

Linear Functions and Systems Review

Name _____ Class _____

1 Candice cleans houses for x hours a week at a job that pays \$6 per hour. She also works a sales job for y hours that pays \$10 per hour. She needs to earn *at least* \$120 each week to pay her bills and she is able to work *no more than* 15 hours a week.

a) Write a system of inequalities that can be used to represent the situation.

$$6x + 10y \geq 120$$

$$x + y \leq 15$$

b) Graph these inequalities on the set of axes.

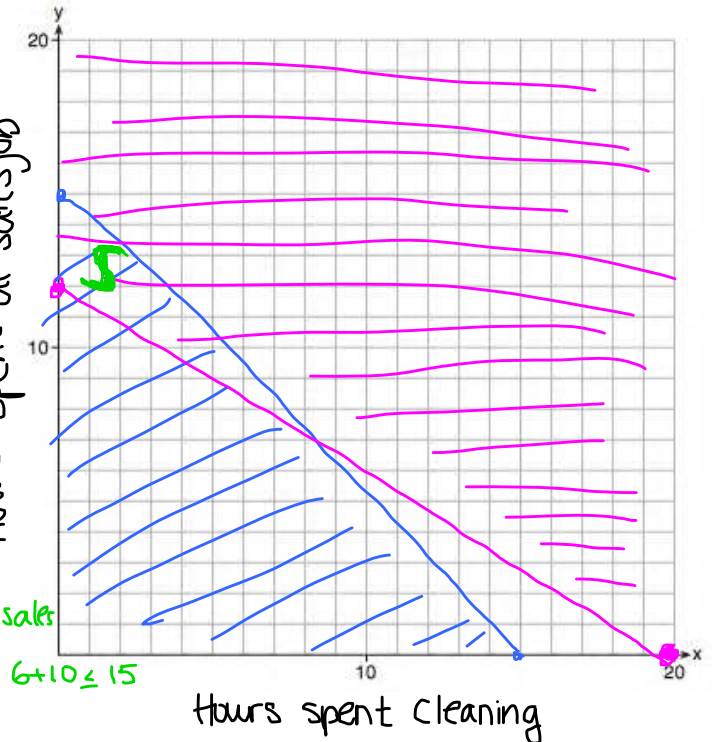


c) Determine and state one combination of hours that will allow Candice to earn *at least* \$120 per week while working *no more than* 15 hours.

Answers vary, but must be in the "S" section.

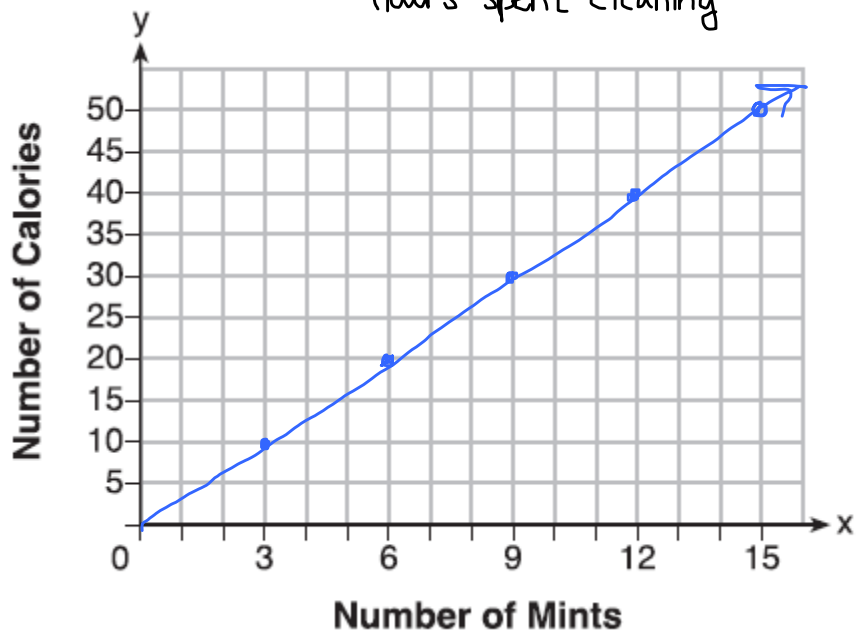
Example: 2 hours cleaning, 12 hours sales

$$2(6) + 12(10) = 12 + 120 = 132 \geq 120 \checkmark$$



2 Max purchased a box of green tea mints. The nutrition label on the box stated that a serving of three mints contains a total of 10 Calories.

a) On the axes to the right, graph the function, C , where $C(x)$ represents the number of Calories in x mints.



b) Write an equation that represents $C(x)$.

$$C(x) = \frac{10}{3}x$$

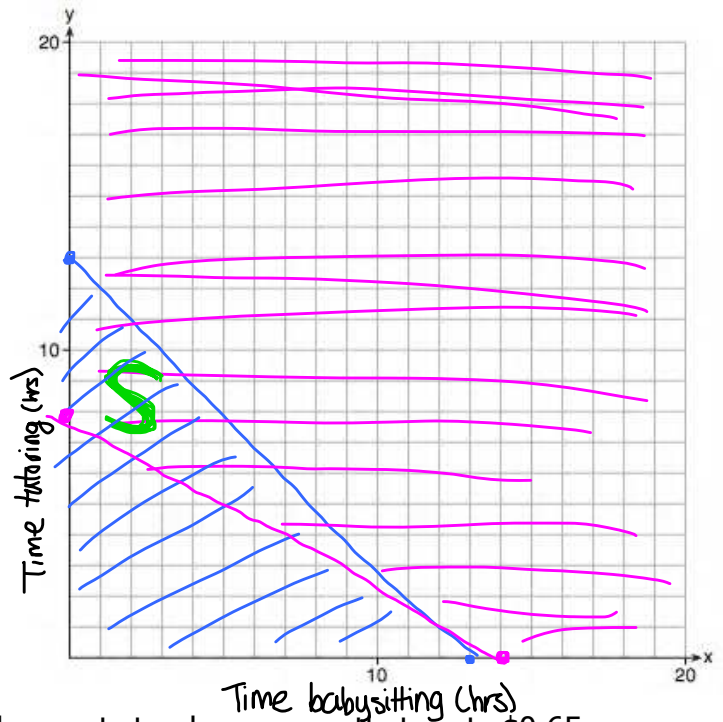
c) A full box of mints contains 180 Calories. Use the equation to determine the total number of mints in the box.

$$\left. \begin{array}{l} C(x) = 180 \\ C(x) = \frac{10}{3}x \end{array} \right\} \begin{array}{l} 180 = \frac{10}{3}x \\ \text{Multiply both sides by 3.} \\ 540 = 10x \\ \boxed{54 \text{ mints} = x} \end{array}$$

3 Emily babysits for \$4 per hour. She also works as a tutor for \$7 per hour. She is only allowed to work 13 hours per week. She wants to make at least \$65. Write and graph a system of inequalities to represent this situation.

a) Write and graph a system of inequalities to represent this situation.

$$\begin{aligned} x &= \# \text{ of hrs. babysitting} \\ y &= \# \text{ of hrs. tutoring} \end{aligned} \quad \begin{cases} 4x + 7y \geq 65 \\ x + y \leq 13 \end{cases}$$



b) What is a possible combination of hours you can work at each job? Justify your answer.

Answers vary
Ex: 2 hrs. babysitting, 9 hrs. tutoring
Justification:

$$\begin{aligned} 4x + 7y &\geq 65 & x + y &\leq 13 \\ 4(2) + 7(9) &\geq 65 & 2 + 9 &\leq 13 \\ 8 + 63 &\geq 65 \rightarrow 71 \geq 65 \checkmark & 11 &\leq 13 \checkmark \end{aligned}$$

4 Chelsea has \$45 to spend at the fair. She spends \$20 on admission and \$15 on snacks. She wants to play a game that costs \$0.65 per game. Write an inequality to find the maximum number of times, x , Chelsea can play the game.

$$20 + 15 + 0.65x \leq 45$$

Using this inequality, determine the maximum number of times she can play the game.

$$\begin{aligned} 35 + 0.65x &\leq 45 \\ 0.65x &\leq 10 \\ x &\leq 15 \frac{2}{13} - \text{less than} \\ &\boxed{15 \text{ games}} \end{aligned}$$

5 Donna wants to make trail mix made up of almonds, walnuts and raisins. She wants to mix one part almonds, two parts walnuts, and three parts raisins. Almonds cost \$12 per pound, walnuts cost \$9 per pound, and raisins cost \$5 per pound. (SS5 - AUI)

Donna has \$15 to spend on the trail mix. Determine how many pounds of trail mix she can make. [Only an algebraic solution can receive full credit.]

Let weight of almonds = x
Let weight of walnuts = $2x$
Let weight of raisins = $3x$
(How much you pay is cost/lb. times weight)

$$\underbrace{12(1x)}_{\text{Almonds}} + \underbrace{9(2x)}_{\text{Walnuts}} + \underbrace{5(3x)}_{\text{Raisins}} = \underbrace{15}_{\text{Total}}$$

$$\begin{aligned} 12x + 18x + 15x &= 15 \\ 45x &= 15 \\ x &= \frac{1}{3} \text{ lb.} \end{aligned} \quad \begin{cases} \text{Almonds} = 1x = 1(\frac{1}{3}) = \frac{1}{3} \text{ lb.} \\ \text{Walnuts} = 2x = 2(\frac{1}{3}) = \frac{2}{3} \text{ lb.} \\ \text{Raisins} = 3x = 3(\frac{1}{3}) = 1 \text{ lb.} \end{cases} \quad \frac{1}{3} + \frac{2}{3} + 1 = \boxed{2 \text{ lb.}}$$

- 6 The cost of 3 markers and 2 pencils is \$1.80. The cost of 4 markers and 6 pencils is \$2.90.

What is the cost of each item? Include appropriate units in your answer.

Let cost of marker = m
 Let cost of pen = p

$$\begin{cases} 3m + 2p = 1.80 \\ 4m + 6p = 2.9 \end{cases} \xrightarrow{\text{elimination}} \begin{cases} 3(3m + 2p = 1.8) \rightarrow -9m - 6p = -5.4 \\ 4m + 6p = 2.9 \end{cases} \rightarrow \begin{array}{r} -5m = -2.5 \\ m = 0.50 \end{array}$$

It costs 15¢/pen and 50¢/marker

$\begin{cases} 3m + 2p = 1.8 \\ 3(0.5) + 2p = 1.8 \\ 1.5 + 2p = 1.8 \\ 2p = 0.3 \rightarrow p = \$0.15 \end{cases}$

- 7 A high school drama club is putting on their annual theater production. There is a maximum of 800 tickets for the show. The costs of the tickets are \$6 before the day of the show and \$9 on the day of the show. To meet the expenses of the show, the club must sell at least \$5,000 worth of tickets.

a) Write a system of inequalities that represent this situation.

of tickets before = x
 # of tickets day of show = y

$$\begin{cases} 6x + 9y \geq 5000 \\ x + y \leq 800 \end{cases}$$

- b) The club sells 440 tickets before the day of the show. Is it possible to sell enough additional tickets on the day of the show to at least meet the expenses of the show? Justify your answer.

answer: $6(440) + 9y \geq 5000$
 $2640 + 9y \geq 5000$
 $9y \geq 2360$
 $y \geq 262.\bar{2}$

→ minimum # of tickets to meet expenses is 263.

$x + y \leq 800$
 $440 + 263 \leq 860$
 $703 \leq 800$

Still satisfies the limit on # of tickets, so yes!

- 8 Next weekend Katie wants to attend either carnival A or carnival B. Carnival A charges \$4 for admission and an additional \$1.25 per ride. Carnival B charges \$2.00 for admission and an additional \$1.75 per ride.

a) In function notation, write $A(x)$ to represent the total cost of attending carnival A and going on x rides. In function notation, write $B(x)$ to represent the total cost of attending carnival B and going on x rides.

$$\begin{aligned} A(x) &= 4 + 1.25x \\ B(x) &= 2 + 1.75x \end{aligned}$$

b) Determine the number of rides Katie can go on such that the total cost of attending each carnival is the same.

$$\begin{aligned} 4 + 1.25x &= 2 + 1.75x \\ -2 & \quad -2 \\ \hline 2 + 1.25x &= 1.75x \\ -1.25x & \quad -1.25x \\ \hline 2 &= 0.5x \\ \frac{2}{0.5} & \quad \frac{0.5}{0.5} \\ 4 &= x \end{aligned}$$

4 rides

c) Katie wants to go on five rides. Determine which carnival would have the lower total cost.

$$\begin{aligned} A(5) &= 4 + 1.25(5) = 4 + 6.25 = \$10.25 \\ B(5) &= 2 + 1.75(5) = 2 + 8.75 = \$10.75 \end{aligned}$$

9 Marsha is buying plants and soil for her garden. The soil costs \$4 per bag and the plants cost \$10 each. She wants to buy at least 5 plants and can spend no more than \$80.

a) Write and graph a system of inequalities to represent this situation.

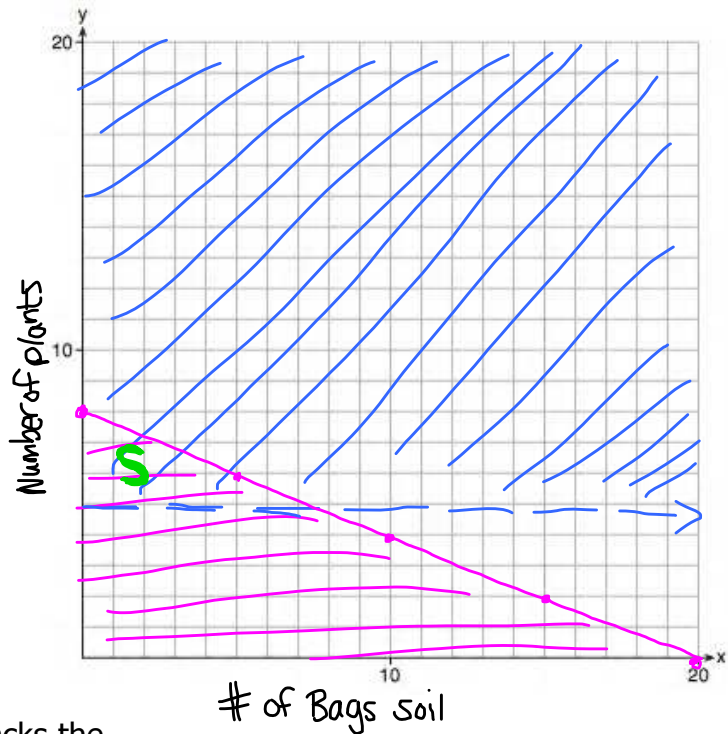
Let # of bags soil = x
Let # of plants = y

$$4x + 10y \leq 80$$

$$y > 5$$

$$10y \leq -4x + 80$$

$$y \leq -\frac{2}{5}x + 8$$



b) What is a possible combination of bags of soil and plants she can buy?

3 bags of soil & 6 plants

JUSTIFICATION:

$$4x + by \leq 80$$

$$4(3) + 6(6) \leq 80$$

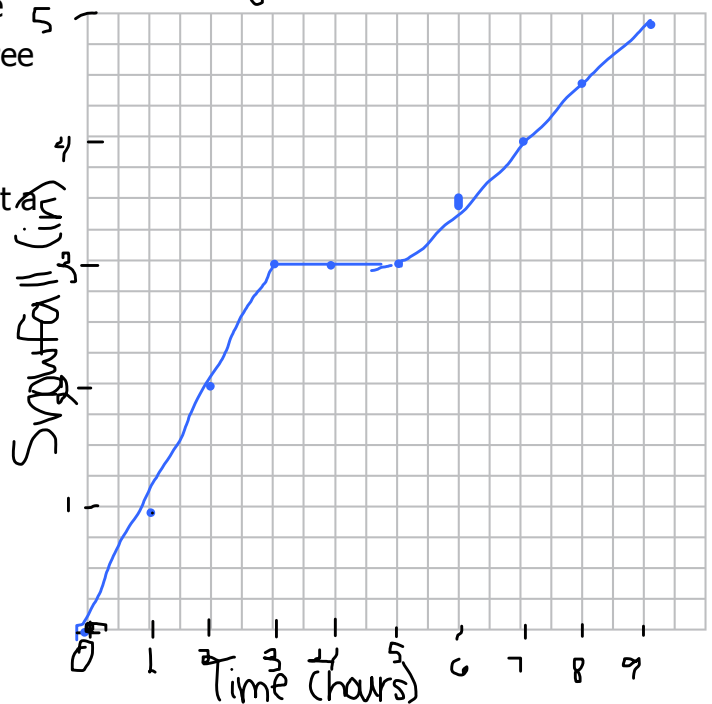
$$12 + 36 \leq 80 \rightarrow 48 \leq 80$$

$$y > 5$$

$$6 > 5$$

10 During a snowstorm, a meteorologist tracks the amount of accumulating snow. For the first three hours of the storm, the snow fell at a constant rate of one inch per hour. The storm then stopped for two hours and then started again at a constant rate of one-half inch per hour for the next four hours.

a) On the grid below, draw and label a graph that models the accumulation of snow over time using the data the meteorologist collected.



b) If the snowstorm started at 6 p.m., how much snow had accumulated by midnight?

$$t = 12 - 6 = 6 \text{ hrs.}$$

Look @ 6 hrs. on graph \rightarrow 3.5"

11 Which system of equations would have the same solution as the system shown?

$$x + 4y = 11$$

$$2x + 2y = 10$$

(1) $x + 4y = 11$
 $x + y = 10$

(2) $2x + 4y = 22$
 $2x + 2y = 10$

(3) $(3x + 12y = 33)$
 $(x + y = 5)$

(4) $x + 4y = 11$
 $2x + 2y = 10$

$3x + 12y = 22$
 $2x + 2y = 10$