Math 115

Fall 2018

Lecture 3

? $a^2 + b^2 = c^2$?
? $d = rt$
$y = mx + b$

Class Quiz. Box your final answer.

① Simplify $(-2)^5 - (5)(-6) = -32 - (-30)$

$$= -32 + 30 = \boxed{-2}$$

② Evaluate $\sqrt{x^2 - y^3}$ for $x = -6$ and $y = -4$

$$= \sqrt{(-6)^2 - (-4)^3} = \sqrt{36 - (-64)} = \sqrt{36 + 64} = \sqrt{100} = \boxed{10}$$

③ Distribute and Simplify: $3(2x + 1) - 3$

$$= 3(2x) + 3 \cdot 1 - 3$$

$$= (3 \cdot 2)x + 3 - 3$$

$$= 6x + 0 = \boxed{6x}$$

Ch. 2 : Solving linear Equations & inequalities

Mathematical Expression : Combination of numbers, operations, and Variables. **NO = Sign**

$$3x + 5, \quad x^2 - 5x + 7, \quad \sqrt{x+4} - \sqrt{x}, \quad \frac{x+5}{x-1}$$

Once two mathematical expressions are equal, we have an equation

$$2x - 3 = x + 7, \quad x^2 - 8x + 7 = 0, \quad \sqrt{x+5} - \sqrt{x} = 1$$

Linear Equation $ax + b = C$, $a, b,$ and C are numbers, and x is our Variable

$$3x - 2 = 7, \quad -4x + 11 = 7$$

$$2(x-4) + 12 = x - 8$$

when Solving linear equations, we want to isolate the variable by itself.

$$x = \# \qquad y = \#, \qquad t = \#$$

It is possible that a linear equation to have exactly one solution, no Solution at all, or infinitely many Solns.

Anytime the Problem Says Solve Numerical Solution must be placed in a Solution Set.

$$\{ \quad \}$$

Properties of equality:

If $A = B$, then

1) $A + C = B + C$ Addition

2) $A - C = B - C$ Subtraction

3) $A \cdot C = B \cdot C$ Multiplication

4) $\dfrac{A}{C} = \dfrac{B}{C}$ $C \neq 0$ Division

Solve

$x - 5 = -17$

$x - 5 + 5 = -17 + 5$ $\rightarrow \{-12\}$

$x + 0 = -12$

$\boxed{x = -12}$

Solve

$x + 7 = 2$ $\rightarrow \boxed{x = -5}$

$x + 7 - 7 = 2 - 7$ $\{-5\}$

$x + 0 = -5$

Solve

$$-2x = 30$$

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

$$\boxed{x = -15}$$

$$\{-15\}$$

$$1x = -15$$

Solve

$$\frac{x}{5} = -10$$

$$5 \cdot \frac{x}{5} = 5 \cdot (-10)$$

$$x = -50$$

$$\{-50\}$$

$$1x = -50$$

Solve

$$2x - 9 = -23$$

$$2x - 9 + 9 = -23 + 9$$

$$2x + 0 = -14$$

$$2x = -14$$

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

$$1x = -7$$

$$\boxed{x = -7}$$

$$\{-7\}$$

Solve $-3x + 5 = -22$

$-3x + 5 - 5 = -22 - 5$

$-3x + 0 = -27$

$-3x = -27$

$-3x + 5 = -22$

$\quad -5 \quad -5$

$-3x \quad = -27$

$\dfrac{-3}{-3}x = \dfrac{-27}{-3}$

$1x = 9$

$\boxed{x = 9}$

$\rightarrow \{9\}$

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7 added to twice Some number is equal to 57.

find the number.

Let x be the number,

$2x + 7 = 57$

$2x + 7 - 7 = 57 - 7$

$2x + 0 = 50$

$2x = 50$

$\dfrac{2}{2}x = \dfrac{50}{2}$

$\boxed{x = 25}$

The number is 25.

10 Subtracted from 3 times a number is equal to 50. Find the number.

Let x be the number

$$3x - 10 = 50$$

$$3x - 10 + 10 = 50 + 10$$

$$3x + 0 = 60$$

$$3x = 60$$

$$\frac{3}{3}x = \frac{60}{3}$$

$$x = 20$$

The number is 20.

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when equation has ( ), distribute to remove it.

Solve

$$3(x - 2) + 8 = -10$$

$$3x - 6 + 8 = -10$$

$$3x + 2 = -10$$

$$3x + 2 - 2 = -10 - 2$$

$$3x + 0 = -12$$

$$3x = -12$$

$$x = \frac{-12}{3}$$

$$x = -4$$

$$\{-4\}$$

Solve

$$-4(x-3)-12=-40$$

$$-4x+12-12=-40$$

$$-4x=-40$$

$$x=\frac{-40}{-4} \qquad \boxed{x=10} \Rightarrow \{10\}$$

2 times the sum of some number and 10 is equal to 20. Find the number.

Let x be the number,

$$2(x+10)=20$$

$$2x+20=20$$

$$2x=20-20$$

$$2x=0$$

$$x=\frac{0}{2} \qquad \boxed{x=0}$$

The number is 0.

Distribute and Solve

$$3(2x+5)+2(2x-7)=101$$

$$6x+15+4x-14=101$$

$$10x+1=101$$
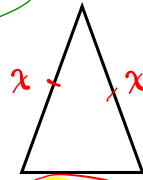
$$10x=101-1$$

$$10x=100$$

$$x=\frac{100}{10}$$

$$x=10$$

$$\{10\}$$

Two Sides of a triangle are equal.

The third side is 4 ft Shorter than the

Sum of equal Sides. The perimeter is 24 ft.
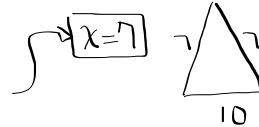
find all 3 Sides.

addition of all Sides

$x + x + 2x - 4 = 24$

x , x

$2x - 4$ → Third Side

$4x - 4 = 24$ $4x = 28$ $x = 7$

$4x = 24 + 4$ $x = \frac{28}{4}$

10

The Sides are 7ft, 7ft, and 10 ft.

$2x - 4$

$2(7) - 4 = 14 - 4 = 10$

7ft, 7ft, 10ft.

When the Variable appears in both Sides, It is recommended to move all variables to the left Sides and all numbers to the right side of the = Sign.

When moving things from one Side to other Side, we must transpose the Sign.

$+ \rightarrow -$

$- \rightarrow +$

ex: Solve $3x + 10 = x + 46$

$3x - x = 46 - 10$

$2x = 36$

$x = \dfrac{36}{2}$ $\boxed{x = 18} \Rightarrow \{18\}$

Solve $2(x-7) + 10 = 17 - x$

$2x - 14 + 10 = 17 - x$

$2x - 4 = 17 - x$

$2x + x = 17 + 4$

$3x = 21$

$x = \dfrac{21}{3}$ $\boxed{x = 7}$ $\{7\}$

Solve

$5(x - 3) + 4 = 3(x + 2) - 8$

$5x - 15 + 4 = 3x + 6 - 8$

$5x - 11 = 3x - 2$

$5x - 3x = -2 + 11$

$2x = 9$

$\boxed{x = \dfrac{9}{2}}$ $\boxed{x = 4\dfrac{1}{2}}$ $\boxed{x = 4.5}$

$\left\{ \dfrac{9}{2} \right\}$

Solve

$$4(3x + 2) - 2(6x - 10) = -28$$

$$12x + 8 \quad -12x + 20 = -28$$

$$28 = -28$$

false

No Solution

$$\emptyset \qquad \{ \ \}$$

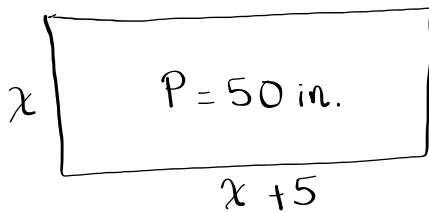Solve

$$3(2x + 5) - (x - 10) = 5(x + 5)$$

$$6x + 15 - x + 10 = 5x + 25$$

$$5x + 25 = 5x + 25$$

$$5x - 5x = 25 - 25$$

$$0 = 0$$

True

infinitely many
Solutions,
All Real numbers, $\mathbb{R}$

find x:
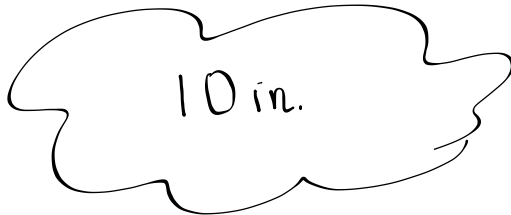
x | $P = 50$ in.
$x + 5$

Hint

$$P = 2L + 2W$$

$$2(x+5) + 2(x) = 50$$
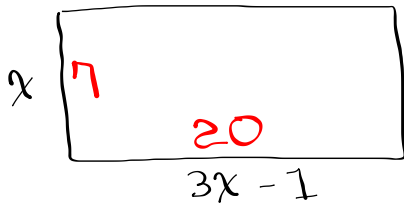
$$2x + 10 + 2x = 50$$

$$4x = 40$$

$$\boxed{x = 10}$$

10 in.

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find the dimensions of the rectangle below if its perimeter is 54 ft. **Hint: See last example**

x | 7
20
$3x - 1$

$$2L + 2W = P$$
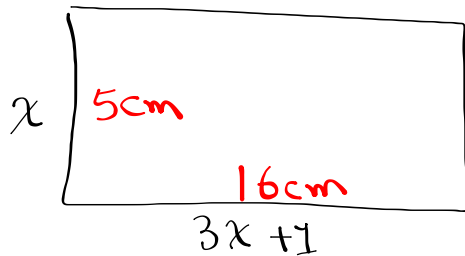
$$2(3x-1) + 2(x) = 54$$

$$6x \quad -2 \quad +2x = 54$$

$$8x = 54 \; +2$$

$$8x = 56$$

$$x = \frac{56}{8} \qquad x = 7$$

7 ft by 20 ft

find (the area) of the rectangle displayed below if its perimeter 42cm.

x | 5cm

16cm

3x+1

Hint: See last 2 examples.

$P = 42$

$2L + 2W = 42$

$2(3x+1) + 2(x) = 42$

$6x + 2 + 2x = 42$

$8x = 42 - 2$

$8x = 40$ $x = 5$

$A = LW$

$= 16 \cdot 5$

$A = 80 \, cm^2$

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whenever the equation contains fraction, use LCD to clear all fractions.

· find LCD

· Multiply everything by LCD

· Simplify to remove(clear) all denominators.

Solve $\frac{1}{2}x - \frac{2}{3} = 4$

LCD = 6 $6 \cdot \frac{1}{2}x - 6 \cdot \frac{2}{3} = 6 \cdot 4$ $x = \frac{28}{3}$

$3 \overline{)28}$ $\quad$ $\frac{9}{}$ $3x - 4 = 24$ $x = 9\frac{1}{3}$

$\underline{-27}$ $3x = 24 + 4$ $x = 9.\overline{3}$

1 $3x = 28$ $\left\{ \frac{28}{3} \right\}$

Solve $\dfrac{3}{4}x - \dfrac{2}{5} = \dfrac{1}{10}x$

Hint: USE LCD to clear deno.

LCD = 20

$\overset{5}{\cancel{20}} \cdot \dfrac{3}{4}x - \overset{4}{\cancel{20}} \cdot \dfrac{2}{5} = \overset{2}{\cancel{20}} \cdot \dfrac{1}{10}x$

$15x - 8 = 2x$

$15x - 2x = 8$

$13x = 8$

$x = \dfrac{8}{13}$

$\left\{ \dfrac{8}{13} \right\}$

Translate only:

12 added to   Square of Some number

Let x be the number

$x^2 + 12$

Subtract -20 from   Some number cubed   Power 3

Let x be the number,

$x^3 - (-20) = x^3 + 20$

Twice the difference of 20 and Some number

is equal to

The Sum of the number and 10.

Let x be the number,

$$2 \cdot (20 - x) = x + 10$$

Difference of
A and B
$$A - B$$

Some number less 10 is equal to

−20 Subtracted from 4 times the number

Let x be Some number,

$$x - 10 = 4x - (-20)$$

$$x - 10 = 4x + 20$$

A Subtract from
B
$$B - A$$

① Go to www.mymathclasses.com

② click on How to do Word Problems
link

③ click on Ch.1 Basic Translations

④ Scroll down to find 20 problems
#19 and 1.

⑤ Do Your work on the paper
that was given to you today.