

Multiply Fractions by Fractions 1


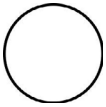

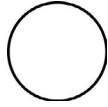



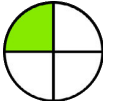
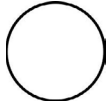




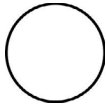




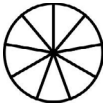



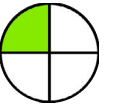
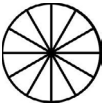




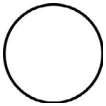




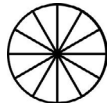



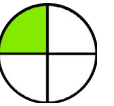
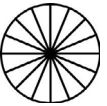



We have studied how to find a fractional part of a whole number using multiplication.

For example, $\frac{3}{5}$ of 80 is written as the multiplication $\frac{3}{5} \times 80$.

REMINDER: The word “of” in this context translates into multiplication.

Now let’s examine how we can use the same idea to find **a fractional part of a fraction**.

1. First find a fractional part of the given fraction **visually**. You can think of a leftover pizza piece, which you are sharing equally with some other people. Then write a multiplication.

<p>a. $\frac{1}{2}$ of  is </p> <p>$\frac{1}{2} \times \frac{1}{2} =$</p>	<p>b. $\frac{1}{2}$ of  is </p> <p> \times  = </p>	<p>c. $\frac{1}{2}$ of  is </p> <p> \times  = </p>
<p>d. $\frac{1}{3}$ of  is </p> <p> \times  = </p>	<p>e. $\frac{1}{3}$ of  is </p> <p> \times  = </p>	<p>f. $\frac{1}{3}$ of  is </p> <p> \times  = </p>
<p>g. $\frac{1}{4}$ of  is </p> <p> \times  = </p>	<p>h. $\frac{1}{4}$ of  is </p> <p> \times  = </p>	<p>i. $\frac{1}{4}$ of  is </p> <p> \times  = </p>

2. Did you notice a shortcut? If so, write it here. Use examples, such as $(1/5) \times (1/2)$ and $(1/4) \times (1/6)$.

Shortcut for multiplying a unit fraction by another unit fraction:

(A unit fraction is of the form $1/n$ where n is a whole number.)

Shortcut: multiplying unit fractions

To multiply fractions of the form $1/n$ where n is a whole number, simply multiply the denominators to get the new denominator.

Example 1. $\frac{1}{4} \times \frac{1}{5} = \frac{1}{20}$ and $\frac{1}{2} \times \frac{1}{6} = \frac{1}{12}$

3. Multiply.

a. $\frac{1}{9} \times \frac{1}{2}$

b. $\frac{1}{13} \times \frac{1}{3}$

c. $\frac{1}{5} \times \frac{1}{20}$

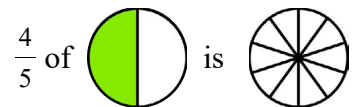
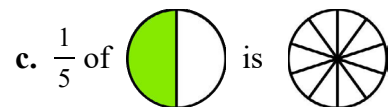
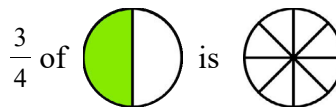
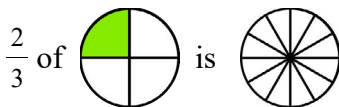
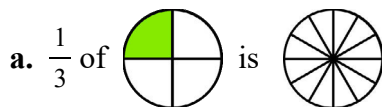
What about finding some other kind of fractional part? Let's again compare this to whole numbers.

Review: To find $\frac{3}{4}$ of 16, or in other words $\frac{3}{4} \times 16$, you can first find $\frac{1}{4}$ of 16, which is 4.

Then just take that three times, which is 12. In other words, $\frac{3}{4} \times 16$ becomes $3 \times (\frac{1}{4} \text{ of } 16) = 12$.

We can use the same idea when finding a fractional part of another fraction.

4. Color in the answer. Compare the problems in each box.



5. Two-thirds of a pizza is left from last night. You eat half of what is left.

- a. Write a fraction multiplication to match this situation.
You can also draw a picture to help you.

- b. Is your final answer a fraction of the *original* pizza, or of the portion that was left over?

Example 2. To find $\frac{4}{5}$ of $\frac{1}{7}$, first find $\frac{1}{5}$ of $\frac{1}{7} = \frac{1}{35}$, and then take that four times to get $\frac{4}{35}$.

Multiplying a fraction by a fraction means taking that fractional part of the fraction.
It is just like taking a certain part of the leftovers, when what is left over is a fraction.

6. Solve. You can find the answer to the bottom problem based on the top problem in each box.

a. $\frac{1}{5} \times \frac{1}{7} =$

$\frac{2}{5} \times \frac{1}{7} =$

b. $\frac{1}{6} \times \frac{1}{4} =$

$\frac{5}{6} \times \frac{1}{4} =$

c. $\frac{1}{8} \times \frac{1}{3} =$

$\frac{3}{8} \times \frac{1}{3} =$

What about generic fraction multiplication problems? For example, how can we do $\frac{5}{8} \times \frac{6}{7}$?
Mathematically, we can treat this as $5 \times \frac{1}{8} \times 6 \times \frac{1}{7}$, and then change the order of the factors to get $5 \times 6 \times \frac{1}{8} \times \frac{1}{7}$, which is equal to $5 \times 6 \times \frac{1}{56} = \frac{30}{56}$.

Essentially, the numerators get multiplied, and the denominators get multiplied.

A shortcut for fraction multiplication: Multiply the numerators to get the numerator for the product.
Multiply the denominators to get the denominator for the product.

Example 3. Give your final answer simplified and as a mixed number.

$$\frac{4}{5} \times \frac{11}{8} = \frac{4 \times 11}{5 \times 8} = \frac{44}{40} = \frac{11}{10} = 1\frac{1}{10}$$

Example 4. Notice how we can write the whole number 5 as $5/1$:

$$\frac{3}{7} \times 5 = \frac{3}{7} \times \frac{5}{1} = \frac{3 \times 5}{7 \times 1} = \frac{15}{7} = 2\frac{1}{7}$$

7. Multiply. Give your answers in the lowest terms and as mixed numbers, if possible.

a. $\frac{3}{9} \times \frac{2}{9}$

b. $\frac{11}{12} \times \frac{1}{6}$

c. $\frac{1}{3} \times \frac{3}{13}$

d. $9 \times \frac{2}{3}$

e. $\frac{2}{9} \times \frac{6}{7}$

f. $10 \times \frac{5}{7}$