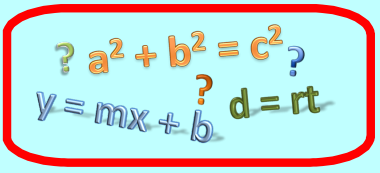
Math 115

Fall 2018

Lecture 2



Review

① Simplify: $(3^2 - (-2)^3)(\sqrt{121} - 5 \cdot 2)$

$= (9 - (-8))(11 - 10) = (9 + 8)(1) = 17 \cdot 1 = \boxed{17}$

② Simplify: $\dfrac{5^3 - |-100|}{(-3)^2 + (-2)^4} = \dfrac{125 - |-100|}{9 + 16} = \dfrac{125 - 100}{25}$

$= \dfrac{25}{25} = \boxed{1}$

③ Evaluate $(x-y)^z$ for $x=1$, $y=-4$, and $z=3$

$(x-y)^z =$

$(1-(-4))^3 = (1+4)^3 = 5^3 = \boxed{125}$

④ Evaluate $-b-\sqrt{b^2-4ac}$ for $a=3$, $b=-5$, and $c=-2$.

$-b-\sqrt{b^2-4ac} = -(-5)-\sqrt{(-5)^2-4(3)(-2)}$

$= 5-\sqrt{25-(-24)}$

$= 5-\sqrt{25+24} = 5-\sqrt{49} = 5-7 = \boxed{-2}$

Name the Property

① $4(x+3) = 4x+4\cdot 3$ Distribution

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

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

$= -6x-3$ Identity

③ $5(x+1)-5 = 5x+5\cdot 1-5$ Dist.

$= 5x+5-5$ Identity

$= 5x+0$ Inverse

$= 5x$ Identity

Working with fractions:

Reduce $\frac{120}{450} = \frac{12 \cdot 10}{45 \cdot 10} = \frac{3 \cdot 4}{3 \cdot 15} = \frac{4}{15}$

Reduce $\frac{75}{80} = \frac{5 \cdot 15}{5 \cdot 16} = \frac{3 \cdot 5}{2 \cdot 2 \cdot 2 \cdot 2} = \boxed{\frac{15}{16}}$

Reduce $\frac{14x^5}{35x^2} = \frac{2 \cdot 7 \cdot \overbrace{x \cdot x \cdot x}^{3} \cdot x \cdot x}{5 \cdot 7 \cdot x \cdot x} = \boxed{\frac{2x^3}{5}}$

$= \boxed{\frac{2}{5}x^3}$

Multiply $\frac{-10}{49} \cdot \frac{35}{24}$

$= -\frac{2 \cdot 5}{7 \cdot 7} \cdot \frac{5 \cdot 7}{2 \cdot 12} = \boxed{-\frac{25}{84}}$

$= \boxed{\frac{-25}{84}}$

Multiply:

$4\frac{1}{2} \cdot \frac{16}{9} = \frac{9}{2} \cdot \frac{16}{9} = \frac{8}{1}$

$= \boxed{8}$

Multiply

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

$$= \left(-\frac{27}{5}\right) \cdot \left(-\frac{13}{3}\right)$$

$$= + \frac{9 \cdot 3}{5} \cdot \frac{13}{3} = \frac{117}{5}$$

$$5 \overline{)117} \quad 23$$
$$-10$$
$$17$$
$$-15$$
$$2$$

$$= \boxed{23\frac{2}{5}}$$

Divide $\frac{5}{12} \div \frac{-5}{21}$

$$\frac{a}{b} \div \boxed{\frac{c}{d}} =$$

$$= \frac{1}{\cancel{5}} \cdot \frac{\cancel{-21}^{7}}{\cancel{12}_{4}\ \cancel{5}_{1}} = \boxed{\frac{-7}{4}} = \boxed{-1\frac{3}{4}}$$

$$\frac{a}{b} \cdot \frac{d}{c}$$

$$4 \overline{)7} \quad 1$$
$$-4$$
$$3$$

Divide $7\frac{1}{2} \div \left(-3\frac{3}{4}\right)$

$$= \frac{15}{2} \div \left(-\frac{15}{4}\right) = \frac{\cancel{15}}{\cancel{2}_{1}} \cdot \frac{\cancel{-4}^{2}}{\cancel{15}} = \frac{-2}{1} = \boxed{-2}$$

Addition & Subtraction with like fractions

Same Denominator

$$\frac{9}{16} + \frac{3}{16} = \frac{9+3}{16} = \frac{\cancel{12}^{3}}{\cancel{16}_{4}} = \boxed{\frac{3}{4}}$$

$$\frac{5}{21} - \frac{-2}{21} = \frac{5-(-2)}{21}$$

$$= \frac{5+2}{21} = \frac{7}{21} = \frac{\cancel{7}\cdot 1}{\cancel{7}\cdot 3}$$

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

$$\frac{3x+1}{x-1} - \frac{2x}{x-1} - \frac{2}{x-1}$$

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

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

$x \neq 1$

Addition / Subtraction with unlike fractions

denominators are different

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

LCD $= 3\cdot 2 = 6$

$$= \frac{4}{6} - \frac{3}{6} = \frac{4-3}{6} = \boxed{\frac{1}{6}}$$

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

LCD $= 12$

$4 = 2\cdot 2$

$6 = 2 \cdot 3$

LCD $= 2\cdot 2\cdot 3$

$$= \frac{9}{12} + \frac{10}{12} = \boxed{\frac{19}{12}} = \boxed{1\frac{7}{12}}$$

Simplify: $\frac{15}{32} - \frac{5}{24}$

$32 = 2\cdot 2\cdot 2\cdot 2\cdot 2 \cdot \boxed{3}$

$24 = 2\cdot 2\cdot 2\cdot \boxed{2}\cdot \boxed{2}\cdot 3$

LCD $= 2\cdot 2\cdot 2\cdot 2\cdot 2\cdot 3 = 96$

$$= \frac{15\cdot 3}{32\cdot 3} - \frac{5\cdot 4}{24\cdot 4}$$

$$= \frac{45}{96} - \frac{20}{96} = \boxed{\frac{25}{96}}$$

Simplify: $\left(\frac{3}{10} - \frac{2\cdot 2}{5\cdot 2}\right) \div \left(1\frac{1}{5}\right)$

LCD = 10

$= \left(\frac{3}{10} - \frac{4}{10}\right) \div \left(\frac{6}{5}\right)$

$= \frac{-1}{10} \cdot \frac{5^{1}}{6} = \boxed{\frac{-1}{12}}$

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Simplify: $\frac{3}{2} \cdot \sqrt{\frac{4}{9}} = \frac{3}{2} \cdot \frac{2}{3} = 1$ Inverse

Simplify: $\frac{1}{2}(2x + 6) - (x + 3)$

$= \frac{1}{2}\cdot(2x) + \frac{1}{2}\cdot 6 - x - 3$ Dist.

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

$= 1x - x + 3 - 3$ Inverse, Commutative

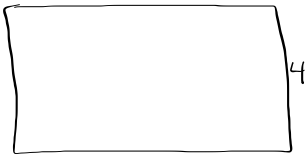
$= x - x + 3 - 3$ identity

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

Find the area & Perimeter:

$A = LW$

$P = 2L + 2W$



$A = 8\frac{1}{4} \cdot 4\frac{2}{3} = \frac{\cancel{33}^{11}}{\cancel{4}_{2}} \cdot \frac{\cancel{14}^{7}}{\cancel{3}} = \frac{77}{2} = 38\frac{1}{2}\ m^2$

$P = 2 \cdot 8\frac{1}{4} + 2 \cdot 4\frac{2}{3}$ LCD = 6

$= \cancel{2} \cdot \frac{33}{\cancel{4}_{2}} + 2 \cdot \frac{14}{3} = \frac{33}{2} + \frac{28}{3} = \frac{33 \cdot 3}{2 \cdot 3} + \frac{28 \cdot 2}{3 \cdot 2}$

$= \frac{99}{6} + \frac{56}{6} = \frac{99+56}{6}$

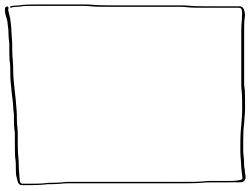
$= \frac{155}{6} = 25\frac{5}{6}\ m$

$$\begin{array}{r} 25 \\ 6\overline{)155} \\ -12 \\ \hline 35 \\ -30 \\ \hline 5 \end{array}$$

Find A & P

$A = S^2$

$P = 4S$



$A = \left(3\frac{1}{4}\right)^2 = \left(\frac{13}{4}\right)^2$

$= \frac{169}{16}\ cm^2$

$= 10\frac{9}{16}\ cm^2$

$P = 4\left(3\frac{1}{4}\right)$

$= \frac{\cancel{4}}{1} \cdot \frac{13}{\cancel{4}} = 13\ cm$

Evaluate $x + y - xy$ for $x = \frac{2}{3}, y = \frac{-3}{5}$

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

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

LCD = 15

$= \frac{10 - 9 + 6}{15} = \boxed{\frac{7}{15}}$

Working with Complex Fractions

Fraction that contains other fractions

$$\frac{3 - \frac{1}{4}}{1 + \frac{1}{2}} = \frac{4 \cdot 3 - 4 \cdot \frac{1}{4}}{4 \cdot 1 + 4 \cdot \frac{1}{2}} = \frac{12 - 1}{4 + 2} = \boxed{\frac{11}{6}}$$

LCD = 4

Simplify $\dfrac{3\frac{1}{5} - 1\frac{1}{2}}{-\frac{17}{10}} = \dfrac{\frac{16}{5} - \frac{3}{2}}{-\frac{17}{10}}$

LCD = 10

$= \dfrac{\cancel{10}^{2} \cdot \frac{16}{\cancel{5}} - \cancel{10}^{5} \cdot \frac{3}{\cancel{2}}}{\cancel{10} \cdot \frac{-17}{\cancel{10}}} = \dfrac{32 - 15}{-17} = \dfrac{17}{-17} = \boxed{-1}$

Evaluate $\dfrac{x - y}{xy}$ for $x = \frac{-3}{4}$ and $y = \frac{1}{5}$

$= \dfrac{\frac{-3}{4} - \frac{1}{5}}{\frac{-3}{4} \cdot \frac{1}{5}} = \dfrac{\frac{-3}{4} - \frac{1}{5}}{\frac{-3}{20}} = \dfrac{\cancel{20}^{5} \cdot \frac{-3}{\cancel{4}} - \cancel{20}^{4} \cdot \frac{1}{\cancel{5}}}{\cancel{20} \cdot \frac{-3}{\cancel{20}}}$

LCD = 20

$= \dfrac{-15 - 4}{-3}$

$= \dfrac{-19}{-3} = \boxed{\dfrac{19}{3}}$

Simplify

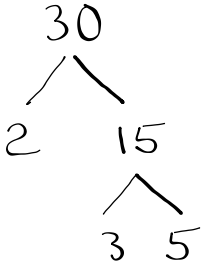
Hint: Distribute

$3(x^2+8x+1)-2(x^2+12x-1)-5$

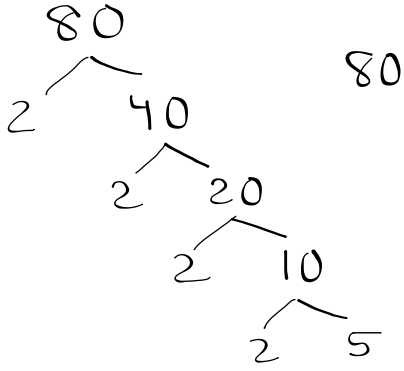
$= 3x^2 + 24x + 3 - 2x^2 - 24x + 2 - 5$

$= 3x^2 - 2x^2 = 1x^2 = x^2$

Prime Factorization



$30 = 2 \cdot 3 \cdot 5$



$80 = \underbrace{2 \cdot 2 \cdot 2 \cdot 2}_{4} \cdot 5$

$= 2^4 \cdot 5$

Find Prime Factorization

① $75 = 3 \cdot 25 = 3 \cdot 5 \cdot 5 = \boxed{3 \cdot 5^2}$

② $210 = 21 \cdot 10 = 3 \cdot 7 \cdot 2 \cdot 5 = \boxed{2 \cdot 3 \cdot 5 \cdot 7}$

③ $1230 = 123 \cdot 10 = 3 \cdot 41 \cdot 2 \cdot 5 = \boxed{2 \cdot 3 \cdot 5 \cdot 41}$

GCF : Greatest Common Factor

24 & 16

$24 = \boxed{8} \cdot 3$
$16 = 8 \cdot 2$

GCF = 8

Find the GCF

$20x^2$, $30x$, $40x^3$

$20x^2 = 10 \cdot 2 \cdot x \cdot x$
$30x = 10 \cdot 3 \cdot x$
$40x^3 = 10 \cdot 2 \cdot 2 \cdot x \cdot x \cdot x$

$\Rightarrow$ GCF = $10x$

LCM: Least Common Multiple

15 ⇒ 15, 30, 45, 60, 75, ---

20 ⇒ 20, 40, 60, 80, 100, ----

$15 = 3 \cdot 5$

$20 = 5 \cdot 2 \cdot 2$

LCM = $3 \cdot 5 \cdot 2 \cdot 2 =$

Find LCM for 24 & 30.

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

$30 = 2 \cdot 3 \cdot 5$

LCM = $2 \cdot 2 \cdot 2 \cdot 3 \cdot 5 =$ 120

CH. 1 ✓