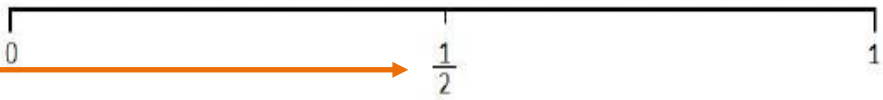
Fractions and the Number Line

Why are fractions important?

Because not everything is represented as a whole number and when the quantity of something falls between two whole numbers it becomes a fraction.

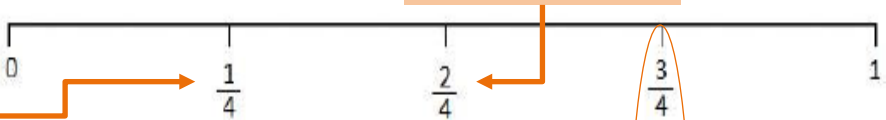
We can use a number line model to illustrate fraction order for values between 0 and 1.

We divide the length into two equal-size pieces and label the point where the segment is divided as $\frac{1}{2}$

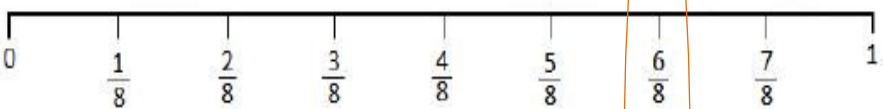


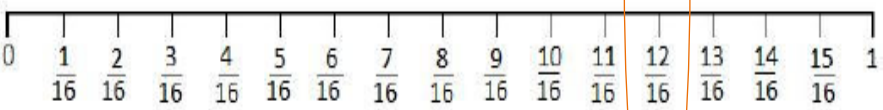
We can also label the halfway point as $\frac{2}{4}$

We further divide each of those halves in half and label these points $\frac{1}{4}$ and $\frac{3}{4}$

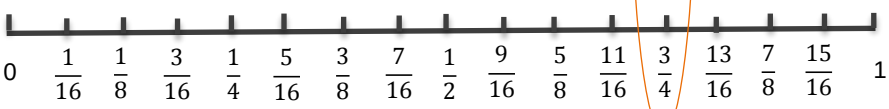


These two number lines extend the fraction relationships to eighths and sixteenths.



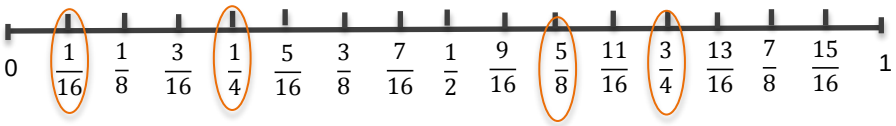


We can bring the number lines above together into a single number line.



In this number line, we have broken one-whole into halves, fourths, eighths, and sixteenths. The points on this number line are labeled in simplest terms but the number lines above show their equivalent fractions. Equivalent fractions means that 3/4 is the same as 6/8, which is the same as 12/16. This is highlighted on the number line chart.

We can use number lines like this to compare fraction values. When comparing numbers the lower values are to the left and higher values to the right.



We can see that $\frac{1}{16} < \frac{1}{4}$ and $\frac{5}{8} < \frac{3}{4}$. We could have compared all four of the fractions by writing them as equivalent fractions using common denominator. Since $\frac{1}{16} < \frac{4}{16} < \frac{10}{16} < \frac{12}{16}$, we can see that $\frac{1}{16} < \frac{1}{4} < \frac{5}{8} < \frac{3}{4}$. By converting fraction values to fractions with common denominators we are able to easily compare their relative sizes.

http://www.learn-with-math games.com/fraction-number-line.html and picture derived from www.stuckongluecrafts.com

When we multiply two whole numbers we obtain a whole number as the result. But when we *divide* two whole numbers, the result in most cases will *not* be a whole number.

It may not be possible to have a whole number of equal shares, e.g. dividing 10 apples among 3 people - each person may receive 3 whole apples but there will be one apple left over.

Where do the other types of fractions belong on the number line?

$\frac{5}{2}$ means the same as $5 \div 2$ but 2 goes into 5 twice with one left over. Another way of expressing this is:

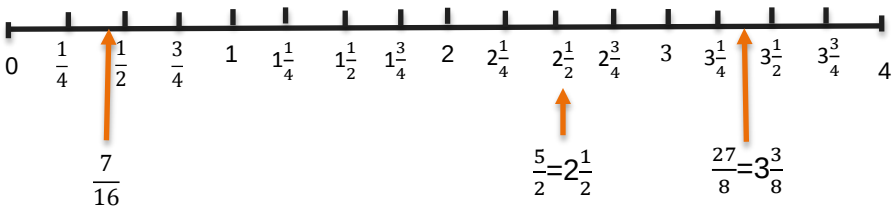
$$\frac{5}{2} = \frac{4+1}{2} = \frac{4}{2} + \frac{1}{2} = 2 + \frac{1}{2}, \quad \text{or } 2\tfrac{1}{2}$$ (half way between 2 and 3)

$\frac{27}{8}$ means the same as $27 \div 8$, but 8 goes into 27 three times with three left over. Another way of expressing this is:

$$\frac{27}{8} = \frac{8 \times 3 + 3}{8} = \frac{24}{8} + \frac{3}{8} = 3 + \frac{3}{8}, \quad \text{or } 3\tfrac{3}{8}$$ (more than 3 but less than 4)

$\frac{7}{16}$ means the same as $7 \div 16$, which cannot reduce any further.

So, on the number line these fractions lie between the points marked as representing whole numbers:



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