

# Multiplying and Dividing Fractions

## Multiplying Fractions

When multiplying by a fraction, we are finding a proportion of a number. For example, the multiplication  $\frac{1}{2} \times 10$  can be read as "one half of ten". What is one half of ten?

Complete the following table:

Multiplication	Words	Answer
$\frac{1}{3} \times 15$	One third of fifteen	5
$\frac{2}{3} \times 9$		
$\frac{3}{5} \times 20$		
$\frac{1}{4} \times 12$		
	Three sixths of eighteen	

What about multiplying two fractions? Use your fraction strips to figure out what one half of four fifths is. Draw a picture of what you did with the fraction strips.

$$\frac{1}{2} \times \frac{4}{5} =$$

Now try to solve this one. Again, draw a picture with fraction strips.

$$\frac{2}{5} \times \frac{5}{8} =$$

Now complete the table on the next page.

Multiplication	Words	Answer
$\frac{3}{4} \times \frac{2}{3}$	Three quarters of two thirds	$\frac{1}{2}$
$\frac{3}{4} \times \frac{3}{5}$		
$\frac{1}{3} \times \frac{5}{8}$		
$-\frac{4}{3} \times \frac{1}{2}$		
	Three sixths of four thirds	

**Summary:** The pattern we notice when multiplying fractions is:

### Dividing Fractions

When dividing fractions, the easiest way to think of it is that you are dividing something into "groups of". For example, when dividing  $3 \div \frac{1}{2}$ , we are asking "how many groups of one half will make three?" Since three is six halves, the answer is six. Fraction strips are really good at showing this. In the space below, try to figure out how many groups of one sixth make up two thirds. The division you are doing is this:

$$\frac{2}{3} \div \frac{1}{6}$$

Complete the following table. Use fraction strips if it helps you.

Division	Words	Answer
$4 \div \frac{1}{3}$	How many groups of one-third make four?	12
$1 \div \frac{1}{4}$		
$\frac{2}{3} \div \frac{1}{6}$		
$\frac{5}{8} \div \frac{1}{4}$		

### A trick

When multiplying fractions on paper, one trick we can use is something called “invert and multiply”. It was discovered a long time ago, and it makes dividing fractions easier.

First, let’s see if we notice what happens when we multiply a fraction by its **reciprocal**.

Now we can use this to divide fractions. Let’s try to divide  $\frac{3}{4} \div \frac{2}{5}$ . We can write this as a fraction of fractions. We want the denominator to be one, so we multiply the top and the bottom of the fraction by the **reciprocal** of the bottom:

$$\frac{\frac{3}{4}}{\frac{2}{5}}$$

After doing this a few times, people noticed that since the bottom always equals one, you only need to multiply the numerator by the reciprocal of the denominator. Let's look at more examples of this:

$$\frac{2}{3} \div \frac{4}{5}$$

$$\frac{5}{3} \div \frac{2}{7}$$

$$-\frac{3}{4} \div \left[-\frac{6}{2}\right]$$