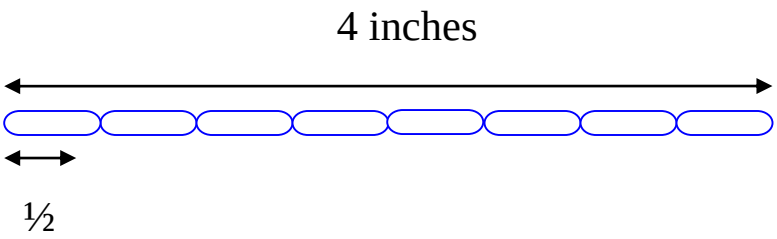
DIVIDING FRACTIONS AND MIXED FRACTIONS

To divide fractions we multiply by the inverse of the second fraction. Sometimes the answer will be larger than either of the numbers being divided. That seems strange for division, but when fractions are involved, it can happen! To understand the meaning of the division process, we'll first look at modeling division of fractions and then we will practice dividing fractions using paper and pencil.

Introduction to Division of Fractions

A child's bracelet is 4 inches long. Each of the links is ½ inch long. How many links are in the chain?



$$4 \div \frac{1}{2} = 8$$

It takes eight ½-inch links to make up a bracelet 4 inches long.

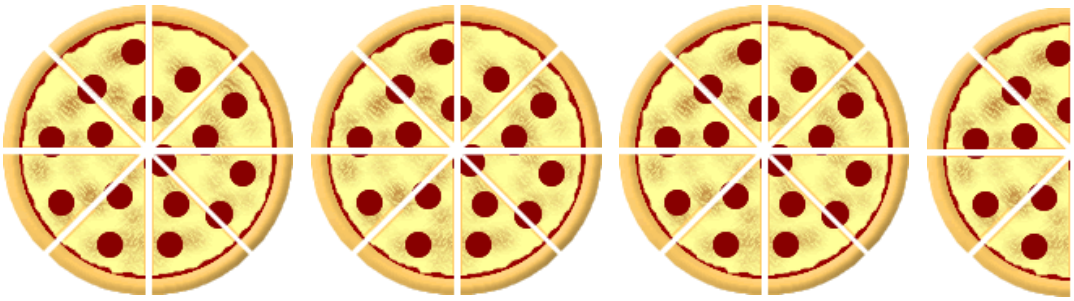
To divide fractions, multiply by the inverse. The inverse is sometimes referred to as the reciprocal. Just flip the fraction to find its reciprocal. The reciprocal of $\frac{1}{2}$ is $\frac{2}{1}$. Mathematically, the inverse (reciprocal) of a fraction is the fraction that is multiplied by the original fraction to get 1. For example, the inverse of $\frac{1}{2}$ is $\frac{2}{1}$ because $\frac{1}{2} \times \frac{2}{1} = 1$.

Here are the steps to do this problem mathematically.

Steps	**Reasons**
$4 \div \frac{1}{2} =$	
$4 \times \frac{2}{1} =$	Multiply by the reciprocal.
$\frac{4}{1} \times \frac{2}{1} =$	Write 4 as a fraction by putting it over 1.
$\frac{4}{1} \times \frac{2}{1} = \frac{8}{1} = 8$	Follow the multiplication rules by multiplying the numerators and the denominators, and then simplifying.

Allie has $3\frac{1}{2}$ pizzas left. If she cuts them into equal $\frac{1}{8}$ slices, how many slices will she have?

We can draw $3\frac{1}{2}$ pizzas and cut each whole pizza into 8 slices. We do have a piece that is cut in half, so to figure out how many slices that piece needs to be cut in, we can take half of the whole pizza. So if a whole pizza is cut into 8 slices then a half of a pizza should be cut into 4 slices. Since we have half of a pizza we cut it into 4 slices. Now you can count the slices.



Allie will have 28 slices.

Let's do this same problem by dividing fractions.

$$3\frac{1}{2} \div \frac{1}{8}$$

Change $3\frac{1}{2}$ to an improper fraction.

$$3\frac{1}{2} = \frac{2 \times 3 + 1}{2} = \frac{7}{2}$$

Now your equation is…

$$\frac{7}{2} \div \frac{1}{8}$$

Multiply by the reciprocal.

$$\frac{7}{2} \times \frac{8}{1} = \frac{56}{2}$$

Simplify your answer.

$$\frac{56}{2} = 28\ slices$$

Dividing Fractions

Divide: $\frac{3}{4} \div \frac{4}{5}$

Multiply by the **reciprocal** (**inverse** of the second number).

$$\frac{3}{4} \div \frac{4}{5} = \frac{3}{4} \times \frac{5}{4} = \frac{3 \times 5}{4 \times 4} = \frac{15}{16}$$

Divide: $\frac{2}{3} \div \frac{8}{9}$

$$\frac{\cancel{2}^{\,1}}{\cancel{3}_{\,1}} \times \frac{\cancel{9}^{\,3}}{\cancel{8}_{\,4}}$$

$$\frac{1 \times 3}{1 \times 4} = \frac{3}{4}$$

Divide: $12 \div \frac{3}{5}$

$$\frac{\cancel{12}^{\,4}}{1} \times \frac{5}{\cancel{3}_{\,1}}$$

$$\frac{4 \times 5}{1 \times 1} = \frac{20}{1} = 20$$

12 is a whole number and can be written in fraction form as $\frac{12}{1}$.

Reciprocal of second fraction

Divide: $2\frac{2}{7} \div 6\frac{2}{3}$

$$\frac{\cancel{16}^{\,4}}{7} \times \frac{3}{\cancel{20}_{\,5}}$$

$$\frac{4 \times 3}{7 \times 5} = \frac{12}{35}$$

$$2\frac{2}{7} = \frac{7 \times 2 + 2}{7} = \frac{16}{7}$$

$$6\frac{2}{3} = \frac{3 \times 6 + 2}{3} = \frac{20}{3}$$