

Math 115
Spring 2018
Lecture 3

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

Class Quiz #1

① Simplify: $\frac{3(-2)^2 - 5}{-7 \cdot 2}$

$$= \frac{3 \cdot 4 - 5}{-14} = \frac{12 - 5}{-14} = \frac{7}{-14} = -\frac{1}{2}$$

Box Your
 Final Ans.

② Evaluate $y^3 - x^2$ for $x = -5$, and $y = -2$

$$= (-2)^3 - (-5)^2 = -8 - 25 = -8 + (-25) = -33$$

③ Simplify: $4(x - 3) + 6(x + 2)$

$$= \underline{4x} - 12 + \underline{6x} + 12 = 10x$$

Ch. 2

Expression: Combination of Numbers,
operations, and Variables
"Letters"

$$3x+5, \quad x^2-4x+5, \quad \frac{x-8}{x+2}, \quad \sqrt{2x+1}$$

No = Sign

we often evaluate or simplify
expressions.

① Evaluate $\sqrt{b^2-4ac}$ for $a=-4, b=3,$
and $c=1.$

$$= \sqrt{3^2 - 4(-4)(1)} = \sqrt{9 - 4(-4)} \\ = \sqrt{9 + 16} = \sqrt{25} = \boxed{5}$$

② Simplify $3(x^2 + 5x - 4) + 2(x^2 - 7x + 6)$

$$= \boxed{3x^2} + 15x - 12 + \boxed{2x^2} - 14x + 12 \\ = 5x^2 + 1x = \boxed{5x^2 + x}$$

when two expressions are equal to each other, we have an equation.

$$2x - 1 = 5, \quad x(x + 4) = x - 8,$$

$$\sqrt{x + 4} + \sqrt{x} = 2, \quad \frac{1}{x - 1} - \frac{1}{x + 1} = 8$$

$$3x^2 - 5x + 2 = x^2 + 4x - 2$$

we often solve the equation to find a solution. Solution is a numerical value that makes the equation true.

Is -3 a solution for $2x + 1 = 5$?

we simply plug it in, and see if two sides are equal or not.

when equal \rightarrow it is a solution

when not equal \rightarrow it is not a solution.

$$2x + 1 = 5$$

$$2(-3) + 1 \stackrel{?}{=} 5$$

$$-6 + 1 \stackrel{?}{=} 5$$

$$-5 = 5$$

\rightarrow NO
 -3 is not
a solution.

Is -2 a solution of

$$3x^2 + 5x = 4x + 10?$$

$$3(-2)^2 + 5(-2) \stackrel{?}{=} 4(-2) + 10$$

$$3 \cdot 4 + 5(-2) \stackrel{?}{=} 4(-2) + 10$$

$$12 - 10 \stackrel{?}{=} -8 + 10$$

$$2 = 2 \checkmark$$

So
 -2 is a
 solution of
 that eqn.

Linear Equation : $Ax + B = C$

our goal is to isolate x by itself.

Equation Properties, If $A=B$, then

$$A + C = B + C$$

$$A - C = B - C$$

$$\left. \begin{array}{l} AC = BC \\ \frac{A}{C} = \frac{B}{C} \end{array} \right\} C \neq 0$$

Solve

$$x - 2 = -12$$

$$x - 2 + 2 = -12 + 2$$

$$x + 0 = -10$$

$$\boxed{x = -10}$$

Solution Set

$$\{-10\}$$

Solve

$$x + 7 = -13$$

$$x + 7 - 7 = -13 - 7$$

$$x + 0 = -20$$

$$x = -20$$

$$\{-20\}$$

Solve $5x = -20$

$$\frac{5x}{5} = \frac{-20}{5}$$

$$\boxed{x = -4}$$

$$\{-4\}$$

Solve $\frac{x}{4} = 25$

$$4 \cdot \frac{x}{4} = 4(25)$$

$$\boxed{x = 100}$$

$$\{100\}$$

Solve $3x + 4 = -11$

$$3x + 4 - 4 = -11 - 4$$

$$3x = -15$$

$$x = \frac{-15}{3} \quad \boxed{x = -5}$$

$$\{-5\}$$

Solve

$$-2x - 7 = 13$$

$$-2x - 7 + 7 = 13 + 7$$

$$-2x = 20$$

$$x = \frac{20}{-2}$$

$$\boxed{x = -10}$$

$$\{-10\}$$

Solve

$$3(x - 1) + 5 = 2$$

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

$$3x + 2 = 2$$

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

$$3x = 0$$

$$x = \frac{0}{3} \quad \boxed{x = 0}$$

Do not use \emptyset for zero.

$$\{0\}$$

10 more than

4 times some number

is equal to -30. Find the number.

Let x be the number,

Solve

$$4 \cdot x + 10 = -30$$

$$4x + 10 - 10 = -30 - 10$$

$$4x = -40$$

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

the number
is -10.

3 times the difference of some number and 5, reduced by the number is equal to 25. Find the number.

Let x be the number,

$$3(x - 5) - x = 25$$

$$3x - 15 - x = 25$$

$$2x - 15 = 25$$

$$\rightarrow 2x = 25 + 15$$

$$2x = 40$$

$$x = \frac{40}{2}$$

$$\boxed{x = 20}$$

The number is 20.

when equation contains fraction,
use LCD to clear all fractions.

Solve

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

$$\text{LCD} = 4$$

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

$$2x - 1 = 12$$

$$2x = 12 + 1$$

$$2x = 13$$

$$\boxed{x = \frac{13}{2}} \quad \left\{ \frac{13}{2} \right\}$$

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

Use LCD = 6 to clear fractions.

$$\cancel{6}^2 \cdot \frac{2}{\cancel{3}}(x-2) + \cancel{6}^3 \cdot \frac{1}{\cancel{2}}x = 6 \cdot (-4)$$

$$4(x-2) + 3x = -24$$

$$\underline{4x} - 8 + \underline{3x} = -24$$

$$7x - 8 = -24$$

$$7x = -24 + 8$$

$$7x = -16$$

$$\boxed{x = \frac{-16}{7}} \Rightarrow \left\{ \frac{-16}{7} \right\}$$

$\frac{1}{2}$ times the sum of some number and 6, increased by $\frac{1}{5}$ of the number is equal to $-\frac{7}{10}$. Find the number. Let x be the number.

$$\frac{1}{2} \cdot (x+6) + \frac{1}{5} \cdot x = -\frac{7}{10}$$

LCD = 10

$$\cancel{10}^5 \cdot \frac{1}{\cancel{2}}(x+6) + \cancel{10}^2 \cdot \frac{1}{\cancel{5}}x = \cancel{10} \cdot -\frac{7}{\cancel{10}}$$

$$5(x+6) + 2x = -7$$

$$5x + 30 + 2x = -7$$

$$7x + 30 = -7$$

$$7x = -7 - 30$$

$$7x = -37$$

$$\boxed{x = \frac{-37}{7}}$$

The number is $-\frac{37}{7}$.

When the variable appears in both sides,
we should use same rules to get all
variables in one, and all numbers on
other side.

Solve $3x - 12 = x + 18$

$$3x - 12 - x = x + 18 - x$$

$$2x - 12 = 18$$

$$2x - 12 + 12 = 18 + 12$$

$$2x = 30 \rightarrow x = \frac{30}{2} \quad \boxed{x=15}$$

$\{15\}$

Solve $2(x - 6) + 9 = 21 - x$

Distribute & Simplify

$$2x - 12 + 9 = 21 - x$$

$$2x - 3 = 21 - x$$

$$\underline{2x} - 3 + \underline{x} = 21 - \cancel{x} + \cancel{x}$$

$$3x - 3 = 21$$

$$3x = 21 + 3$$

$$3x = 24$$

$$\boxed{x=8}$$

$\{8\}$

Solve $3(x-5) - 2(x-10) = x+7$

Distribute & Simplify

$$\underline{3x} \text{ } (-15) - \underline{2x} \text{ } (+20) = x+7$$

$$x+5 = x+7$$

$$x-x = 7-5$$

$$0 = 2 \rightarrow \text{False} \rightarrow \boxed{\emptyset}$$

NO Solution

or

Do not place \emptyset inside of solution set.

$\emptyset = \{ \}$ Empty Set

Solve

$$6(x+1) - 2(x-2) = 4(x+3) - 2$$

Hint: Distribute and Simplify

$$\underline{6x} \text{ } (+6) - \underline{2x} \text{ } (+4) = 4x \text{ } (+12) - 2$$

$$4x + 10 = 4x + 10$$

$$4x - 4x = 10 - 10$$

$$0 = 0 \Rightarrow \text{True}$$

$\boxed{\mathbb{R}}$

infinitely Many Solns

All Real numbers

Solve

$$2(4x - 9) + 3 = 5x - 6$$

$$8x - 18 + 3 = 5x - 6$$

$$8x - 15 = 5x - 6$$

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

$$3x = 9$$

$$\boxed{x = 3} \Rightarrow \{3\}$$

Solve $\frac{3}{5}x - 2 = \frac{2}{3}x - 1$

use LCD = 15 to clear fractions

$$\cancel{15}^3 \cdot \frac{3}{\cancel{5}}x - 15 \cdot 2 = \cancel{15}^5 \cdot \frac{2}{\cancel{3}}x - 15 \cdot 1$$

$$9x - 30 = 10x - 15$$

$$9x - 10x = -15 + 30$$

$$-1x = 15$$

$$x = \frac{15}{-1}$$

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

$$\{-15\}$$

Solve $\frac{1}{10}(3x-7) = \frac{3}{10}x + 5$

$LCD = 10$

~~$10 \cdot \frac{1}{10}(3x-7) = 10 \cdot \frac{3}{10}x + 10 \cdot 5$~~

$3x - 7 = 3x + 50$

$3x - 3x = 50 + 7$

$0 = 57$

False



No Solution

Do not place \emptyset inside of $\{ \}$. or \emptyset

Solve $\frac{3(x+2)}{4} = 2x - 3$

$LCD = 4$

~~$4 \cdot \frac{3(x+2)}{4} = 4 \cdot 2x - 4 \cdot 3$~~

$3(x+2) = 8x - 12 \rightarrow x = \frac{-18}{-5}$

$3x + 6 = 8x - 12$

$3x - 8x = -12 - 6$

$-5x = -18$

$x = \frac{18}{5}$

$\left\{ \frac{18}{5} \right\}$

Solve: $\frac{5(-2x+9)}{6} + 3 = \frac{1}{2}$

LCD = 6

~~6~~ · $\frac{5(-2x+9)}{6}$ + 6 · 3 = ~~6~~ · $\frac{1}{2}$

$5(-2x+9) + 18 = 3$

$-10x + 45 + 18 = 3$

$-10x + 63 = 3$

$-10x = 3 - 63$

$x = \frac{-60}{-10}$

$x = 6$

$\{6\}$

Maria has 18 Coins.

Nickels & Dimes only.

of Dimes is 3 more than twice
of nickels.

How many dimes does she have?

$\boxed{\text{Dimes}} + \boxed{\text{Nickels}} = 18 \text{ Coins}$

$2x+3 + x = 18$

$3x + 3 = 18$

$3x = 18 - 3$

$3x = 15$

$x = 5$

$2(5) + 3 =$

13

She has
13 Dimes.

How to word problems

Basic Translation Chapter

Translate only

7 more than 5 times Some number.

Let x be Some number,

$$5 \cdot x + 7 = 5x + 7$$

-8 Subtracted from Square of Some number.

Let x be the number,

$$x^2 - (-8) = x^2 + 8$$

A more than B $\rightarrow B + A$

A added to B $\rightarrow B + A$

A Subtracted from B $\rightarrow B - A$

A less than B $\rightarrow B - A$

Twice Some number Subtracted from

the number Cubed.

Let x be the number,

$$x^3 - 2x$$

half Some number added to

Square root of the number.

Let x be the number,

$$\sqrt{x} + \frac{1}{2}x \quad \text{or} \quad \sqrt{x} + \frac{x}{2}$$

4 times the difference of 10 and

Some number is equal to

5 more than the number.

Let x be the number

$$4 \cdot (10 - x) = x + 5$$

optional

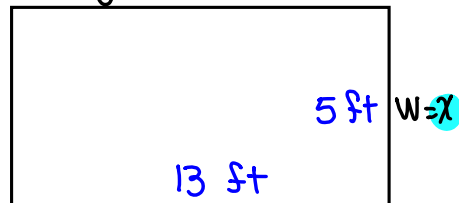
A rectangular garden has a perimeter of 36 ft.

Its length is 3 ft longer than twice its width.

① Draw & label such garden.

$$P = 36 \text{ ft}$$

$$2L + 2W = 36$$



$$L = 2x + 3$$

② Now make Substitution

$$2(2x + 3) + 2(x) = 36$$

$$6x + 6 = 36$$

$$6x = 30$$

$$x = 5$$

③ Solve $4x + 6 + 2x = 36$

WORK on SG2 for
Math 115