# Math 115

# Spring 2019

# Lecture 2

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

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

Feb 19-8:47 AM

## Review

1) Simplify $(7^2 + 1)(\sqrt{16} - \sqrt{9})$

$= (49 + 1)(4 - 3) = 50 \cdot 1 = \boxed{50}$

2) Evaluate $\sqrt{x^2 - y^2} + xy$ for $x = -5$ & $y = -3$

$\sqrt{x^2 - y^2} + xy = \sqrt{(-5)^2 - (-3)^2} + (-5)(-3)$

$= \sqrt{25 - 9} + 15 = \sqrt{16} + 15 = 4 + 15 = \boxed{19}$

3) Translate: the difference between abs. value of $-10$ and $-10$.

$|-10| - (-10)$

Simplify

$10 - (-10) = 10 + 10 = \boxed{20}$

① Simplify: $\dfrac{-8 \cdot 5 + |-36|}{\sqrt{100} - \sqrt{64}} = \dfrac{-40 + 36}{10 - 8} = \dfrac{-4}{2}$

$= \boxed{-2}$

② Evaluate $(x + y)^2 - xy$ for $x = -4$ and $y = 0$.

$(x+y)^2 - xy = (-4+0)^2 - (-4)(0)$

$= (-4)^2 - 0 = 16 - 0 = \boxed{16}$

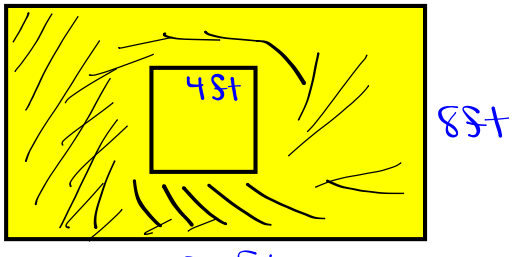
③ Translate: $-4$ times the sum of abs. value of $-8$ and square root of 9

$(-4)\cdot(|-8| + \sqrt{9})$

Simplify $-4(8+3)$

$= -4(11) = \boxed{-44}$

Find the shaded area




Hint:

$A_{rectangle} = L \cdot W$

$A_{square} = s^2$

Shaded Area $= A_{Rectangle} - A_{Square}$

$= LW - s^2$

$= (20)(8) - 4^2 = 160 - 16$

$= \boxed{144\ ft^2}$

## Subtraction with Signed numbers:

$$A - B = A + (-B)$$

Simplify: $12 - (-5) = 12 + (5)$

$= \boxed{17}$

Simplify: $-|-14| - 6 = -14 - 6$

$= -14 + (-6)$

$= \boxed{-20}$

## Simplify

1) $-\sqrt{36} - (-6) = -6 - (-6)$

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

Do not use $\phi$ for Zero

2) $5 \cdot (-3) - |-15| = -15 - 15$

$= -15 + (-15)$

$= \boxed{-30}$

3) $(-4)^3 + (-2)^4$

$= -64 + 16$

$= \boxed{-48}$

Evaluate

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

$= (-2)^5 - 5(-2) = -32 - (-10) = -32 + 10 = \boxed{-22}$

2) $mx + b$ for $m = -3$, $x = 4$, and $b = -8$

$= (-3)(4) + (-8) = -12 + (-8) = \boxed{-20}$

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

$= \sqrt{(-6)^2 - 4(9)(1)} = \sqrt{36 - 36} = \sqrt{0} = \boxed{0}$

(36)

Working with Fractions:

Reduce

1) $\frac{28}{36}$

$= \frac{2 \cdot 14}{2 \cdot 18} = \frac{14}{18}$

$= \frac{2 \cdot 7}{2 \cdot 9} = \boxed{\frac{7}{9}}$

2) $\frac{-75}{120} = -\frac{5 \cdot 15}{5 \cdot 24}$

$= -\frac{5 \cdot 3}{3 \cdot 8}$

$= \boxed{-\frac{5}{8}} = \boxed{\frac{-5}{8}}$

① Write $\frac{34}{15}$ as a mixed number.

$$15 \overline{)\,34} \quad 2,\ -30,\ 4$$

$$\frac{34}{15} = \boxed{2\frac{4}{15}}$$

② Write $-6\frac{3}{5}$ as an improper fraction

$$= -\frac{6 \cdot 5 + 3}{5} = \boxed{-\frac{33}{5}}$$

③ Simplify $\frac{0}{-10} = \boxed{0}$

④ Simplify $\frac{|-5|}{0}$

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

$\frac{\text{Non Zero}}{\text{Zero}} \Rightarrow$ Undefined

$\emptyset$

Simplify : $\dfrac{(-9)^2 - (-3)^4}{\sqrt{64} + (-2)^3}$

$$= \frac{81 - 81}{8 + (-8)}$$

$$= \frac{0}{0}$$

Indeterminate

$\frac{\text{Zero}}{\text{Zero}}$ Indeterminate

Translate only: Some number → $x$

1) The sum of Some number and −10.

$x + (-10)$

2) Some number increased by −10.

$x + (-10)$

3) −10 added to Some number.

$x + (-10)$

4) 20 added to twice Some number

$2x + 20$

5) Total of Square Some number and −5.

$x^2 + (-5)$

6) −5 more than Some number cubed.

$x^3 + (-5)$

## More Fractions

Add & Simplify $\frac{5}{8} + \frac{1}{6}$

LCD

$8 = 2 \cdot 2 \cdot 2$

$6 = 2 \cdot 3$

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

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

$= \frac{15}{24} + \frac{4}{24}$

$= \frac{15+4}{24} = \boxed{\frac{19}{24}}$

Subtract and Simplify

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

$6 = 2 \cdot 3$

$4 = 2 \cdot 2 \Rightarrow LCD = 2 \cdot 3 \cdot 2 = 12$

$= \frac{10}{12} - \frac{3}{12} = \boxed{\frac{7}{12}}$

## Simplify

① $\frac{20}{49} \cdot \frac{14}{25}$

$= \frac{4 \cdot \cancel{5}}{7 \cdot \cancel{7}} \cdot \frac{\cancel{7} \cdot 2}{\cancel{5} \cdot 5}$

$= \boxed{\frac{8}{35}}$

② $3\frac{1}{3} \div 2\frac{1}{2}$

Hint: Convert mixed # into improper fraction

$= \frac{10}{3} \div \boxed{\frac{5}{2}}$

$= \frac{\overset{2}{\cancel{10}}}{3} \cdot \frac{2}{\cancel{5}} = \boxed{\frac{4}{3}}$ ✓

$= \boxed{1\frac{1}{3}}$ better choice

Simplify

1) $\frac{3}{4} \div \sqrt{\frac{9}{16}}$

$= \frac{3}{4} \div \frac{3}{4}$

$= \frac{\cancel{3}^{1}}{\cancel{4}} \cdot \frac{\cancel{4}^{1}}{\cancel{3}} = \boxed{1}$

$3 = 3$
$6 = 3 \cdot 2 \Rightarrow LCD = 6$

2) $\left(\frac{2}{3} - \frac{1}{6}\right)^2 \cdot \left|-1\frac{1}{2}\right|$

$= \left(\frac{2 \cdot 2}{3 \cdot 2} - \frac{1}{6}\right)^2 \cdot \left|\frac{-3}{2}\right|$

$= \left(\frac{4}{6} - \frac{1}{6}\right)^2 \cdot \frac{3}{2}$

$= \left(\frac{3}{6}\right)^2 \cdot \frac{3}{2}$

$= \left(\frac{1}{2}\right)^2 \cdot \frac{3}{2}$

$= \frac{1}{4} \cdot \frac{3}{2} = \boxed{\frac{3}{8}}$

Evaluate

$4x^2 - 6x + 1$ for $x = 0$, $x = \frac{-1}{2}$, and $x = \frac{1}{2}$

For $x = 0$

$4x^2 - 6x + 1 = 4(0)^2 - 6(0) + 1$

$= 4(0) - 6(0) + 1 = 0 - 0 + 1 = \boxed{1}$

For $x = \frac{-1}{2}$

$4x^2 - 6x + 1 = 4\left(\frac{-1}{2}\right)^2 - 6\left(\frac{-1}{2}\right) + 1$

$= \cancel{4} \cdot \frac{1}{\cancel{4}} + \overset{3}{\cancel{6}} \cdot \frac{1}{\cancel{2}} + 1 = 1 + 3 + 1 = \boxed{5}$

For $x = \frac{1}{2}$

$4x^2 - 6x + 1 = 4\left(\frac{1}{2}\right)^2 - 6\left(\frac{1}{2}\right) + 1$

$= \cancel{4} \cdot \frac{1}{\cancel{4}} - \overset{3}{\cancel{6}} \cdot \frac{1}{\cancel{2}} + 1 = 1 - 3 + 1 = \boxed{-1}$

Evaluate $mx + b$ for

Do not use $\emptyset$ for 0.

① $m = \frac{3}{2}$, $x = -2$, and $b = 3$

$mx + b = \frac{3}{2}(-2) + 3 = -3 + 3 = \boxed{0}$

② $m = \frac{-2}{3}$, $x = \frac{3}{2}$, and $b = -3$

$mx + b = \left(\frac{-2}{3}\right)\left(\frac{3}{2}\right) + (-3)$

$= -1 + (-3) = \boxed{-4}$

Properties of Real Numbers:

① Commutative Prop.:

$A + B = B + A$

$A \cdot B = B \cdot A$

example: $7 + (-12) = -12 + 7$

$8 \cdot (-5) = -5 \cdot 8$

$x + 3y = 3y + x$

$y \cdot (-4) = -4 \cdot y$

## 2) Associative Prop.:

$$A + (B + C) = (A + B) + C$$

$$A \cdot (B \cdot C) = (A \cdot B) \cdot C$$

Example: $-8 + (5 + x) = (-8 + 5) + x$

$15 \cdot (2 \cdot x) = (15 \cdot 2) \cdot x$

$23 + (7 + x^2) = (23 + 7) + x^2$

$\frac{3}{4} \cdot \left(\frac{5}{6} \cdot x\right) = \left(\frac{3}{4} \cdot \frac{5}{6}\right) \cdot x$

## 3) Distributive Prop.

$$A(B + C) = A \cdot B + A \cdot C$$

Example $5(x + 4) = 5 \cdot x + 5 \cdot 4$

$= 5x + 20$

$3(x^2 - x + 7) = 3 \cdot x^2 - 3 \cdot x + 3 \cdot 7$

$= 3x^2 - 3x + 21$

Distribute & Simplify:

$$4\left(2x - \frac{1}{2}\right) = 4(2x) - \cancel{4}^{2} \cdot \frac{1}{\cancel{2}}$$

$$= \boxed{8x - 2}$$

4) Identity Prop.

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

$a \cdot \boxed{1} = a$ Multiplicative

Example: $8 + 0 = 8$

$8 \cdot 1 = 8$

$-12 + 0 = -12$

$-12 \cdot 1 = -12$

5) Inverse Prop.

$a + (-a) = 0$

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

Example: $5 + (-5) = 0$

$8 \cdot \frac{1}{8} = 1$

$-\frac{4}{7} + \boxed{\frac{4}{7}} = 0$

$\frac{5}{3} \cdot \boxed{\frac{3}{5}} = 1$

6) Properties of 0.

$a + 0 = a$ $\quad -10 + 0 = -10$

$a \cdot 0 = 0$ $\quad 15 \cdot 0 = 0$

7) Property of 1

$a \cdot 1 = a$ $\quad 2019 \cdot 1 = 2019$

$-7x^2 \cdot 1 = -7x^2$