1.5B Operations with Rational Numbers
Multiplication / Division

Multiplying Fractions:

Recall: Multiplication is just repeated addition.
The result of multiplication is called the product.

Steps:
1. Change mixed fractions to improper
2. Simplify signs

Ex. 5: Multiply.

a) $3 \cdot \frac{2}{5}$

$= \frac{2}{5} + \frac{2}{5} + \frac{2}{5}$

$= \frac{6}{5}$

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

The result is the product of the numerators over the product of the denominators.

b) $\frac{2}{3} \cdot \frac{1}{2}$

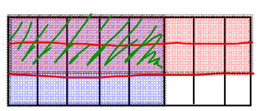
$= \frac{2}{6} \begin{matrix} \div 2 \\ \div 2 \end{matrix}$

$= \frac{1}{3}$

This is "half of two-thirds" which is one-third.

Multiply the numerators together and multiply the denominators together.

c) $\frac{5}{8} \cdot \frac{2}{3}$



$\frac{5}{8}$

$= \frac{10}{24} \begin{matrix} \div 2 \\ \div 2 \end{matrix}$

$= \frac{5}{12}$

Nice shortcut!

$\frac{5}{\cancel{8}_4} \cdot \frac{\cancel{2}^1}{3}$

$= \frac{5}{12}$

$\frac{2}{8} \begin{matrix} \div 2 \\ \div 2 \end{matrix} = \frac{1}{4}$

When multiplying fractions, you can reduce any number in a numerator with any number in a denominator **before** you multiply, by dividing out a common factor.

Ex. 6: Multiply

a) $\frac{11}{4} \cdot \frac{8}{33}$

$= \frac{2}{3}$

b) $\frac{15}{3} \cdot \frac{18}{25}$

$= \frac{18}{5}$

Ex. 7: Reduce, then multiply.

$\frac{6}{14} \bullet \frac{-7}{2}$

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

b) $-2\frac{1}{4} \bullet 3\frac{2}{6}$

$= -\frac{8+1}{4} \cdot \frac{18+2}{6}$

$= -\frac{9}{4} \cdot \frac{20}{6}$

$= -\frac{15}{2}$

Dividing Fractions:

Ex. 8: Divide.

$\frac{3}{4} \div \frac{5}{7}$

Process: Instead of dividing, multiply by the reciprocal.

$\frac{4}{5}$ (fraction) ⟶ $\frac{5}{4}$ (reciprocal)

$= \frac{3}{4} \times \frac{7}{5}$

$= \frac{21}{20}$

Ex. 9: Divide.

a) $\frac{-6}{5} \div \frac{7}{2}$

$= -\frac{6}{5} \times \frac{2}{7}$

$= -\frac{12}{35}$

b) $\frac{4}{3} \div \left(-2\frac{4}{9}\right)$ ← convert to improper first!

$= \frac{4}{3} \div \left(-\frac{22}{9}\right)$

$= \frac{4}{3} \times -\frac{9}{22}$

$= -\frac{6}{11}$

c) $\frac{3}{2} \cdot \frac{1}{6} \div \frac{5}{12}$

$= \frac{3}{2} \cdot \frac{1}{6} \cdot \frac{12}{5}$

$= \frac{3}{5}$

d) $\left(\frac{1}{2} - \frac{4}{5}\right) \div \frac{9}{25}$

$= \left(\frac{5}{10} - \frac{8}{10}\right) \times \frac{25}{9}$

$= -\frac{3}{10} \times \frac{25}{9}$

$= -\frac{5}{6}$

Ex. 10:
During one week it rained for two and a half hours on Monday, one and three quarter hours on Tuesday, and two and five sixth hours on Wednesday.
a) Find the total period of rainfall for this week.

b) How much longer did it rain on Wednesday than on Tuesday?

Ex. 11: Suppose your friend has half a chocolate bar left and you eat $\frac{2}{3}$ of it.
What fraction is left uneaten?

Ex. 12: Maheen has a jar of jelly beans that is $\frac{2}{3}$ full.
She wants to divide it into 3 equal parts to share with her friends. What fraction of the whole jar will each friend have?

Homework is only:

Set 1: #5ace, 6ace, 7ace, 8 ,10

Set 2: #6ace, 7ace, 10,12,13,14