Math 115

Spring 2019

Lecture 3

$? \; a^2 + b^2 = c^2 \; ?$

$y = mx + b \quad ? \quad d = rt$

Feb 19-8:47 AM

Some Review:

1) Simplify: $\dfrac{(-5)^3 + (-10)^2}{-\sqrt{25} - 2 \cdot 5} = \dfrac{-125 + 100}{-5 - 10} = \dfrac{-25}{-15} = \dfrac{\cancel{5} \cdot 5}{\cancel{5} \cdot 3} = \boxed{\dfrac{5}{3}} = \boxed{1\dfrac{2}{3}}$

2) Evaluate $-b - \sqrt{b^2 - 4ac}$ for $a = 5$, $b = 6$ and $c = -1$

$= -6 - \sqrt{6^2 - 4(5)(-1)}$

$= -6 - \sqrt{36 + 20} = -6 - \sqrt{56}$ (Not a Perfect sqr)

$\approx \boxed{-13.5}$

3) Translate only: The sum of some number and 10, raised to the second power, reduced by the product of the number and 10.

Let x be the number,

$(x + 10)^2 - x \cdot 10$

Recall $a \cdot b = b \cdot a$

$x \cdot 10 = 10 \cdot x$

Simplify:

1) $\frac{-36}{48} = -\frac{4\cdot 9}{4\cdot 12} = -\frac{3\cdot 3}{3\cdot 4}$

$= \boxed{\frac{-3}{4}} = \boxed{-.75}$

2) $\frac{5}{8} - \frac{1}{6}$

$= \frac{5\cdot 3}{8\cdot 3} - \frac{1\cdot 4}{6\cdot 4}$

$= \frac{15}{24} - \frac{4}{24} = \boxed{\frac{11}{24}}$

LCD =
$8 = 2\cdot 2\cdot 2$
$6 = 2 \cdot 3$
LCD $= 2\cdot 2\cdot 2\cdot 3$
$= 24$

3) $4\frac{2}{3} \div \left(-1\frac{2}{5}\right)$

$= \frac{14}{3} \div \frac{-7}{5} = \frac{2}{3}\cdot\frac{-5}{7} = \boxed{\frac{-10}{3}}$

$= \boxed{-3\frac{1}{3}}$

4) $\sqrt{\frac{16}{25}} + \sqrt{\frac{49}{100}}$

$= \frac{4\cdot 2}{5\cdot 2} + \frac{7}{10}$ LCD = 10

$= \frac{8}{10} + \frac{7}{10} = \frac{3}{2} = \boxed{1\frac{1}{2}} = \boxed{1.5}$

Translate only: 6 times the difference of twice some number and 5, increased by 30.

Let x be the number

$6(2x - 5) + 30$

Simplify

$6(2x-5) + 30$

$= 6(2x) - 6\cdot 5 + 30$

$= (6\cdot 2)x - 30 + 30$

$= 12x - 30 + 30$

$= 12x + 0$

$= \boxed{12x}$

Name the Property used

1) $10 + 2x = 2x + 10$ → $A + B = B + A$ Commutative Prop. → $A \cdot B = B \cdot A$

2) $x^2 \cdot 8 = 8 \cdot x^2$

3) $4(5x) = (4\cdot 5)x = 20x$ → $A(B\cdot C) = (A\cdot B)\cdot C$ Associative
$(A+B)+C = A+(B+C)$

4) $(x - 8) + 8 = x + (-8 + 8) = x + 0 = \boxed{x}$
Associative Inverse Identity
$a + (-a) = 0$

5) $2\left(\frac{1}{2}x + 1\right) - 2 = 2\left(\frac{1}{2}x\right) + 2\cdot 1 - 2$ Dist.
Associative Identity
$= (2\cdot\frac{1}{2})x + 2 - 2$
Inverse Inverse
$= 1\cdot x + 0 = x + 0 = x$
Identity Identity

1) Commutative Prop: $a+b=b+a$

$a \cdot b = b \cdot a$

$8+(-5) = -5+8$, $-12 \cdot x = x \cdot (-12)$

2) Associative Prop: $a+(b+c)=(a+b)+c$

$a \cdot (b \cdot c) = (a \cdot b) \cdot c$

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

$x \cdot (x \cdot 10) = (x \cdot x) \cdot 10 = x^2 \cdot 10 = 10 \cdot x^2 = 10x^2$

3) Distributive Prop: $a(b+c) = a \cdot b + a \cdot c$

$4(x+1) = 4 \cdot x + 4 \cdot 1 = \boxed{4x+4}$

$-5(2x-3) = -5(2x) - (-5)3 = (-5 \cdot 2)x + 15$

$= \boxed{-10x+15}$

Distribute & Simplify:

1) $3(x+6) + 2(x-9)$

$= 3x + 18 + 2x - 18 = 3x + 2x + 18 - 18$

$= 5x + 0 = \boxed{5x}$

2) $4(x^2+5x-3) - 2(2x^2+10x-6)$

$= 4x^2 + 20x - 12 - 4x^2 - 20x + 12$

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

Do not use ϕ for 0.

4) Inverse Prop.: $a + (-a) = 0$

$a \cdot \frac{1}{a} = 1$, $a \neq 0$

$12 + (-12) = 0$ $\quad -\frac{3}{4} + \frac{3}{4} = 0$ $\quad 5x + (-5x) = 0$

$12 \cdot \frac{1}{12} = 1$ $\quad -\frac{3}{4} \cdot \frac{-4}{3} = 1$ $\quad 5x \cdot \frac{1}{5x} = 1$, $x \neq 0$

5) Identity Prop.: $a + 0 = a$

$a \cdot 1 = a$

$25 + 0 = 25$ $\quad -4x + 0 = -4x$

$25 \cdot 1 = 25$ $\quad -4x \cdot 1 = -4x$

Perform the indicated operation and Simplify

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

$= (3 \cdot 2)x + 3 - 3$ Associtive & Identity

$= 6x + 0$ Multiply & inverse

$= \boxed{6x}$ Identity

Name all properties used to simplify

$$\frac{2}{3}\left(\frac{3}{2}x + 1\right) - \frac{2}{3}$$

$= \frac{2}{3}\left(\frac{3}{2}x\right) + \frac{2}{3}\cdot 1 - \frac{2}{3}$ Distribution

$= \left(\frac{2}{3}\cdot\frac{3}{2}\right)x + \frac{2}{3}\cdot 1 - \frac{2}{3}$ Associative

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

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

$= x + 0$ Inverse

$= \boxed{x}$ Identity.

Ch. 2 Working with linear equations with one variable

Mathematical Expression:

Combination of numbers, operations, and variables. **No = Sign.**

$3x+7$, $2x^2 - 10x$, $-b + \sqrt{b^2-4ac}$, $\frac{x+3}{x-1}$

we can

- Simplify
- Evaluate

Simplify:

1) $5x - 12 - 2x + 20 = 3x + 8$

2) $4(x - 6) + 6(x + 4)$

$= 4x - 24 + 6x + 24 = 10x + 0 = 10x$

3) $-2(4x^2 - 3x + 5) + 4(2x^2 + x - 5) + 30$

$= -8x^2 + 6x - 10 + 8x^2 + 4x - 20 + 30$

$= 10x$

Evaluate

1) $-3x^2 + 5x$ for $x = -2$

$= -3(-2)^2 + 5(-2) = -3 \cdot 4 + 5 \cdot (-2) = -12 + (-10) = -22$

2) $\frac{x - 8}{x + 2}$ for $x = 8$ & $x = -2$

$= \frac{8 - 8}{8 + 2} = \frac{0}{10} = 0$

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

$= \frac{-2 - 8}{-2 + 2} = \frac{-10}{0}$ undefined

$\frac{\text{Nonzero}}{\text{Zero}} = \text{undefined}$

3) $-b + \sqrt{b^2 - 4ac}$ for $a = 1$, $b = -6$, and $c = 9$.

$= -(-6) + \sqrt{(-6)^2 - 4(1)(9)}$

$= 6 + \sqrt{36 - 36} = 6 + \sqrt{0} = 6 + 0 = 6$

Mathematical Equation

When two expressions are equal, we have an equation.

$3x - 5 = 7$, $x^2 + 100 = 20x$, $\sqrt{x} + \sqrt{x-1} = 1$

$y = 3x + 8$ $\quad y = \frac{x-8}{x+2}$

We can Solve equation to find Solution.

Solution is a numerical value that makes both sides of equation equal.

Is 5 a Solution for

$2x - 10 = x + 4$?

Plug it in, and verify

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

$10 - 10 \stackrel{?}{=} 5 + 4$

$0 \stackrel{?}{=} 9$ → False,

5 is not a Soln.

Is -4 a solution of

$3x^2 - 40 = -2x$?

$3(-4)^2 - 40 \stackrel{?}{=} -2(-4)$

$3 \cdot 16 - 40 \stackrel{?}{=} 8$

$48 - 40 \stackrel{?}{=} 8$

$8 \stackrel{?}{=} 8$ → True

So -4 is a solution.

Properties of equality

If $A = B$, then

$A + C = B + C$ Addition Prop.

$A - C = B - C$ Subtraction Prop.

$A \cdot C = B \cdot C$ Multiplication Prop.

$\frac{A}{C} = \frac{B}{C}$ Division Prop.

} $C \neq 0$

Linear Equation $Ax + B = C$

our objective → $x = ?$

Solve $x - 4 = 10$

$x - 4 + 4 = 10 + 4$

$\boxed{x = 14}$ → Solution Set $\{14\}$

Solve $x + 8 = -12$

$x + 8 - 8 = -12 - 8$

$\boxed{x = -20}$ → Soln Set $\{-20\}$

Solve $4x = -48$

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

$\boxed{x = -12}$ → Soln Set $\{-12\}$

Solve $\frac{x}{10} = -1$

$10 \cdot \frac{x}{10} = 10(-1)$

$\boxed{x = -10}$ → Soln. Set $\{-10\}$

Solve $2x - 5 = 7$

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

$2x = 12$

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

$x = 6$

$\{6\}$

Solve $3x + 2 = -19$

$3x + 2 - 2 = -19 - 2$

$3x = -21$

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

$\boxed{x = -7}$

$\{-7\}$

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

Hint: Distribute & Simplify

$2x - 10 + 3 = 7$

$2x - 7 = 7$

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

$2x = 14$

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

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

Solve $\frac{x}{4} + 8 = -2$

$\frac{x}{4} + 8 - 8 = -2 - 8$

$\frac{x}{4} = -10$

$4 \cdot \frac{x}{4} = 4(-10)$

$\boxed{x = -40} \rightarrow \{-40\}$

Solve

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

Hint: Distribute & Simplify

$2x+12+3x-6=6$

$5x+6=6$

$5x+6-6=6-6$

$5x=0$

$\frac{5x}{5}=\frac{0}{5}$

$x=0$

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

$\{0\}$

Do not use ϕ for 0.

Translate only:

twice some number reduced by -15 is -13.

Let x be the number

$2x-(-15)=-13$

Translate only:

Square of some number increased by 15 is equal to twice the number.

Let x be the number,

$x^2+15=2x$

Translate only:

when 7 is subtracted from 3 times the total of some number and 5, the result is equal to the difference of the number and 10.

Let x be the number,

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

Translate only

The sum of some number and 3 times its square root is equal to 10.

Let x be the number,

$$x + 3\cdot\sqrt{x} = 10$$

Translate only:

The quotient of some number and the number reduced by 5 is equal to the ratio of 2 to 3.

Let x be the number

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

$$x \div (x-5) = \frac{2}{3}$$

Translate only:

10 less than Some number cubed is equal to the number less −10.

Recall

A less B $\Rightarrow$ A−B

A less than B $\Rightarrow$ B−A

Let x be the number;

$$x^3 - 10 = x - (-10)$$

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1) www.mymathclasses.com

2) Click on How to do word Problem

3) Go to Ch. 1, do 1–20 for Thursday.