FRACTION MODELS

Students first encounter fractions in terms of numbers less than 1: half of a candy bar, 1/3 of a pizza, etc. That's probably what first pops into your head when you think about fractions, too. The top number on a fraction is called the **numerator**; the bottom number is the **denominator**. Any number can be represented as a fraction, and the numerator and denominator don't have to be whole number (although in reduced form, they are whole numbers).

Part to Whole

The most common interpretation for fractions involves the **part-to-whole concept.** In this model, the denominator represents the number of equal part the whole is split into, and the numerator represents how many of those pieces we have. In the image below, the whole is 8 for the circle, 5 for the bar and 20 for the grids. The parts are 5, 3, and 11, respectively.

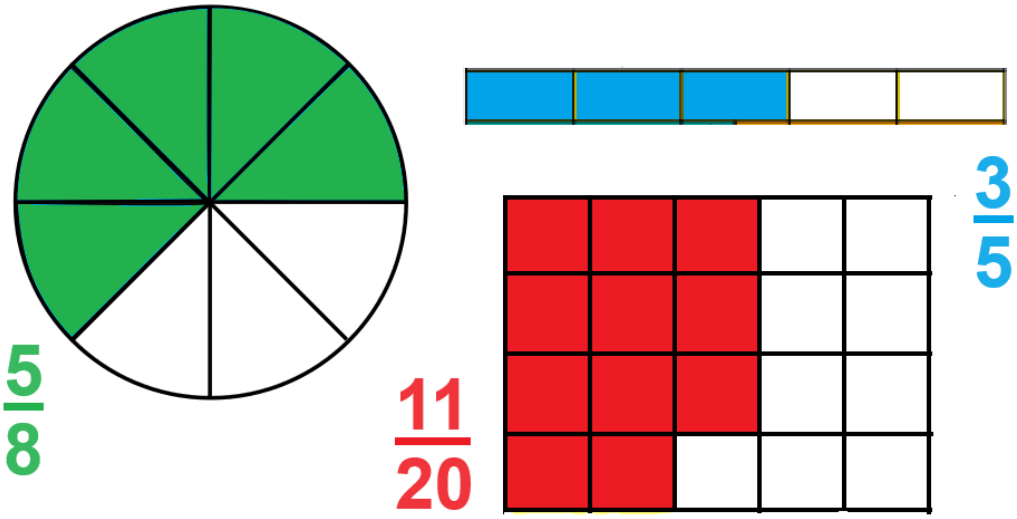

Figure 1: Part to Whole Fraction Models

Division

Any fraction can also be seen as a **division** problem. The numerator represents the divisor, and the denominator represents the number of pieces it's being split into.

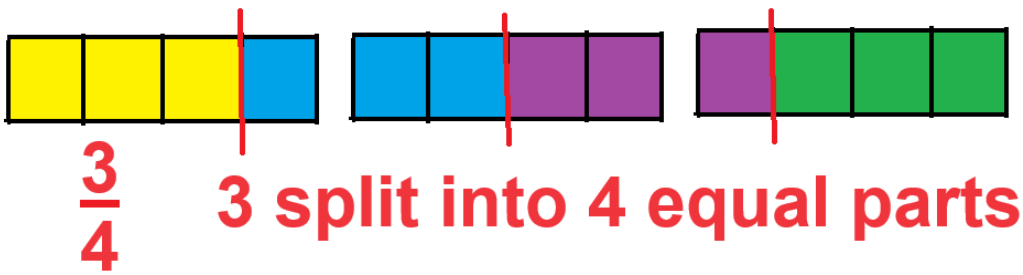

Figure 2: Division model for 3/4

Ratio

Fractions can also be interpreted using the **ratio concept.** Fractions are used to compare two quantities. In the image below, we can see that the New York Times Tower is approximately half the height of the One World Trade Center.

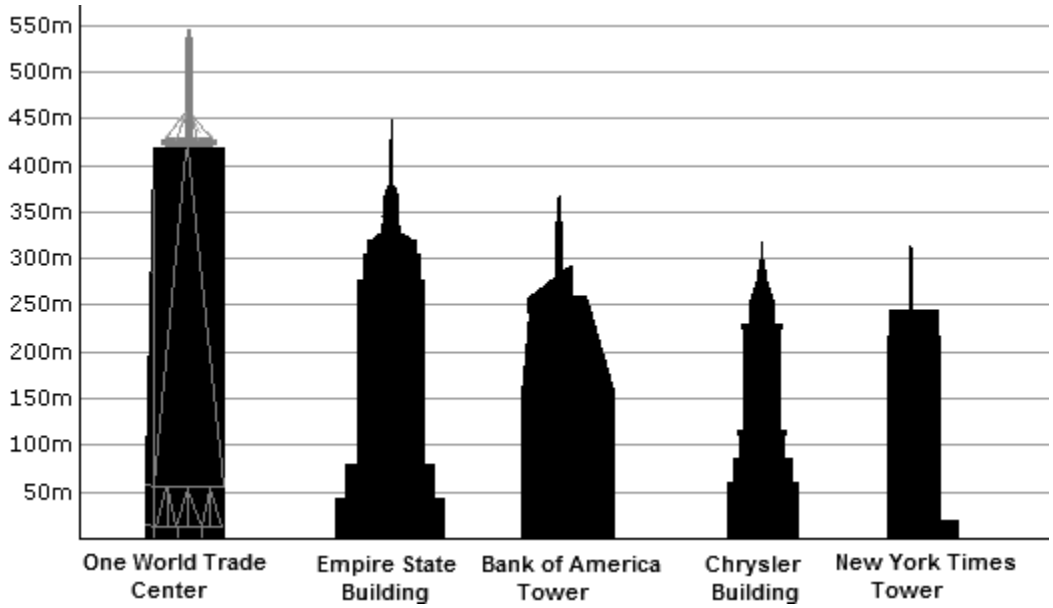

Figure 3: Comparing NY Building Heights
https://commons.wikimedia.org/wiki/File:NY_Height_Comparison.png

Fraction Bar Model

We're going to primarily use fraction bars as our model moving forward. This consists of a rectangular bar that represents the "unit", or one, split into regions of equal area. The main reason we're using this model is because it's fairly easy to draw.

Note that it's very important the bar is split into sections of **equal size**. This is sometimes hard to do when drawing models by hand.

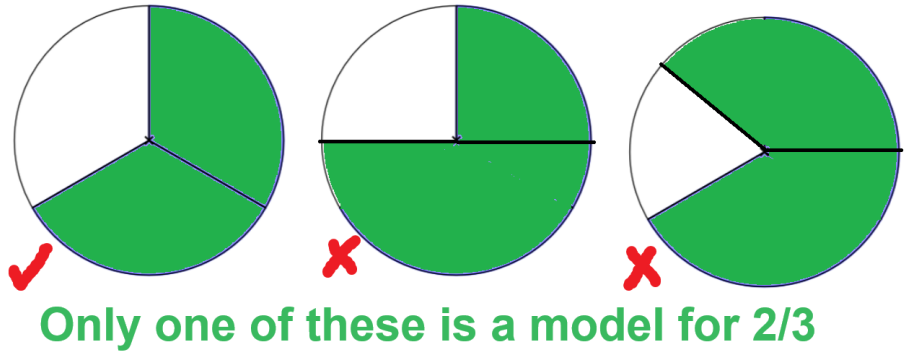

Figure 4: Only one of these is a model for 2/3

We say two fractions are **equivalent** if they have the same amount of area shaded in their fraction bar representation. In the image below, 4/8, 2/4, and 1/2 are all equivalent because they have the same amount of the whole shaded.

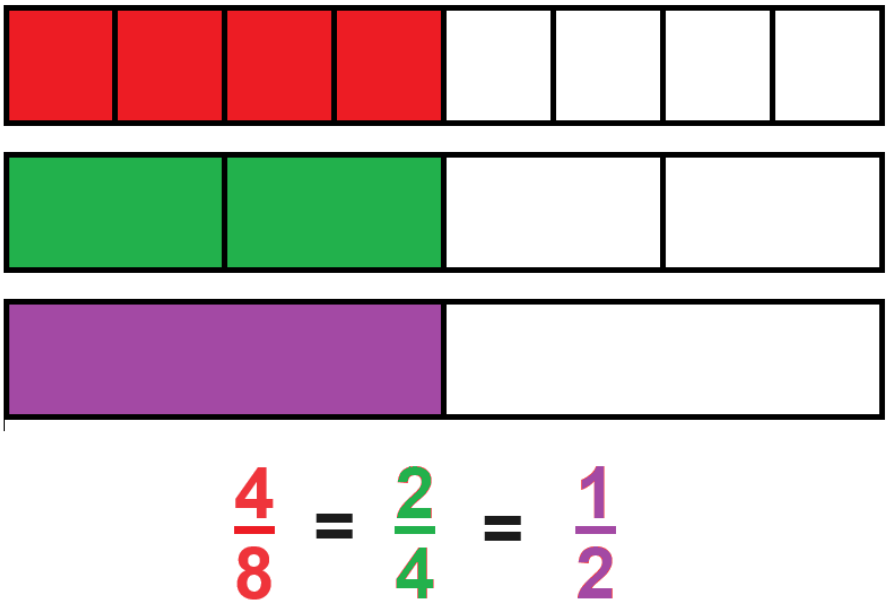

Figure 5: Equivalent fractions

Note that we can create equivalent fractions by either subdividing each of our section into the same number of regions or by grouping sections into a smaller number. This is the same as multiplying or dividing both the numerator and denominator by the same number.

In the image below, I can group my eights into sets of 2 to reduce my fraction to 2/4. I can also subdivide my halves into two sections each to get the equivalent 2/4.

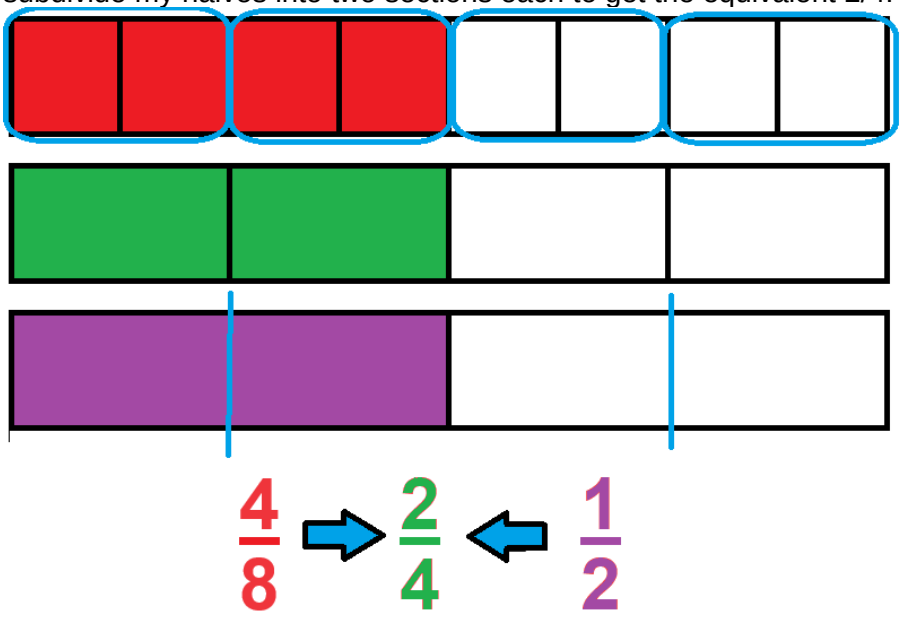

Figure 6: Finding equivalent fractions