Math 115

Spring 2018

Lecture 4

$? \; a^2 + b^2 = c^2 \; ?$
$?$
$y = mx + b \quad d = rt$

Some Review:

① Evaluate: $\left(\dfrac{2}{3} - \dfrac{1}{2} \right)^2 \div 1\dfrac{1}{6}$

$= \left(\dfrac{4-3}{6} \right)^2 \div \dfrac{7}{6} = \left(\dfrac{1}{6} \right)^2 \cdot \dfrac{6}{7} = \dfrac{1}{\cancel{36}^{\,6}} \cdot \dfrac{\cancel{6}}{7} = \boxed{\dfrac{1}{42}}$

② Evaluate $\dfrac{\sqrt{x^2 + y^2} - xy}{x - y}$ for $x = -3 \; \& \; y = -4$
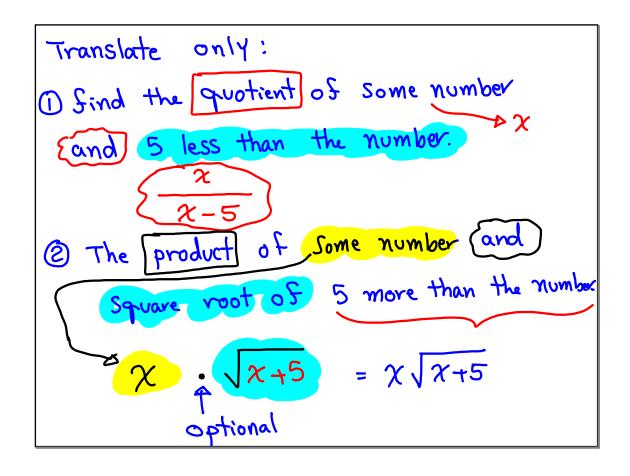
$= \dfrac{\sqrt{(-3)^2 + (-4)^2} - (-3)(-4)}{-3 - (-4)} = \dfrac{\sqrt{9 + 16} - 12}{-3 + 4} = \dfrac{\sqrt{25} - 12}{1}$
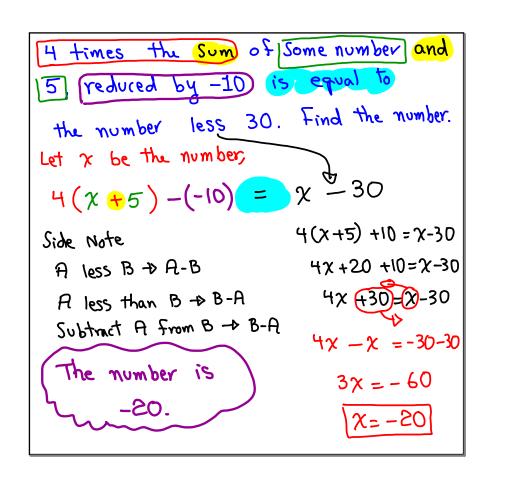
$-3^2 = -9 \;,\; (-3)^2 = 9$

$\boxed{-7} \; \circ\!\!-\!\!-\!\!- = \dfrac{5 - 12}{1} = \dfrac{-7}{1}$

Simplify & Name the prop:

$$\frac{7}{2}\left(\frac{2}{7}x + 1\right) - \frac{7}{2}$$

$$= \frac{7}{2}\cdot\left(\frac{2}{7}x\right) + \frac{7}{2}\cdot 1 - \frac{7}{2} \qquad \text{Distributive}$$

$$= \left(\frac{7}{2}\cdot\frac{2}{7}\right)x + \frac{7}{2}\cdot 1 - \frac{7}{2} \qquad \text{Associative}$$

$$= 1\cdot x + \frac{7}{2}\cdot 1 - \frac{7}{2} \qquad \text{Inverse}$$

$$= x + \frac{7}{2} - \frac{7}{2} \qquad \text{Identity}$$

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

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

Translate only:

① find the **quotient** of some number → x
and 5 less than the number.

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

② The **product** of some number **and**
square root of 5 more than the number

$$x \cdot \sqrt{x+5} = x\sqrt{x+5}$$

optional

Solve

① $4x - 3 = -39$

$4x = -39 + 3$

$4x = -36$

$x = \dfrac{-36}{4}$

$\boxed{x = -9}$

$\{-9\}$

② $-2x + 7 = -13$

$-2x = -13 - 7$

$-2x = -20$

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

$\boxed{x = 10}$

$\{10\}$

Solve

① $3(x - 2) - 12 = x - 40$

$3x - 6 - 12 = x - 40$

$3x - 18 = x - 40$

$3x - x = -40 + 18$

$2x = -22$

$\boxed{x = -11}$

$\{-11\}$

② $4(2x + 5) - 8(x - 1) = 28$

$8x + 20 - 8x + 8 = 28$

$28 = 28 \rightarrow$ True $\rightarrow$ infinite number of Solutions

$0 = 28 - 28$

$0 = 0$

$\mathbb{R}$

All Real numbers

3

Solve:

① $\frac{3}{4}x + \frac{1}{2} = \frac{1}{6}x - \frac{1}{3}$ Hint: use LCD to clear fractions

$4 = 2 \cdot 2$
$6 = 2 \cdot 3$
$2 = 2$
$3 = \qquad 3$
$LCD = 2 \cdot 2 \cdot 3 = 12$

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

$9x + 6 = 2x - 4$
$9x - 2x = -4 - 6$

$7x = -10$

$\boxed{x = \frac{-10}{7}}$

$\left\{\frac{-10}{7}\right\}$

② $5(3x - 4) - 7(2x + 3) = x + 41$

$15x \,(-20) - 14x \,\boxed{-21} = x + 41$

$x - 41 = x + 41$

$x - x = 41 + 41$

$0 = 82$
false

$\boxed{\varnothing}$ $\{\ \}$ $\boxed{\text{No Soln}}$

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4 times the **sum** of Some number and 5 reduced by −10 is equal to the number less 30. Find the number.

Let x be the number.

$4(x + 5) - (-10) = x - 30$

Side Note
 A less B → A−B
 A less than B → B−A
 Subtract A from B → B−A

The number is −20.

$4(x+5) + 10 = x - 30$
$4x + 20 + 10 = x - 30$
$4x + 30 = x - 30$
$4x - x = -30 - 30$
$3x = -60$
$\boxed{x = -20}$

Class Quiz: <u>Box Your final Ans</u>

Solve

① $5x - 3 = x + 33$

$5x - x = 33 + 3$

$4x = 36$

$x = \frac{36}{4}$ $\boxed{x = 9}$ $\{9\}$

② $\frac{2}{3}x - \frac{1}{2} = x$

LCD = 6

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

$4x - 3 = 6x$

$4x - 6x = 3$

$-2x = 3$

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

$\boxed{\{\frac{-3}{2}\}}$

③ $3(x+2) - (x+6) = 2x$

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

$2x = 2x$

$2x - 2x = 0$

$0 = 0$ True

infinite # of Solns, $\boxed{\mathbb{R}}$

Complex Fractions

It is a fraction that contains fraction.

$$\frac{\frac{1}{2} - \frac{1}{3}}{4} \quad , \quad \frac{3\frac{1}{3} - 4\frac{2}{5}}{7\frac{1}{2}} \quad , \quad \frac{\frac{5}{7} - 3}{\frac{2}{3} + 1}$$

To Simplify or reduce complex fractions,

① find LCD of <u>all denominators</u>

② Multiply <u>everything</u> by the LCD

③ Simplify, Simplify, Simplify.

Simplify

$$\frac{\frac{2}{5} - \frac{1}{4}}{1\frac{3}{10}} = \frac{\frac{2}{5} - \frac{1}{4}}{\frac{13}{10}}$$

$$= \frac{\overset{4}{\cancel{20}} \cdot \frac{2}{5} - \overset{5}{\cancel{20}} \cdot \frac{1}{4}}{\underset{2}{\cancel{20}} \cdot \frac{13}{10}}$$

LCD = 20

$$= \frac{4 \cdot 2 - 5 \cdot 1}{2 \cdot 13} = \frac{8 - 5}{26}$$

$$= \boxed{\frac{3}{26}}$$

Simplify

$$\frac{3\frac{1}{4} - 4\frac{2}{3}}{3 - \frac{5}{6}} = \frac{\frac{13}{4} - \frac{14}{3}}{3 - \frac{5}{6}}$$

LCD = 12

$$= \frac{\overset{3}{\cancel{12}} \cdot \frac{13}{4} - \overset{4}{\cancel{12}} \cdot \frac{14}{3}}{12 \cdot 3 - \underset{2}{\cancel{12}} \cdot \frac{5}{6}} = \frac{3 \cdot 13 - 4 \cdot 14}{12 \cdot 3 - 2 \cdot 5} = \frac{39 - 56}{36 - 10}$$

$$= \boxed{\frac{-17}{26}}$$

Ratio of A to B $\Rightarrow \dfrac{A}{B}$

Find the ratio of 24 to 80.

$$\frac{24}{80} = \frac{\cancel{8} \cdot 3}{\cancel{8} \cdot 10} = \boxed{\frac{3}{10}}$$

find the ratio of $3\frac{1}{3}$ to $1\frac{1}{5}$.

$$\frac{3\frac{1}{3}}{1\frac{1}{5}} = \frac{\frac{10}{3}}{\frac{6}{5}} = \frac{10}{3} \div \frac{6}{5} = \frac{10}{3} \cdot \frac{5}{\cancel{6}_3} = \boxed{\frac{25}{9}}$$

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find the ratio of $3\frac{3}{4}$ to 5.

$$\frac{3\frac{3}{4}}{5} = \frac{\frac{15}{4}}{5} = \frac{15}{4} \div 5 = \frac{15}{4} \div \frac{5}{1}$$

$$= \frac{\cancel{15}^3}{4} \cdot \frac{1}{\cancel{5}} = \boxed{\frac{3}{4}}$$

when two ratios are equal to each other
we have proportion.

$$\frac{A}{B} = \frac{C}{D}$$

To verify, do cross-multiplication

$$AD = BC$$

Verify the following proportion

$$\frac{2.5}{15} = \frac{6}{80} \implies 2.5(80) \overset{?}{=} 6(15)$$

$$200 \overset{?}{=} 90$$

Not a true Proportion.

$$\frac{4\frac{2}{3}}{56} = \frac{\frac{3}{4}}{9}$$

$$56 \cdot \frac{3}{4} = 9 \cdot 4\frac{2}{3}$$

$$\frac{\overset{14}{\cancel{56}}}{1} \cdot \frac{3}{\cancel{4}} = \overset{3}{\cancel{9}} \cdot \frac{\overset{14}{14}}{\cancel{3}}$$

True Proportion $42 = 42$ ✓

Solving Proportion Equation

Solve $\frac{x}{1.5} = \frac{4}{3}$ Cross-Multiply

$$3x = 4(1.5)$$

$$x = \frac{4(1.5)}{3} \qquad \boxed{x = 2}$$

$$\{2\}$$

$$\frac{x-4}{8} = \frac{3}{2}$$

Hint: Cross-Multiply

$$2(x-4) = 8 \cdot 3$$

$$2x - 8 = 24$$

$$2x = 24 + 8$$

$$2x = 32 \qquad \boxed{x = 16}$$

$$\{16\}$$

Solve $\dfrac{2x+3}{5x-1} = \dfrac{2}{5}$ Hint: Cross-Multiply

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

$$10x +15 = 10x -2$$

$$10x - 10x = -2 -15$$

$$0 = -17 \quad \text{False} \rightarrow \emptyset$$

No Soln.

It took Leo 4.5 hrs to build 3 walls. At this rate, How many of these walls can he build in 18 hours?
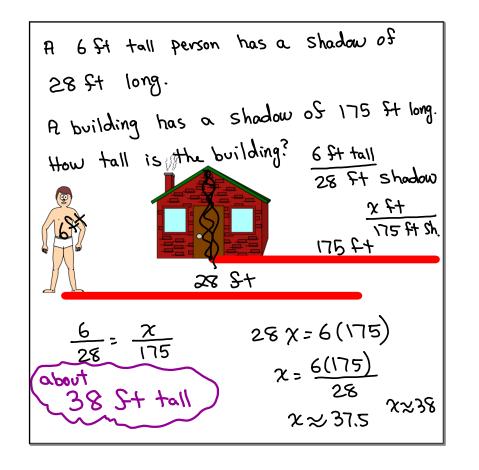
$$\frac{4.5 \text{ hrs}}{3 \text{ Walls}} = \frac{18 \text{ hours}}{x \text{ Walls}}$$

Solve $\dfrac{4.5}{3} = \dfrac{18}{x}$

$$4.5x = 3 \cdot 18$$

$$x = \frac{3 \cdot 18}{4.5} \quad x = 12$$

12 Walls

Maria used 2.5 cups of sugar to bake 20 muffins. At this rate, how many cups of sugar do I need to bake 50 muffins?

$$\frac{2.5 \text{ cups}}{20 \text{ Muffins}} = \frac{x \text{ cups}}{50 \text{ Muf.}}$$

Solve $\quad \dfrac{2.5}{20} = \dfrac{x}{50}$

$20x = 2.5(50)$

$x = \dfrac{2.5(50)}{20}$

$x = 6.25$

6.25 cups of Sugar.

A 6 ft tall person has a shadow of 28 ft long.

A building has a shadow of 175 ft long. How tall is the building?

$\dfrac{6 \text{ ft tall}}{28 \text{ ft shadow}}$

$\dfrac{x \text{ ft}}{175 \text{ ft Sh.}}$

6 ft

175 ft

28 ft

$\dfrac{6}{28} = \dfrac{x}{175}$

$28x = 6(175)$

$x = \dfrac{6(175)}{28}$

$x \approx 37.5 \qquad x \approx 38$

about 38 ft tall

Due Monday

SG 3
but also work on SG4 (will be
                        collected at
                        the end of
                        class).

How to do word Problems

Do ch. 1   Make sure to use the cover
           page and the work page.