

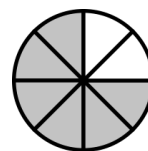
Name: _____

Simplifying Fractions

Do you remember how we first went about changing one fraction to another fraction that was equivalent? We did it by splitting up the fractional parts into even smaller pieces. This is the same as multiplying both the numerator and the denominator of the original fraction by the same number.

Well, we can also find equivalent fractions in the opposite way. Instead of splitting up parts, we combine parts to form larger pieces. Let's see how this reverse (backwards) process works.

Here we have a circle that is divided into **8** equal pieces.
6 pieces (**6/8** of the circle) are *grey*.



Now, the old pieces have been *grouped in twos* and joined together.

The number of new pieces equals the number of groups of 2.

How do we find the number of groups of 2?—we divide.

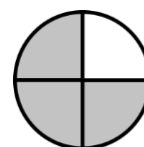
We can make **(6 ÷ 2) = 3** groups of 2 from the 6 grey pieces.

That's **3** new *grey* pieces.

And we can make **(8 ÷ 2) = 4** groups of 2 total.

That's **4** new *total* pieces.

3/4 of the circle is now grey.



Notice that both the 6 grey pieces (the numerator of the original fraction) and the 8 total pieces (denominator of the original fraction) get divided by 2.

$$\mathbf{6/8 = (6 \div 2)/(8 \div 2) = 3/4}$$

Let's look at one more.

Here the original pieces have been joined in fours.

Before: **4** grey pieces and **12** total pieces.

After: **(4 ÷ 4) = 1** grey and **(12 ÷ 4) = 3** total.

Before **4/12** of the rectangle was grey.

After **1/3** is grey.

$$\mathbf{4/12 = (4 \div 4)/(12 \div 4) = 1/3}$$



$$\frac{4}{12}$$



$$\frac{1}{3}$$

Notice that we ended up with 1/4 as many grey pieces and 1/4 as many total pieces. *Both* the numerator of the original fraction *and* the denominator get *divided* by 4.

Changing a fraction to an equivalent fraction by combining parts into equal sized groups is called **simplifying** (or **reducing**) the original fraction.

Name: _____

Simplifying Fractions

Note: When you simplify a fraction, the new simplified fraction has larger pieces than the original fraction, but there are fewer of them.

This means that both the numerator and the denominator of the simplified fraction will be smaller than the numerator and denominator of the original fraction.

We like smaller numbers because they are easier to visualize (picture) and easier to deal with. This is why we say that original fraction has been **reduced** (smaller numerator and denominator) or **simplified** (made easier).

You can change a fraction into an equivalent fraction by dividing both the numerator and the denominator by the *same* number. This is the same as combining the parts of the whole into groups of the same size. But you *must* divide *both* the numerator *and* the denominator into the same size groups. This means that your divisor must be a factor of both the numerator and the denominator.

For example, we can simplify **3/24** to the equivalent fraction 1/8 because we can divide *both* **3** and **24** into **groups of three**. We know this because 3 is a factor of both 3 and 24. ($3 \times 1 = 3$ and $3 \times 8 = 24$) This tells us that both 3 and 24 are divisible by 3.

$$\frac{3}{24} \xrightarrow{\div 3} \frac{1}{8}$$

When we divide *both* numerator and denominator of 3/24 by 3, we get 1/8. Therefore, 3/24 is equivalent to 1/8. There is no need to draw a picture.

Let's say we want to simplify the fraction **12/16**.

We need to divide both 12 and 16 by the same number, so we look for a number that is a factor of both 12 and 16.

How about **4**? $4 \times 3 = 12$ and $4 \times 4 = 16$. So, both 12 and 16 are divisible by 4. **$12/16 = (12 \div 4)/(16 \div 4) = 3/4$** .

$$\frac{12}{16} = \frac{3}{4}$$

Diagram showing the simplification of 12/16 to 3/4 by dividing both numerator and denominator by 4. Arrows indicate the division process: 12 ÷ 4 = 3 and 16 ÷ 4 = 4.

What other number can you use to divide both 12 and 16? _____

What equivalent fraction does that give you? _____

Can you simplify your fraction even further? _____ What do you get? _____