

## 1.3 Multiplying & Dividing Fractions

Recall: Multiplication is just repeated addition.

The result of multiplication is called the product.

Example 2: Multiply.

$$\begin{aligned} \text{a) } 3 \cdot \frac{2}{5} &= \frac{2}{5} + \frac{2}{5} + \frac{2}{5} \\ &= \frac{6}{5} \end{aligned}$$



$$\begin{aligned} \text{b) } 4 \cdot \frac{3}{7} &= \frac{3}{7} + \frac{3}{7} + \frac{3}{7} + \frac{3}{7} \\ &= \frac{12}{7} \end{aligned}$$



So the result is the product of the numerators over the denominator.

$$\begin{aligned} 3 \cdot \frac{2}{5} &= \frac{3 \cdot 2}{5} \\ &= \frac{6}{5} \end{aligned}$$

$$\begin{aligned} 4 \cdot \frac{3}{7} &= \frac{4 \cdot 3}{7} \\ &= \frac{12}{7} \end{aligned}$$

c)  $\frac{2}{3} \cdot \frac{1}{2}$  This is "half of two-thirds" which is one-third.

$$\begin{aligned} \frac{2}{3} \cdot \frac{1}{2} &= \frac{2 \cdot 1}{3 \cdot 2} \\ &= \frac{2}{6} \\ &= \frac{1}{3} \end{aligned}$$



Multiply the numerators together and multiply the denominators together.

Click here!



DO NOT NEED  
A COMMON  
DENOMINATOR

$$\text{c) } \frac{4}{7} \cdot \frac{2}{5}$$

$$= \frac{8}{35}$$

$$\text{d) } \frac{\boxed{\begin{array}{cc} 4 & 5 \\ 3 & 12 \end{array}}}{\div 4} \rightarrow \frac{1}{3} \cdot \frac{5}{3}$$

$$= \frac{20}{36} \div 4$$

$$= \frac{5}{9}$$

$$\text{e) } \frac{\begin{array}{cc} \div 11 & \div 4 \\ 11 & 8 \\ \div 4 & \div 11 \\ 4 & 33 \end{array}}{\div 4}$$

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

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

Notice



When multiplying fractions, you can reduce any number in the numerator with any number in the denominator before you multiply.

Example 3: Simplify, then multiply.

$$\begin{aligned} \text{a) } & \frac{\overset{\div 5}{\cancel{5}}}{3} \cdot \frac{4}{\underset{\div 5}{\cancel{25}}} \\ &= \frac{1}{3} \cdot \frac{4}{5} \\ &= \frac{4}{15} \end{aligned}$$

$$\begin{aligned} \text{b) } & \frac{\overset{\div 6}{\cancel{6}}}{\underset{\div 7}{\cancel{7}}} \cdot \frac{\overset{\div 7}{\cancel{21}}}{\underset{\div 6}{\cancel{48}}} \\ &= \frac{1}{1} \cdot \frac{3}{8} \\ &= \frac{3}{8} \end{aligned}$$

## Dividing Fractions

Example 4: Divide.

$$\frac{3}{4} \div \frac{5}{7} = ??? \quad \text{This is asking how many times } \frac{5}{7} \text{ goes into } \frac{3}{4}.$$

Trick: Invert & Multiply!

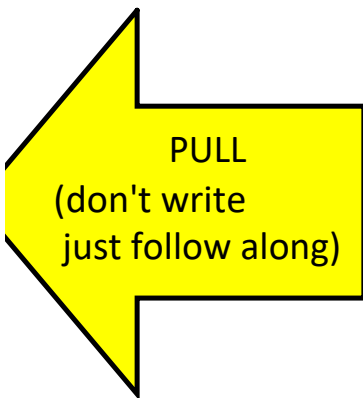
$$\begin{aligned} \frac{3}{4} \div \frac{5}{7} &= \frac{3}{4} \cdot \frac{7}{5} \\ &= \frac{21}{20} \end{aligned}$$

This is called the reciprocal.

Click here!

\*take reciprocal  
FIRST - before you reduce

Why does this work?



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

Write it as one big fraction

$$\begin{array}{r} \frac{3}{4} \cdot \frac{7}{5} \\ \hline \frac{5}{7} \cdot \frac{7}{5} \end{array}$$

Let's make the denominator equal to 1 to get rid of it...

$$= \frac{\frac{3}{4} \cdot \frac{7}{5}}{1}$$

Look at what's left!

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

$$= \frac{21}{20}$$

Example 5: Divide.

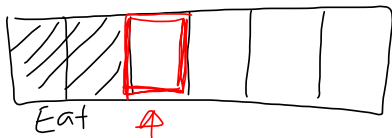
$$\begin{aligned} \text{a) } \frac{6}{5} \div \frac{7}{2} \\ &= \frac{6}{5} \cdot \frac{2}{7} \\ &= \frac{12}{35} \end{aligned}$$

$$\begin{aligned} \text{b) } \frac{4}{3} \div \left(-\frac{5}{9}\right) \\ &= \frac{4}{\cancel{3}^{\div 3}} \times \left(-\frac{\cancel{9}^{\div 3}}{5}\right) \\ &= \frac{4}{1} \times \left(-\frac{3}{5}\right) \\ &= -\frac{12}{5} \end{aligned}$$

$$\begin{aligned} \text{c) } \frac{\cancel{3}^{\div 3}}{2} \cdot \frac{1}{\cancel{6}^{\div 3}} \div \frac{5}{12} \\ &= \frac{1}{2} \cdot \frac{1}{2} \div \frac{5}{12} \\ &= \frac{\cancel{1}^{\div 4}}{\cancel{4}^{\div 4}} \times \frac{\cancel{12}^{\div 4}}{5} \\ &= \frac{1}{1} \times \frac{3}{5} \\ &= \frac{3}{5} \end{aligned}$$

$$\begin{aligned} \text{d) } \left(\frac{1}{2} - \frac{4}{5}\right) \div \frac{9}{25} \\ &= \left(\frac{5}{10} - \frac{8}{10}\right) \times \frac{25}{9} \\ &= \left(-\frac{\cancel{3}^{\div 3}}{\cancel{10}^{\div 5}}\right) \times \frac{\cancel{25}^{\div 5}}{\cancel{9}^{\div 3}} \\ &= -\frac{1}{2} \times \frac{5}{3} \\ &= -\frac{5}{6} \end{aligned}$$

Example 6: Suppose your friend has half a chocolate bar left and you eat  $\frac{2}{3}$  of it. What fraction of the whole chocolate bar is left?



We ate

$$\frac{1}{2} \times \frac{2}{3} \\ = \frac{1}{3}$$

Whats left

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

Have left:  $\frac{1}{6}$



Example 7: Kennedy 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: Handout 1.3

