Math 115

Winter 2017

Lecture 2

Simplify:

① $(2-1)^5 \cdot \{-4(2-3^2)-2^5\}$

$= (1)^5 \cdot \{-4(2-9)-32\} = 1 \cdot \{-4(-7)-32\}$

$= 28-32 = \boxed{-4}$

② $4(2x-1)+2(-4x+2)$

$= 8x-4+(-8x)+4 = 0+0 = \boxed{0}$

Do not use ϕ for zero.

Evaluate

① $-5x^2 + 10x - 4$ for $x = -2$.

$= -5(-2)^2 + 10(-2) - 4 = -5(4) + 10(-2) - 4$

$= -20 + (-20) + (-4) = \boxed{-44}$

② $\dfrac{\sqrt{|x|} - y}{x^2 - y^2}$ for $x = -9$ & $y = 3$.

Do not use ϕ for ∅

$= \dfrac{\sqrt{|-9|} - 3}{(-9)^2 - 3^2} = \dfrac{\sqrt{9} - 3}{81 - 9} = \dfrac{3-3}{72} = \dfrac{0}{72} = \boxed{0}$

Simplify & Name the property:

$\frac{1}{2}(2x - 1) + \frac{1}{2}$ — Distributive Prop.

$= \frac{1}{2}\cdot(2x) - \frac{1}{2}\cdot 1 + \frac{1}{2}$ — Associative Prop.

$= (\frac{1}{2}\cdot 2)x - \frac{1}{2}\cdot 1 + \frac{1}{2}$

Inverse ↓ identity ↓

$= 1\cdot x - \frac{1}{2} + \frac{1}{2} = x + 0 = \boxed{x}$

Ident. Inverse Identity

Translate:

① 3 times some number increased by -10.

$3 \cdot x + (-10) = 3x - 10$

② Square of some number decreased by -8.

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

③ Some number times the sum of -5 and the number.

$x \cdot (-5 + x)$

④ the quotient of some number and the number increased by 5.

$$\frac{x}{x+5}$$

⑤ The difference of twice some number and 3, raised to second power.

$(2x - 3)^2$

Simplify:

1) $\frac{3}{5} \ominus \frac{\ominus 2}{3} = \frac{3 \cdot 3}{5 \cdot 3} + \frac{2 \cdot 5}{3 \cdot 5} = \frac{9}{15} + \frac{10}{15}$

LCD = 15

$= \boxed{\frac{19}{15}} = \boxed{1\frac{4}{15}}$

2) $\frac{3x-8}{10} + \frac{2x+8}{10}$

$= \frac{3x-8+2x+8}{10} = \frac{5x}{10}$

$= \frac{5 \cdot x}{5 \cdot 2} = \boxed{\frac{x}{2}}$

3) $-3\frac{1}{3} \cdot 2\frac{2}{5}$

$= -\frac{\cancel{10}^{2}}{\cancel{3}} \cdot \frac{\cancel{12}^{4}}{\cancel{5}} = -2 \cdot 4 = \boxed{-8}$

4) $-\frac{4}{5} \div 10$

$= -\frac{4}{5} \div \frac{10}{1} = -\frac{\cancel{4}^{2}}{5} \cdot \frac{1}{\cancel{10}_{5}} = \boxed{\frac{-2}{25}} = \boxed{-.08}$

5) $\sqrt{\frac{49}{25}} \div \left(-1\frac{2}{5}\right)$

$= \frac{7}{5} \div \left(\frac{-7}{5}\right)$

$= \frac{7}{5} \cdot \frac{-5}{7}$

$= \boxed{-1}$

Class Quiz #1 Name First Last

① Simplify: $-2(\sqrt{9}-\sqrt{16})-\sqrt{4}$

$= -2(3-4)-2 = -2(-1)-2$

$= 2-2 = \boxed{0}$

② Simplify: $4(x+3)-2(x+6)$

$10-2x$ $= 4x+12-2x-12 = \boxed{2x}$

③ Translate: twice some number less than 10

The Sum of A and B
The total of A and B
$\Rightarrow A+B$

A more than B $\Rightarrow B+A$

A added to B $\Rightarrow B+A$

The difference of A and B $\Rightarrow A-B$

A minus B $\Rightarrow A-B$

A less than B $\Rightarrow B-A$

A less B $\Rightarrow A - B$

A Subtracted from B $\Rightarrow B - A$

Difference of x^2 and -10

$x^2 - (-10) = x^2 + 10$

4 times Some number Subtracted from 25

$25 - 4x$

Square of Some number less twice the number.

$x^2 - 2x$

Difference of $5x$ and 3, raised to the third power, then reduced by x^2.

$(5x-3)^3 - x^2$

Translate:

3 times Some number increased by 10

is equal to

8 less than the number.

$3x + 10 = x - 8$

Now we have an equation

When two expressions are equal, we have an equation.

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

$\sqrt{2x-3} = x + 4,$

$4(x-1) + 7 = 2(x+5) - 1,$

$\frac{x-3}{x+5} = \frac{2}{3}$

We usually Solve an equation,

We ≠ Simplify an expression.

Solution to an equation is a numerical value that makes both sides of equation equal to each other.

Solution makes the equation a true Statement.

Linear Equation

$Ax + B = C$

x is the variable, $A, B, C \rightarrow$ numbers.

$3x - 5 = -17$

Linear equations have exactly one Solution, infinitely many Solutions, or no Solution at all.

Solve linear equation:

Our goal is to isolate the variable on the left-hand side of the equal sign.

Some Properties: If $A=B$, then

$A+C=B+C$, $A-C=B-C$,

$A \cdot C = B \cdot C$, $c \neq 0$, $\frac{A}{C}=\frac{B}{C}$ $c \neq 0$

Solve:

$2x-5=7$

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

$2x=12$

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

$x=6$ ← Solution, Solution Set $\{6\}$

Check:

$2(6)-5=7$

$12-5=7$

$7=7$ ✓

Solve & check:

$-3x + 8 = -13$

$-3x + 8 - 8 = -13 - 8$

$-3x = -21$

$\frac{-3x}{-3} = \frac{-21}{-3}$

Check:

$-3(7) + 8 = -13$

$-21 + 8 = -13$

$-13 = -13$ ✓

Solution → $x = 7$ → Solution Set → $\{7\}$

Solve: Hint: Distribute & Simplify

$4(x-2) + 3(2x+5) = 7$

$4x - 8 + 6x + 15 = 7$

$10x + 7 = 7$

$10x + 7 - 7 = 7 - 7$

$10x = 0$

$\frac{10x}{10} = \frac{0}{10}$

$x = 0$

$\frac{\text{Zero}}{\text{Non Zero}} = \text{Zero}$

$\{0\}$

Solve Hint: Distribute & Simplify

$3(2x+10)-2(3x+5)=-20$

$6x+30-6x-10=-20$

$20=-20$

False

No Solution $\rightarrow$ $\emptyset=\{\}$ (empty)

Do not use $\{\emptyset\}$

Solve

$-4(5x-8)+5(4x+3)=47$

$-20x+32+20x+15=47$

$47=47$

True

Infinitely many Solutions

All Real numbers, $\mathbb{R}$

Maria is 5 years older than Jose.

The sum of their ages is 29.

How old are they now?

Jose $\rightarrow x$

Maria $\rightarrow x+5$

Jose + Maria = 29

$x + x+5 = 29$

$2x + 5 = 29$

$2x + 5 - 5 = 29 - 5$

$2x = 24$

$\frac{2x}{2} = \frac{24}{2}$

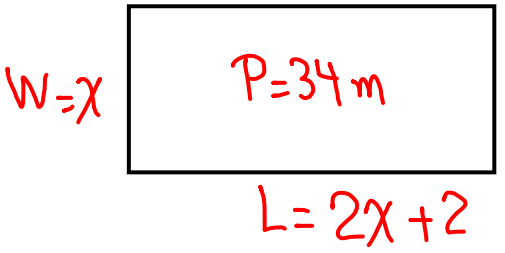
$\boxed{x = 12}$

Jose is 12 and Maria is 17 years old.

The perimeter of this room is 34 meters.

the length is 2 meters longer than twice of its width.

The room is rectangular. Find its dimensions.



Formula

$P = 2L + 2W$

So $2L + 2W = 34$

$2(2x+2) + 2(x) = 34$

$4x + 4 + 2x = 34$

$6x + 4 = 34$

$6x + 4 - 4 = 34 - 4$

$6x = 30$

$\frac{6}{6}x = \frac{30}{6}$

$x = 5$

width is 5m,
Length is 12m.

There were 47 Students in a math class. The # of female Students was 1 fewer than 3 times the # of male Students. Find how many female Students in that math class.

Females → $3x - 1$
Males → x

Females + Males = 47

$3x - 1 + x = 47$

$4x - 1 = 47$

$4x - 1 + 1 = 47 + 1$

$4x = 48$

$\frac{4}{4}x = \frac{48}{4}$

$\boxed{x = 12}$

There were 35 Females in that class.

Females $\rightarrow 3x - 1 = 3(12) - 1 = \boxed{35}$

Math Lab Tutoring location & time

G5 - lower level G5-009

M - Th. 11:00 AM - 7:00 pm

Friday & Saturday 10:00 AM - 4:00 PM

Whenever the variable is on both sides, we use equation properties to get all variables on the left-hand side and the rest on the right-hand side.

Solve $3x - 7 = x + 13$

Soln: 10

Soln set $\{10\}$

$3x - 7 + 7 = x + 13 + 7$

$3x = x + 20$

$3x - x = x + 20 - x$

$2x = 20$

$x = 10$

Solve

$3x + 12 = -2x - 28$

$3x + 12 - 12 = -2x - 28 - 12$

$3x = -2x - 40$

$3x + 2x = -2x - 40 + 2x$

$5x = -40$

$x = \frac{-40}{5}$

$\boxed{x = -8}$

$\{-8\}$

Solve

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

$2x - 10 + 3 = 4x + 12 - 2$

$2x - 7 = 4x + 10$

$2x - 4x = 10 + 7$

$-2x = 17$

$x = \frac{17}{-2}$

$\boxed{x = \frac{-17}{2}}$ $\boxed{x = -8.5}$

$\{\frac{-17}{2}\}$

Solve

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

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

$6x+5 = 6x-16$

$6x-6x = -16-5$

$0 = -21$ → False → $\emptyset$ or $\{\}$

Solve

$5(x-1)-3(x+4) = 2(x-3)-11$

$5x-5-3x-12 = 2x-6-11$

$2x-17 = 2x-17$

$2x-2x = -17+17$

$0 = 0$ → True → infinitely Many Solns. All Reals $\mathbb{R}$

Whenever the equation contains fractions, multiply everything on both sides of the equation by the LCD of all fractions.

ex: Solve $\frac{2}{3}x - \frac{3}{4} = \frac{1}{2}x + \frac{5}{6}$

LCD = 12

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

$8x - 9 = 6x + 10$

$8x - 9 = 6x + 10$

$8x - 6x = 10 + 9$

$2x = 19 \rightarrow \boxed{x = \frac{19}{2}} \rightarrow \left\{\frac{19}{2}\right\}$

Solve: $\frac{-3}{4}x + 5 = \frac{2}{5}x - 1$ LCD = 20

$20 \cdot \frac{-3}{4}x + 20 \cdot 5 = 20 \cdot \frac{2}{5}x - 20 \cdot 1$

$-15x + 100 = 8x - 20$

$-15x + 100 = 8x - 20$

$-15x - 8x = -20 - 100$

$-23x = -120$

$x = \frac{-120}{-23}$ $\quad \boxed{x = \frac{120}{23}} \rightarrow \left\{\frac{120}{23}\right\}$

$\frac{2}{5}$ of Some number reduced by 6 is equal to $\frac{1}{2}$ of the number increased by 5. Find the number.

$\frac{2}{5} \cdot x - 6 = \frac{1}{2} \cdot x + 5$ $\quad$ LCD = 10

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

$4x - 60 = 5x + 50$

$4x - 5x = 60 + 50$

$-x = 110$

$-1x = 110$

$x = \frac{110}{-1}$

$\boxed{x = -110}$

the number is -110.

$.1x + .05(2x - 3) = 2.45$

$.1 = \frac{1}{10}$, $.05 = \frac{5}{100}$, $2.45 = \frac{245}{100}$

multiply everything by 100, simplify

$100(.1x) + 100(.05)(2x-3) = 100(2.45)$

$10x + 5(2x-3) = 245$

$$10x + 5(2x-3) = 245$$

$$10x + 10x - 15 = 245$$

$$20x - 15 = 245$$

$$20x = 245 + 15$$

$$20x = 260$$

$$x = \frac{260}{20}$$

$$x = 13$$

$$\{13\}$$

Solve

$$.25(2x-1) + .35x = 100$$

$$.25(2x) - .25(1) + .35x = 100$$

$$.5x - .25 + .35x = 100$$

$$.85x - .25 = 100$$

$$.85x = 100 + .25$$

$$.85x = 100.25$$

$$x = \frac{100.25}{.85}$$

$$x = 117.941176$$

$$x \approx 117.94$$

John paid \$1.87 to purchase two types of stamps. Some @ 13¢ and Some @ 15¢ each.

The number of 15¢ stamps was 1 more than twice the # of 13¢ Stamps.

How many of each?

Total cost = \$1.87

13¢ + 15¢ = 1.87

15¢ → 2x+1

13¢ → x

$$\underbrace{13x}_{\text{cost for 13¢ stamp}} + \underbrace{15(2x+1)}_{\text{cost for 15¢ stamp}} = \underbrace{187}_{\text{187¢ Total cost.}}$$

$$13x + 15(2x+1) = 187$$

$$13x + 30x + 15 = 187$$

$43x + 15 = 187$

$43x = 187 - 15$

$43x = 172$

$x = \frac{172}{43}$

$\boxed{x = 4}$

4 stamps @ 13¢ each

and

9 stamps @ 15¢ each.

FF → 75¢ each

HB → $1.25 each

Mike paid → $8.25

# of FF was twice # of HB.

How many of each?

FF → $2x$

HB → x

Total cost

$125x + 75(2x) = 825$

$125x + 150x = 825$

$375x = 825$

$275x = 825$

$x = \frac{825}{275}$ $\boxed{x = 3}$

3 HB & 6 FF