y \leq 150$

$y \leq 10$

$x \geq 8$

b. Graph the inequalities.



c. List two possible combinations.

(20, 0) (10, 15)