

Math 115

Spring 2018

Lecture 6

$$\begin{array}{l} ? a^2 + b^2 = c^2 ? \\ y = mx + b \quad ? \quad d = rt \end{array}$$

Solving linear inequalities

$<$, \leq , $>$, \geq

Do everything like Solving linear equations

- Remove ()
- Clear fractions
- Variables on the LHS, numbers are on the RHS

when isolating the variable, Reverse the inequality whenever dividing or multiplying by a negative number.

Solve

$$\begin{array}{l} 2x - 5 < 13 \\ 2x < 13 + 5 \\ 2x < 18 \\ x < \frac{18}{2} \end{array}$$

$$x < 9$$

Solve

$$\begin{array}{l} x - 12 \leq 3x + 6 \\ x - 3x \leq 6 + 12 \\ -2x \leq 18 \\ \frac{-2}{-2} x \geq \frac{18}{-2} \end{array}$$

$$x \geq -9$$

Solve

$$2(x-3) - 4(x+3) \geq 0$$

$$2x - 6 - 4x - 12 \geq 0$$

$$-2x - 18 \geq 0$$

$$-2x \geq 18$$

$$\frac{-2}{-2}x \leq \frac{18}{-2}$$

$$x \leq -9$$

Solve

$$\frac{1}{4}(x+3) > \frac{1}{2}(x-4) + 2$$

LCD = 4

$$4 \cdot \frac{1}{4}(x+3) > 4 \cdot \frac{1}{2}(x-4) + 4 \cdot 2$$

$$1(x+3) > 2(x-4) + 8$$

$$x+3 > 2x-8+8$$

$$x-2x > -3$$

$$-x > -3$$

$$-1x \geq -3$$

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

$$x < 3$$

twice Some number

Subtracted from 10

exceeds

-20.

Find all such numbers. let x be such number,

$$10 - 2x > -20$$

$$-2x > -20 - 10$$

$$-2x > -30$$

$$\frac{-2}{-2}x < \frac{-30}{-2}$$

$$x < 15$$

All numbers less than 15.

3 times the sum of some number and 10 is at most

6 less than 5 times the number.

Find all such numbers. let x be such number

$$3(x + 10) \leq 5x - 6$$

$$3x + 30 \leq 5x - 6$$

$$3x - 5x \leq -6 - 30$$

$$-2x \leq -36$$

$$\frac{-2}{-2}x \geq \frac{-36}{-2}$$

$$x \geq 18$$

All numbers that are at least 18.

I have a \$100 budget for moving.
I can rent a truck for \$25/day and 30¢ per mile. If I need this truck for one day, how many miles can I drive it?

Total cost at most \$100.

$$25 + .30M \leq 100$$

$$.3M \leq 100 - 25$$

$$.3M \leq 75$$

$$M \leq \frac{75}{.3}$$

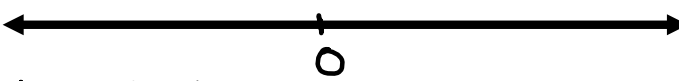
$$\rightarrow M \leq 250$$

at most
250
miles

How to write final ans for inequalities

1) Set-Builder Notation $\{x \mid \text{such that}\}$

2) Graphing on number line system



3) Interval notation: $(,)$, $[,]$, $(,]$, $[,)$

Solve $2(x-3) + 4 < 10$

$$2x - 6 + 4 < 10$$

$$2x - 2 < 10$$

$$2x < 10 + 2$$

$$2x < 12$$

$$x < \frac{12}{2}$$

$$x < 6$$

① Set-Builder Notation $\{x \mid x < 6\}$

② Graphing



③ Interval notation $(-\infty, 6)$

Solve

$$x - 8 \leq 3(x+1) - 7$$

$$x - 8 \leq 3x + 3 - 7$$

$$x - 8 \leq 3x - 4$$

$$x - 3x \leq -4 + 8$$

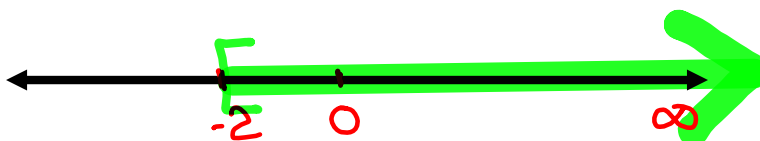
$$-2x \leq 4$$

$$\frac{-2}{-2}x \geq \frac{4}{-2}$$

$$x \geq -2$$

① S.B.N. $\{x | x \geq -2\}$

② Graphing



③ I.N. $[-2, \infty)$

Solve for y:

$$3x + 5y = -15$$

$$5y = -3x - 15$$

$$\frac{5}{5}y = \frac{-3}{5}x - \frac{15}{5}$$

$$y = -\frac{3}{5}x - 3$$

$$\cancel{12} \cdot \frac{2}{3}x - \cancel{12} \cdot \frac{1}{4}y = \cancel{12} \cdot \frac{5}{6}$$

$$8x - 3y = 10$$

$$-3y = -8x + 10$$

$$y = \frac{-8}{-3}x + \frac{10}{-3}$$

$$y = \frac{8}{3}x - \frac{10}{3}$$

Solve for y

$$\frac{2}{3}x - \frac{1}{4}y = \frac{5}{6}$$

Hint: Use LCD to
clear fractions
LCD = 12

what percent of 360 is 45?

$$\frac{P}{100} = \frac{\text{Part}}{\text{whole}}$$

$$\frac{P}{100} = \frac{45}{360}$$

$$360P = 100(45)$$

$$P = \frac{100(45)}{360}$$

$$P = 12.5$$

12.5% of 360 is 45

$$\frac{P}{100} \cdot 360 = 45$$

$$\frac{36}{10} P = 45$$

$$3.6 P = 45 \quad P = \frac{45}{3.6}$$

$$P = 12.5$$

12.5% of 360 is 45.

18% of what number is 44.1?

$$\frac{P}{100} = \frac{\text{Part}}{\text{whole}}$$

$$\frac{18}{100} = \frac{44.1}{x}$$

$$18x = 100(44.1)$$

$$x = \frac{100(44.1)}{18}$$

$$x = 245$$

18% of 245 is 44.1

$$\frac{18}{100} \cdot x = 44.1$$

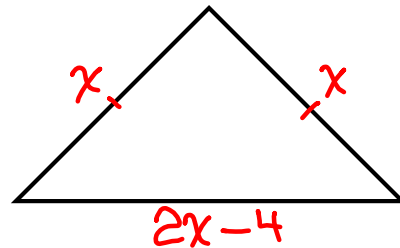
$$.18 x = 44.1$$

$$x = \frac{44.1}{.18}$$

$$x = 245$$

18% of 245 is 44.1

Draw a triangle with two equal sides, and third side 4 cm shorter than the sum of equal sides.



Find all 3 sides if the perimeter is 44 cm.

Side 1 + Side 2 + Side 3 = Perimeter

$$x + x + 2x - 4 = 44$$

$$4x - 4 = 44$$

$$4x = 44 + 4$$

$$4x = 48$$

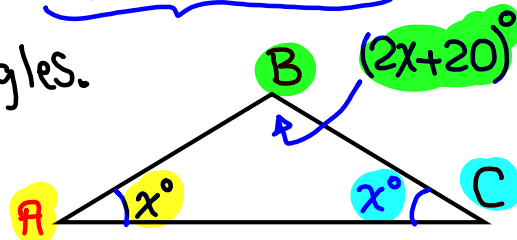
$$x = \frac{48}{4} \quad \boxed{x=12}$$

12 cm, 12 cm, and 20 cm

Draw a triangle with two equal angles. The third angle is 20° more than the sum of equal angles.

Find all 3 angles.

Hint: $A + B + C = 180^\circ$



$$x + 2x + 20 + x = 180$$

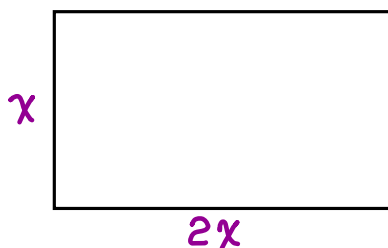
$$4x + 20 = 180$$

$$4x = 180 - 20$$

$$4x = 160 \quad x = \frac{160}{4} \quad x = 40$$

$40^\circ, 40^\circ, \text{ and } 100^\circ$

Draw a rectangle such that its length is twice its width.



Find its dimensions if the perimeter is 90 ft.

$$P = 2L + 2W$$

$$2L + 2W = 90$$

$$2(2x) + 2(x) = 90$$

$$4x + 2x = 90$$

$$6x = 90$$

$$x = \frac{90}{6}$$

$$x = 15$$

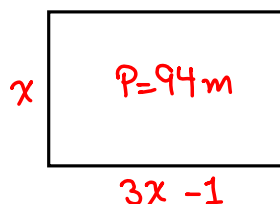


15 ft by 30 ft

A rectangular garden has a perimeter of 94 m.

The length is 1 meter shorter than 3 times its width.

1) Draw and label such garden



2) find its dimensions.

12 m by 35 m

3) find its area.

$$A = LW$$

$$= 35(12)$$

$$A = 420 m^2$$

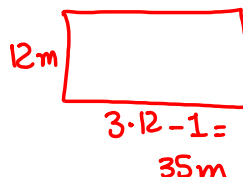
$$2L + 2W = 94$$

$$2(3x - 1) + 2(x) = 94$$

$$6x - 2 + 2x = 94$$

$$8x = 96$$

$$x = 12$$



$$3 \cdot 12 - 1 = 35m$$

Leo has a piece of wood that is 67 inches long.
 He needs 3 pieces out of this.
 One piece is 1 inch longer than twice another piece.
 The third piece is 20 inches shorter than the longer of the first two pieces.
 Find the measure of all 3 pieces.

First Second Third

x $2x+1$ $2x+1-20$

$x + 2x+1 + 2x+1-20 = 67$

$5x - 18 = 67$

$5x = 67+18$

$5x = 85$

$x = 17$

17 in., 35 in., and 15 in.

Solve, identify the equation

$$4(x-2) + 2(x+4) = 3(2x-10) + 30$$

$$\cancel{4x} - \cancel{8} + \cancel{2x} + \cancel{8} = \cancel{6x} - \cancel{30} + \cancel{30}$$

$$6x = 6x$$

$$6x - 6x = 0$$

$$0 = 0$$

True

All Reals

\mathbb{R}

Identity

Solve, identify the type of equation:

$$5(2x - 3) - 2(5x + 7) = 29$$

$$\cancel{10x} - 15 - \cancel{10x} - 14 = 29$$

$$-29 = 29 \quad \text{False}$$

Contradiction

\emptyset No Soln.
 $\{ \}$

For Wednesday
 Work on SG 5

A Software costs \$35.

Sales tax rate is 8%.

Find

1) Amount of Sales tax

Amount of tax is 8% of price.

$$x = .08 \cdot 35 \Rightarrow x = \$2.80$$

2) Total cost. Total Cost = Price + Sales tax
 $= 35 + 2.80$

$$\text{Total Cost} = \$37.80$$

Price of a bike is \$365.95

Tax rate is 7%.

① Find amount of Sales tax

Amount of tax is 7% of Price.
 $x = .07 \cdot 365.95$

$$x = \$25.62$$

② Find total cost.

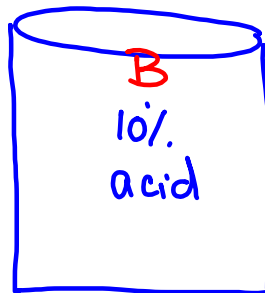
Total Cost = Price + tax

$$= 365.95 + 25.62 \Rightarrow \$391.57$$

There are two containers of Acid.



40 Liters



60 Liters

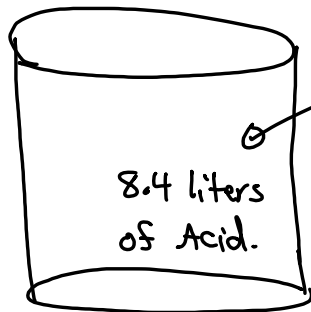
① Find the amount of acid in each container.

Amount of acid is rate of acid times liters

Container A $\Rightarrow x = .06(40) \Rightarrow x = 2.4$
 liters of acid

Container B $\Rightarrow x = .10(60) \Rightarrow x = 6$
 liters of acid.

Let's mix these two containers



Total liters of acid
 $2.4 + 6 = 8.4$

$$40 + 60 = 100 \text{ liters}$$

Find the rate of acid in the mixture.

8.4 is what percent of 100?

$$\frac{P}{100} = \frac{\text{Part}}{\text{Whole}}$$

$$\frac{P}{100} = \frac{8.4}{100}$$

$$100P = 100(8.4)$$

$$P = \frac{100(8.4)}{100}$$

$$P = 8.4$$

8.4% of
 Acid in the mixture

Leo got a raise of \$1950.

This was 6% increase of his old salary.

what was his old salary?

6% of Salary was 1950.

$$.06 \cdot x = 1950$$

$$x = \frac{1950}{.06}$$

$$x = 32,500$$

\$32,500

Monica got a raise from \$35,000 to \$37,450. what was the increase rate?

$$37450 - 35000 = 2450$$

Amount of increase/Decrease

is equal to rate of original Amount

$$2450 = \frac{P}{100} \cdot 35000$$

$$2450 = 350P$$

$$P = \frac{2450}{350}$$

$$P = 7$$

7% Raise