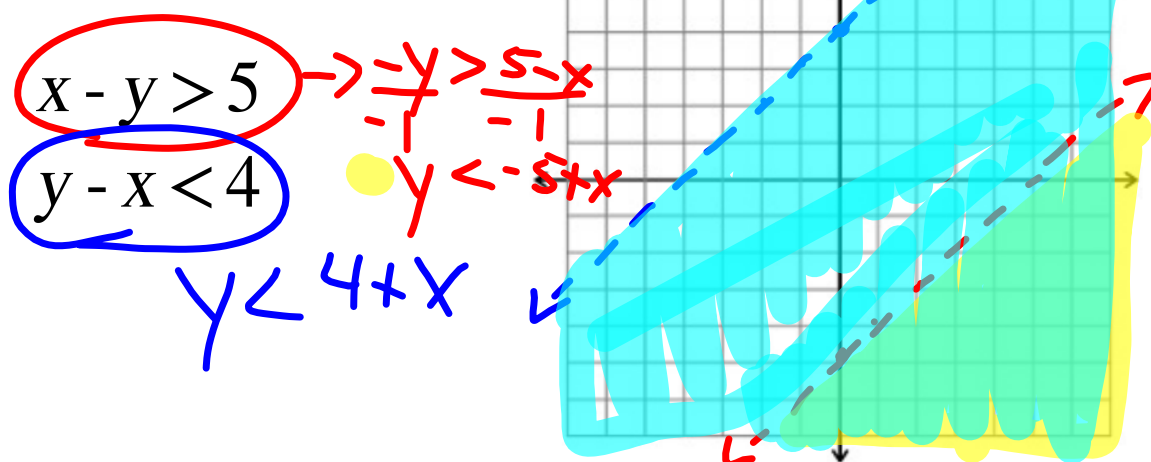


Warm Up (9/25/17)

Graph the solution set to the following system of linear inequalities:



Module 1: Lesson 24

Applications of Systems of Linear Equations and Inequalities

In this lesson we will use word problems to explore the possible applications of linear equations and inequalities.

You can use a number of strategies to help make sense of the problem. This includes "guess and check", making a table, drawing a picture of the situation (if it applies), or algebraically.

Key Words to look out for:

Addition:

add / plus
 sum
 total
 combine
 both
 and
 increased by

Multiplication:

times
 double/twice, triple, etc.
 multiple of
 per
 by
 each
 product of

Equality: =

equal to
 equals
 is
 the same as

Subtraction:

take away
 decrease by
 difference
 fewer
 remain
 left over

Division:

split
 cut up
 quotient
 separated
 out of
 half of

Inequality: < or >

at least
 at most
 no more than
 no less than
 not equal to

Keep Track of Variables and Constraints

Variable: The item or unknown we are solving for.

Constraint: These are limitations that are imposed on the variables. (These may not always show up in word problems)

Example 1

Joyce is setting up a bake sale to raise money for her drama club at school. She plans to sell baked goods for \$1.50 per item. She had also spent \$36 on baking ingredients and other supplies. How many baked goods must Joyce sell in order to make a profit?

→ multiply 1.5

-36 ←

equation > 0

Variable: $b \rightarrow$ baked goods sold

$$\begin{array}{r}
 1.5b - 36 > 0 \\
 \quad +36 \quad +36 \\
 \hline
 1.5b > 36 \\
 \quad \underline{1.5} \quad \underline{1.5} \\
 b > 24
 \end{array}$$

Joyce needs to sell at least 24 baked goods

Example 2:

In Lewis Carroll's *Through the Looking Glass*, Tweedledum says, "the sum of your weight and twice of mine is 361 pounds." Tweedledee says, "The sum of your weight and twice of mine is 362 pounds." Find both of their weights.



Variables

$X \rightarrow$ T. Dum's weight

$2X \rightarrow$ Twice T. Dum's weight

$Y \rightarrow$ T. Dee's weight

$2Y \rightarrow$ Twice T. Dee's weight

$$Y + 2x = 361$$

$$2y + x = 362$$

1st way: Substitution

$$X = 362 - 2y$$

$$Y + 2x = 361$$

$$Y + 2(362 - 2y) = 361$$

$$Y + 724 - 4y = 361$$

$$-3y + 724 = 361$$

$$\begin{array}{r} -724 \\ -724 \end{array}$$

$$\begin{array}{r} -3y = -363 \\ -3 \quad -3 \end{array}$$

$$Y = 121$$

Solve for x

$$\begin{array}{r} 121 + 2x = 361 \\ -121 \quad -121 \\ \hline 2x = 240 \end{array}$$

$$\frac{2x}{2} = \frac{240}{2}$$

$$X = 120$$

② Use Elimination

$$-2(y + 2x = 361)$$

$$2y + x = 362$$

$$-2y - 4x = -722$$

$$+ 2y + x = 362$$

$$\frac{-3x}{-3} = \frac{-360}{-3}$$

$$x = 120$$

Solve for y

$$\begin{array}{r} 2y + 120 = 362 \\ -120 \quad -120 \\ \hline \end{array}$$

$$\frac{2y}{2} = \frac{242}{2}$$

$$y = 121$$

*Note that a different method still yields the same answer.

(Put your answer in a sentence)

Tweedledee weighs 121 pounds and Tweedledum weighs 120 pounds.

Example 3

Pam has two part-time jobs. At one job, she works as a cashier and makes \$8 per hour. At her second job, she works as a tutor and makes \$12 per hour. One week she worked 30 hours and made \$268. How many hours did she spend at each job?

Variables

of hours cashier $\rightarrow x$
 # of hours tutor $\rightarrow y$
 makes as a cashier $\rightarrow 8x$
 money as a tutor $\rightarrow 12y$

total hours worked : 30
 total money made : 268

Use
 Substitution.

$$x + y = 30$$

$$8x + 12y = 268$$

$$x = \underline{30 - y}$$

$$8(30 - y) + 12y = 268$$

$$240 - 8y + 12y = 268$$

$$240 + 4y = 268$$

$$\begin{array}{r} 240 + 4y = 268 \\ -240 \quad -240 \\ \hline \end{array}$$

$$4y = 28$$

$$\frac{4y}{4} = \frac{28}{4}$$

$$y = 7$$

$$x = 23$$

Pam worked 23 hours as a cashier and 7 hours as a tutor.