Name: Key	Date:
Topic:	Class:

Main Ideas/Questions	Notes/Examples

Linear Inequalities

A **linear inequality** is similar to a linear equation, however with an inequality symbol instead.

Example: Given $y \geq -2x + 9$, determine which points satisfy the inequality:

a) (7, 4)

$4 \geq -2(7) + 9$

$4 \geq -14 + 9$

$4 \geq -5$ ✓ yes!

b) (-1, 3)

$3 \geq -2(-1) + 9$

$3 \geq 2 + 9$

$3 \geq 11$ × No!

c) (10, -5)

$-5 \geq -2(10) + 9$

$-5 \geq -20 + 9$

$-5 \geq -11$ ✓ yes!

Real World Example

John sells t-shirts. Plain shirts cost $5 and graphic shirts cost $7. In order to match his product costs, he must make at least $1,200.

a) Write an inequality to represent this situation.

$5p + 7g \geq 1200$

b) If he sells 150 plain shirts and 60 graphic shirts, will he be able to cover the product costs?

$5(150) + 7(60) \geq 1200$

$750 + 420 \geq 1200$

$1170 \geq 1200$ No!

c) If he sells 90 graphic shirts, what's the minimum number of plain shirts he must sell to break even?

$5p + 7(90) = 1200$

$5p + 630 = 1200$

$5p = 570$

$p = 114$

Graphing Linear Inequalities

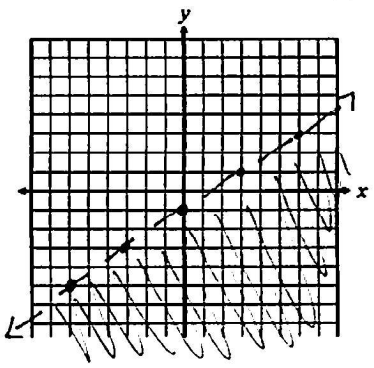
Graphing linear inequalities in a visual way of showing the ordered pairs that satisfy the inequality.

①	Put the inequality in **SLOPE-INTERCEPT FORM.** Be sure to flip the inequality if you multiply or divide by a negative.
②	**GRAPH** the line. Use a dashed line for < and > symbols and a solid line for ≤ and ≥ symbols.
③	**SHADE** above the line for > or ≥ symbols and below the line for < or ≤ symbols.

Directions: Graph each linear inequality.

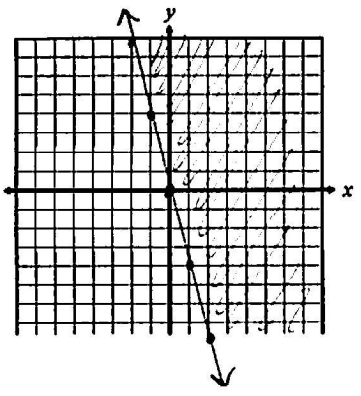
1. $y < \frac{2}{3}x - 1$

↑ dotted, below



2. $y \geq -4x$

↑ Solid, above



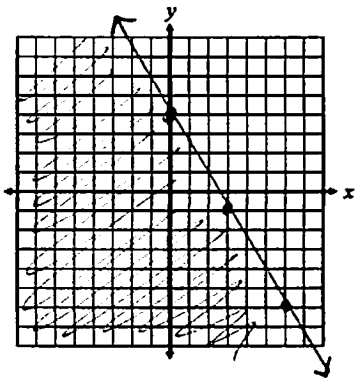
3. $5x+3y \leq 12$

$3y \leq -5x+12$

$y \leq -\frac{5}{3}x+4$

↑

Solid, below



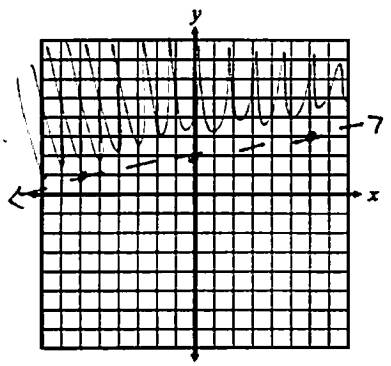
4. $x-6y<-12$

$-6y<-x-12$

$y>\frac{1}{6}x+2$

↑

dotted, above



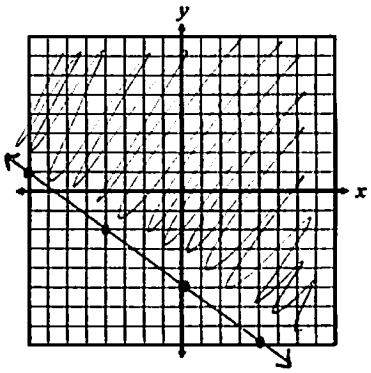
5. $9x+12y \geq -60$

$12y \geq -9x-60$

$y \geq -\frac{3}{4}x-5$

↑

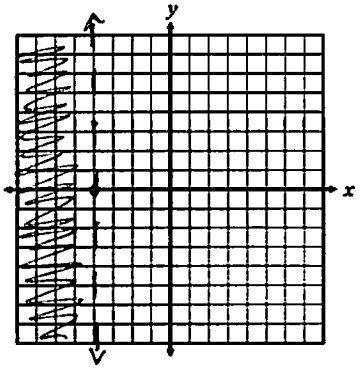
Solid, above



6. $x<-4$

↑

dotted, left



7. Stephanie spends \$0.10 per text message sent and \$0.25 per picture message sent on her cell phone. Her monthly budget for messaging is \$30.

a) Write a linear inequality to represent this situation, then graph.

$.10x+.25y \leq 30$

$.25y \leq -.10x+30$

$y \leq -0.4x+120$

$y \leq -\frac{2}{5}x+120$

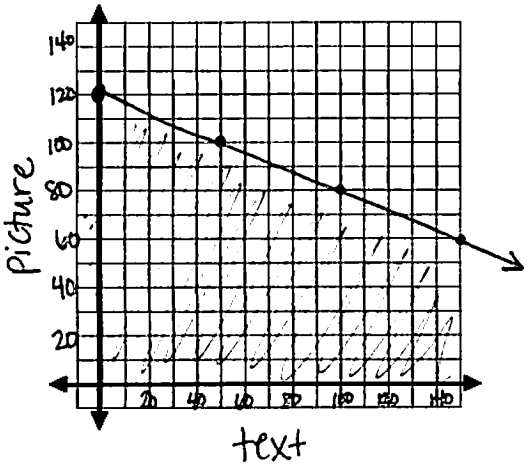
x = text

y = picture

b) Using your graph, give two possible combinations of text and picture messages she can send and stay within her budget. (Answers May Vary)

80 text + 40 picture

140 text + 10 picture



8. Scott makes \$12 per hour babysitting and \$8 per hour working at the grocery store. He will need to make at least \$600 to buy a new computer.

a) Write a linear inequality to represent this situation, then graph.

$12x+8y \geq 600$

$8y \geq -12x+600$

$y \geq -\frac{3}{2}x+75$

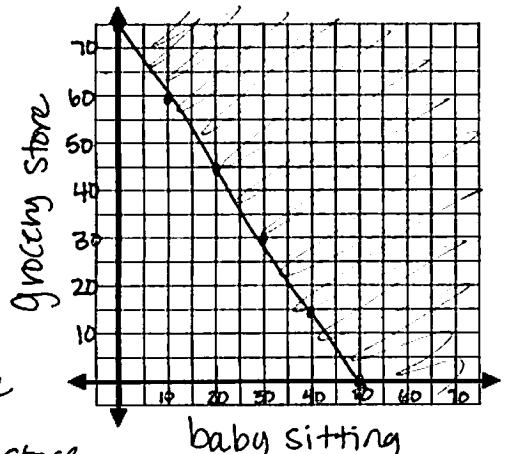
x = babysitting

y = grocery store

b) Using your graph, give two possible combinations of the number of hours Scott can babysit and work in the grocery store to ensure he can afford his new computer. (Answers may vary)

70 hours babysitting + 0 at grocery store

30 hours babysitting and 35 at grocery store.



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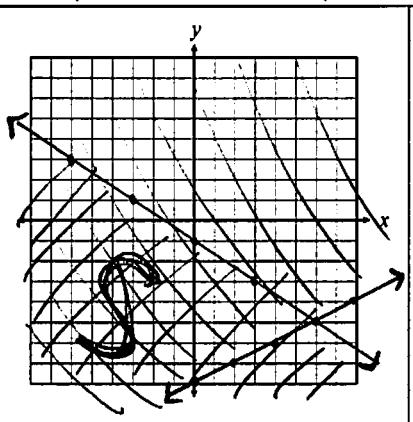
Main Ideas/Questions	Notes/Examples
Systems of Linear Inequalities	The **solution** to a system of linear inequalities is the **set of ordered pairs that satisfy ALL the linear inequalities.** The solution can be shown by graphing.
	① **GRAPH** and **SHADE** each linear inequality.
	② The **SOLUTION** to the system is where the **shading overlaps.**

Directions: Graph each system of linear inequalities. Clearly indicate the solution region.

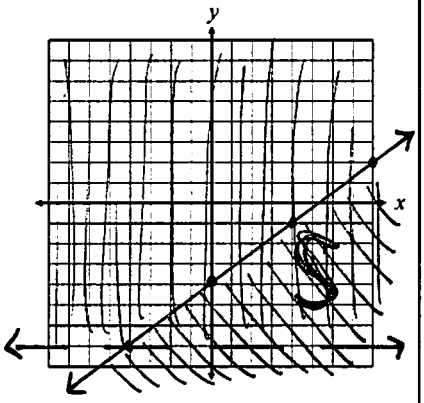
1. $y \le -\frac{2}{3}x - 1$

$y \ge \frac{1}{2}x - 8$



2. $y \le \frac{3}{4}x - 4$

$y > -7$



3. $x - y > 1$

$x + 4y > 20$

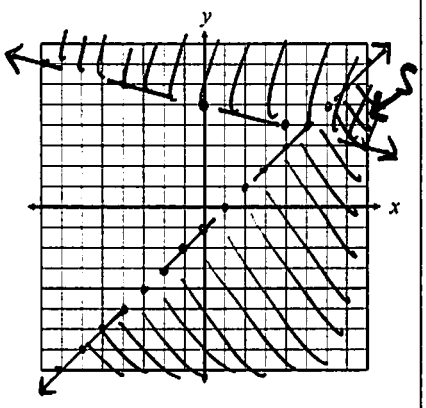
$-y > -x + 1$

$y < x - 1$

$x + 4y > 20$

$4y > -x + 20$

$y > -\frac{1}{4}x + 5$



4. $7x + 3y \le 18$

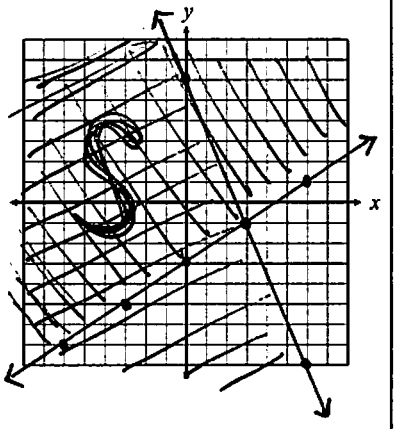
$2x - 3y \le 9$

$3y \le -7x + 18$

$y \le -\frac{7}{3}x + 6$

$-3y \le -2x + 9$

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



5. $x + 2y < -6$

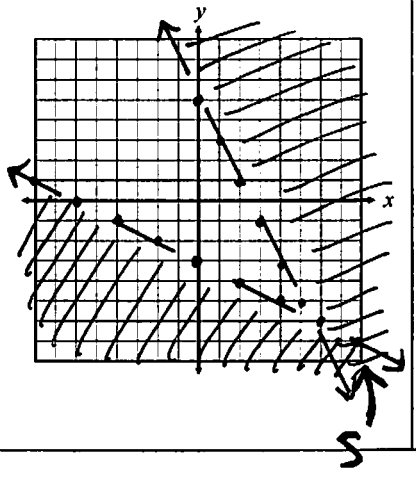
$-4x - 2y < -10$

$2y < -x - 6$

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

$-2y < 4x - 10$

$y > -2x + 5$

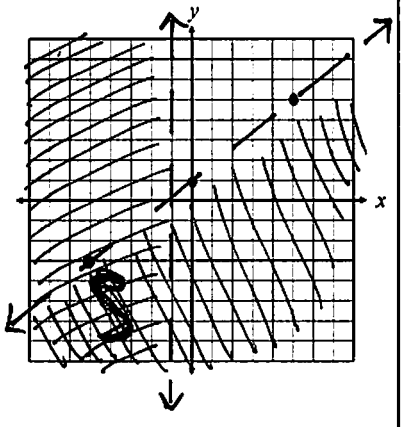


6. $4x - 5y > -5$

$x < -1$

$-5y > -4x - 5$

$y < \frac{4}{5}x + 1$



7. Which points are solutions to the system of inequalities below? Check all that apply.

$x - 6y > -48$

$2x + 3y < 9$

- ☒ (1, 1)
- ☐ (-2, 6)
- ☐ (9, -2)
- ☒ (-8, -3)
- ☐ (3, 4)
- ☒ (4, -7)

(1, 1)
$1 - 6 > -48$ yes
$2 + 3 < 9$ yes

(3, 4)
$3 - 24 > -48$ yes
$6 + 12 < 9$ no

(-8, -3)
$-8 + 18 > -48$ yes
$-16 - 9 < 9$ yes

(+9, -2)
$9 + 12 > -48$ yes
$18 - 6 < 9$ no

(-2, 6)
$-2 - 36 > -48$ yes
$-4 + 18 < 9$ no

(4, -7)
$4 + 42 > -48$ yes
$8 - 21 < 9$ yes

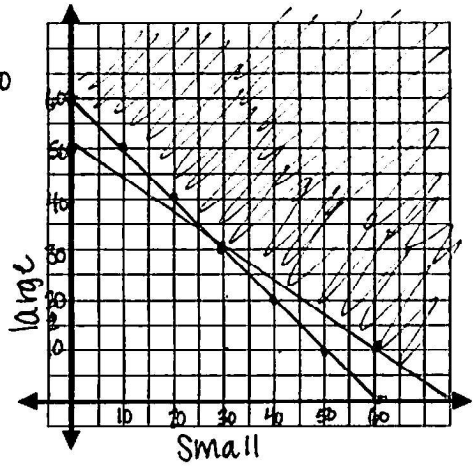
8. To raise money to attend Boy Scout camp, Alec is selling popcorn. Small bags of popcorn sell for $4 each and large bags sell for $6 each. He needs to earn at least $300 to attend camp. He will also earn a badge if he sells at least 60 bags total of any combination.

a) Write a system of linear inequalities to represent this situation, then graph.

x = Small bag
y = large bags

$4x + 6y \geq 300 \rightarrow y \geq -\frac{2}{3}x + 50$

$x + y \geq 60 \rightarrow y \geq -x + 60$



b) Using your graph, give two possible combinations of bags of popcorn that Alec can sell to attend camp and earn his badge.

(10, 60) - 10 small + 60 large bags

(50, 40) - 50 small + 40 large bags

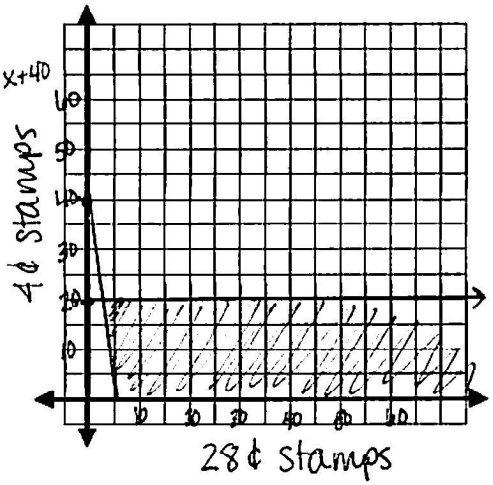
9. Greg needs at least $1.60 in stamps to mail a package. He has 28¢ and 4¢ stamps. He can use no more than twenty 4¢ stamps as he only has one book left.

a) Write a system of linear inequalities to represent this situation, then graph.

x = 28¢ stamps
y = 4¢ stamps

$.28x + .04y \geq 1.60 \rightarrow y \geq -7x + 40$

$y \leq 20$



b) Using your graph, give two possible combinations of stamps that Greg can use to ensure he mails his package with the corect postage.

(5, 15) = 5 - 28¢ stamps + 14 - 4¢ stamps

(20, 0) = 20 - 28¢ stamps