Math 115

Spring 2017

Lecture 2

Warm up problems

① Simplify: $\dfrac{\sqrt{5^2-(-3)^2}\ -2^3}{-4\left(3^2-2\cdot5\right)}=\dfrac{\sqrt{25-9}\ -8}{-4(9-2\cdot5)}$

$=\dfrac{\sqrt{16}\ -8}{-4(9-10)}=\dfrac{4-8}{-4(-1)}=\dfrac{-4}{4}=\boxed{-1}$

② Distribute: $-4\left(3x^2-8x+1\right)$

$=-4\cdot3x^2-4\cdot(-8x)-4\cdot1=\boxed{-12x^2+32x-4}$

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

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

Do not use $\emptyset$ for zero.

④ Translate only:

Five times the sum of 10 and some number

is equal to

the difference of twice the number and -8.

$$5 \cdot (10 + x) = 2x - (-8)$$

$$\boxed{5(10 + x) = 2x + 8}$$

⑤ Draw a rectangle such that its width is 4 inches more than half of its length. Label it.

$$\frac{1}{2}x + 4 = \frac{x}{2} + 4$$

x

Collect like terms:

① $12x - (-8x) = 12x + 8x = \boxed{20x}$

② $3x^2 - 7x + 7x^2 + 3x = \boxed{10x^2 - 4x}$

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

$= 2x^2 - 10x + 2 + 5x^2 + 10x - 5$

$= \boxed{7x^2 - 3}$

Operation with fractions:

① $\dfrac{12}{25} \cdot \dfrac{10}{9} = \dfrac{4 \cdot \cancel{3}}{\cancel{5} \cdot 5} \cdot \dfrac{2 \cdot \cancel{5}}{\cancel{3} \cdot 3} = \boxed{\dfrac{8}{15}}$

② $3\dfrac{1}{5} \div 2\dfrac{1}{5} = \dfrac{16}{5} \div \boxed{\dfrac{11}{5}}$

$= \dfrac{16}{\cancel{5}} \cdot \dfrac{\cancel{5}}{11} = \boxed{\dfrac{16}{11}} = \boxed{1\dfrac{5}{11}}$

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

$LCD = 4$

Simplify: $\dfrac{5}{6} - \sqrt{\dfrac{25}{9}}$

$= \dfrac{5}{6} - \dfrac{5 \cdot 2}{3 \cdot 2} = \dfrac{5}{6} - \dfrac{10}{6} = \dfrac{5 - 10}{6}$

$= \boxed{\dfrac{-5}{6}}$

Simplify: $\dfrac{5}{14} - \left(\dfrac{-3}{49}\right)$

$= \dfrac{5}{14} + \dfrac{3}{49} = \dfrac{5 \cdot 7}{2 \cdot 7 \cdot 7} + \dfrac{3 \cdot 2}{7 \cdot 7 \cdot 2}$

$= \dfrac{35}{98} + \dfrac{6}{98} = \boxed{\dfrac{41}{98}}$

Simplify

$$\left(\sqrt{\frac{49}{100}} - \sqrt{\frac{25}{36}}\right)^2 = \left(\frac{7}{10} - \frac{5}{6}\right)^2$$

$10 = 2 \cdot 5$

$6 = 2 \qquad \cdot 3$

$LCD = 2 \cdot 5 \cdot 3 = 30$

$(-)^{even} = +$

$(-)^{odd} = -$

$$= \left(\frac{7 \cdot 3}{10 \cdot 3} - \frac{5 \cdot 5}{6 \cdot 5}\right)^2$$

$$= \left(\frac{21}{30} - \frac{25}{30}\right)^2 = \left(\frac{-4}{30}\right)^2$$

$$= \left(\frac{-2}{15}\right)^2 = \boxed{\frac{4}{225}}$$

1) $$\frac{-8}{45} \div 1\frac{1}{3} = \frac{-8}{45} \div \frac{4}{3} = \frac{-8}{45} \cdot \frac{3}{4} = \frac{-2 \cdot 4}{15 \cdot 3} \cdot \frac{3}{4} = \boxed{\frac{-2}{15}}$$

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

$$= \frac{10x}{10} = \frac{10 \cdot x}{10 \cdot 1} = \frac{x}{1} = \boxed{x}$$

Evaluate $\frac{1}{2}x - \frac{3}{4}y$ for $x = \frac{-3}{5}$, $y = \frac{1}{3}$

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

$= \frac{-3}{10} - \frac{1}{4}$

$= \frac{-3 \cdot 2}{10 \cdot 2} - \frac{1 \cdot 5}{4 \cdot 5}$

$= \frac{-6}{20} - \frac{5}{20} = \frac{-6-5}{20} = \boxed{\frac{-11}{20}}$

$10 = 2 \cdot 5$
$4 = 2 \quad \cdot 2$
$\overline{LCD = 2 \cdot 5 \cdot 2}$
$= 20$

Evaluate $x^2 - y^3$ for $x = \frac{-3}{8}$, $y = \frac{-1}{4}$

$= \left(\frac{-3}{8}\right)^2 - \left(\frac{-1}{4}\right)^3$

$= \frac{9}{64} - \frac{-1}{64} = \frac{9}{64} + \frac{1}{64} = \frac{9+1}{64} = \frac{10}{64} = \frac{2 \cdot 5}{2 \cdot 32}$

$= \boxed{\frac{5}{32}}$

Evaluate $|x| - y^2$ for $x = \frac{-3}{4}$, $y = \frac{3}{8}$

$= \left|\frac{-3}{4}\right| - \left(\frac{3}{8}\right)^2 = \frac{3 \cdot 16}{4 \cdot 16} - \frac{9}{64} = \frac{48}{64} - \frac{9}{64} = \boxed{\frac{39}{64}}$

Properties of real numbers:

① Commutative Prop.

$$A + B = B + A \quad , \quad A \cdot B = B \cdot A$$

$$x + 7 = 7 + x \quad , \quad -5 \cdot 4 = 4 \cdot (-5)$$

$$3x + 8y = 8y + 3x \qquad \frac{3}{7} \cdot \frac{1}{2} = \frac{1}{2} \cdot \frac{3}{7}$$

② Associative Prop.

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

$$(x + 8) + 7 = x + (8 + 7) \qquad (7 \cdot 2) \cdot 5 = 7 \cdot (2 \cdot 5)$$

$$= x + 15 \qquad 6 \cdot (-4 \cdot x) = (6 \cdot -4) \cdot x$$

$$= -24x$$

③ Distributive Prop.

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

$$4(x + 7) = 4 \cdot x + 4 \cdot 7$$

$$= 4x + 28$$

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

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

$$= \boxed{-6x - 3}$$

4) Identity Prop.

$$a + 0 = a \qquad 3x + 0 = 3x$$

$$a \cdot 1 = a \qquad -8x^2 \cdot 1 = -8x^2$$

5) Inverse Prop.

$$a + (-a) = 0 \qquad 23 + (-23) = 0$$

$$a \cdot \frac{1}{a} = 1 \; ; \; a \neq 0 \qquad 5 \cdot \frac{1}{5} = 1$$

$$-7x^3 + 7x^3 = 0$$

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

Name the properties used:

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

$$4 \cdot (2x) + 4 \cdot 1 - 4 = \qquad \text{Distributive}$$

$$(4 \cdot 2)x + 4 - 4 = \qquad \text{Associative \& Identity}$$

$$8x + 0 = \qquad \text{Inverse}$$

$$8x \qquad \text{Identity}$$

Name the properties

$$3\left(\tfrac{1}{3}x - 1\right) + 3 =$$

$$3\cdot\left(\tfrac{1}{3}x\right) - 3\cdot 1 + 3 = \qquad \text{Distributive}$$

$$\left(3\cdot\tfrac{1}{3}\right)x - 3 + 3 = \qquad \text{Associative \& Identity}$$

$$1x + 0 = \qquad\qquad \text{Inverse}$$

$$x + 0 = \qquad\qquad \text{Identity}$$

$$x \qquad\qquad\qquad \text{Identity}$$

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① $(2x)\cdot 5 = 5\cdot(2x)$ Commutative

$$= (5\cdot 2)x \qquad \text{Associative}$$

$$= 10x$$

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② $(-8 + 4x)\cdot 2 + 16 = (4x - 8)\cdot 2 + 16$ Comm.

    A   + B   B   +A

$$8x + 0 = \qquad = 2(4x - 8) + 16 \qquad \text{Comm.}$$

      Inverse

$$\boxed{8x} \quad \text{Identity} \qquad = 2\cdot(4x) - 2\cdot 8 + 16 \qquad \text{Dist.}$$

$$= (2\cdot 4)x - 16 + 16 \qquad \text{Associative}$$
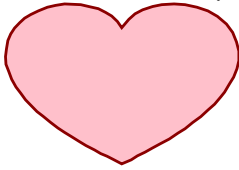
⋮

5) Name the properties used below

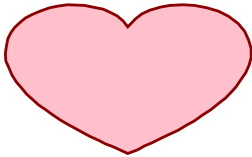$$5\left(\tfrac{1}{5}x + 1\right) - 5 = 5 \cdot \left(\tfrac{1}{5}x\right) + 5 \cdot 1 - 5$$

Dist.

$$= \left(5 \cdot \tfrac{1}{5}\right)x + 5 - 5$$

Associative
Identity

$$= 1x + 0$$

Inverse

$$= x$$

Identity

Intro to ch.2 : Solving Linear Equation

Solve: $3x - 5 = 13$

$$3x - 5 + 5 = 13 + 5$$
$$3x + 0 = 18$$
$$3x = 18$$
$$\tfrac{1}{3} \cdot (3x) = \tfrac{1}{3} \cdot 18$$

$$\left(\tfrac{1}{3} \cdot 3\right)x = 6$$
$$1x = 6$$
$$\boxed{x = 6}$$

Soln. Set. → $\{6\}$

Solve

$$2(x - 10) + 20 = -18$$

$$2x - 20 + 20 = -18$$

$$2x + 0 = -18$$

$$2x = -18$$

$$\frac{2}{2}x = -\frac{18}{2}$$

$$\{-9\}$$

Soln. Set

$$\boxed{x = -9}$$ — It is still an eqn.

Maria is <u>twice</u> as old as jose.

(Sum) of their ages $\boxed{\text{is } 45}$ Yrs.

How old are they?

Jose → x

Maria → $2x$

Maria + Jose = 45

$$2x + x = 45$$

$$3x = 45 \quad → \boxed{x = 15}$$

Jose is 15 Yrs old, and Maria is 30 Yrs old.

A rectangle has a perimeter of 38ft.
the length is 1 ft longer than its width.

1) Draw & lable the rectangle

2) Use formula for Perimeter X

P = 38
2L + 2W = 38

3) Solve to get dimensions of
   the rectangle.

$x + 1$

$2L + 2W = 38$

$2(x + 1) + 2x = 38$

$4x = 36$

$2x + 2 + 2x = 38$

$x = \frac{36}{4}$

$4x + 2 = 38$

9 ft by 10ft

$x = 9$

$4x = 38 - 2$

Due Tomorrow:

   WP 1 & SG 1

Class QZ 1   Box Your ans.

① Simplify : $\sqrt{100} - 2^2 \cdot 5$

② Evaluate : $x^3 + 8$ for $x = -2$