

Multiplying & Dividing Rational Expressions

Recall

$$\frac{3}{5} \cdot \frac{4}{9} = \frac{\overset{4}{\cancel{12}}}{\underset{15}{\cancel{45}}} = \frac{4}{15}$$

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

To multiply:

- ① factor each num/den completely
- ② Divide num. and den. by common factors.
- ③ multiply remaining factors in num. & den.

$$\textcircled{1} \frac{\frac{3a}{\cancel{15a^2}}}{\frac{\cancel{14}}{2}} \cdot \frac{\cancel{7}^1}{\cancel{5a}_1} = \frac{3a}{2}$$

②

$$\frac{\overset{1}{z+9}}{\underset{4}{\cancel{1z}}} \cdot \frac{\overset{z^2}{\cancel{3z^2}}}{\underset{1}{\cancel{z+9}}} = \frac{z^2}{4}$$

$$\textcircled{3} \quad \frac{5x-15}{3x+9} \cdot \frac{4x+12}{6x-18}$$

$$\frac{5(\cancel{x-3})}{3(\cancel{x+3})} \cdot \frac{4(\cancel{x+3})}{\underset{3}{\cancel{6}}(\cancel{x-3})}$$

$$\frac{10}{9}$$

④

$$\frac{27-3z}{4} \cdot \frac{12}{2z-18}$$

$$\frac{3(\overset{-1}{\cancel{9-z}})}{\cancel{4}} \cdot \frac{\overset{3}{\cancel{12}}}{2(\cancel{z-9})}$$

$$-\frac{9}{2}$$

Recall, $\frac{3}{5} \div \frac{9}{10}$

$$\frac{\cancel{3}}{\cancel{5}} \cdot \frac{10^2}{9} = \frac{2}{3}$$

To divide:

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

multiply ^{1st} fraction by reciprocal of ^{2nd}.

Ex. ① $\frac{3}{2y-6} \div \frac{6}{y-3}$

$\frac{\cancel{2}}{\cancel{2}(y-3)} \cdot \frac{\cancel{y-3}}{6}$

$\frac{1}{6}$

$$\textcircled{2} \quad \frac{2-t}{8} \div \frac{t-2}{6}$$

$$\frac{\overset{-1}{\cancel{2-t}}}{\cancel{8}_4} \cdot \frac{\cancel{6}^3}{\cancel{t-2}} = \frac{-3}{4}$$

$$\textcircled{3} \frac{z^2 - 3z + 2}{z^2 + 4z + 3} \div \frac{z-1}{z+1}$$

$$\frac{(z-2)\cancel{(z-1)}}{(z+3)\cancel{(z+1)}} \cdot \frac{\cancel{z+1}}{\cancel{z-1}}$$

$$\frac{z-2}{z+3}$$

④

$$\frac{m^2 - 4}{16 - 8m} \div \frac{m + 2}{8}$$

$$\frac{\cancel{(m+2)} \cancel{(m-2)}}{8 \cancel{(2-m)}} \cdot \frac{\cancel{8}}{\cancel{m+2}}$$

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