Sect 5.1 – Ratios

Objective a & b: Writing ratios.

A **ratio** is a comparison of two quantities that have the same type of units. If we want to write the ratio of 5 to 7, we have three different ways to express it. We can write "5:7," or "5 to 7," or "$\frac{5}{7}$." All three forms are equivalent and we will express our ratios using whole numbers. Also, since we are comparing two quantities with the same type of units, if the units are not already the same, we will convert them so that they are the same and then leave them off in our answer. In this class, we will write the ratios as a fraction in lowest terms or what is called "simplest form".:

Write the following in simplest form:

Ex. 1 Write the ratio of 11 feet to 16 feet.

Solution:

$\frac{11\text{feet}}{16\text{feet}} = \frac{11}{16}$.

Ex. 2 Out of 21 races, the horse "Skating Across the Alamo" is expected to win once. Write the ratio of expected losses to expected wins.

Solution:

Since the horse is expected to only win once out of 21 races, then the horse is expected to lose 20 times. So, the ratio of expected losses to expected wins is $\frac{20}{1}$.

In the last example, we left our answer as an improper fraction. Before, if we got a result of $\frac{20}{1}$, we would write our answer as 20. In ratios, since we are comparing two quantities, we need to leave the answer as the improper fraction.

Ex. 3 Write the ratio of 3 pounds to fifteen ounces.

Solution:

Since the units are not the same, we need to either convert the ounces to pounds or the pounds to ounces. In this case, it is easier to convert the pounds to ounces, so 3 pounds = 3(16) = 48 ounces. So, our ratio becomes:

$\frac{3\text{pounds}}{15\text{ounces}} = \frac{48\text{ounces}}{15\text{ounces}} = \frac{48}{15}$, but 48 and 15 have a common factor

of 3, so reduce: $\frac{48}{15} = \frac{16}{5}$. Thus, our answer is $\frac{16}{5}$.

Objective c: Writing ratios of Mixed Numbers and Decimals

Ex. 4 Write the ratio of 5.2 quarts to 32 cups.

Solution:

First change the 5.2 quarts to cups. So, 5.2 quarts = 5.2(4) = 20.8 cups. So, our ratio becomes:

$\frac{5.2\,\text{quarts}}{32\,\text{cups}} = \frac{20.8\,\text{cups}}{32\,\text{cups}} = \frac{20.8}{32}$. But, our ratios need to be expressed as a quotient of two whole numbers in lowest terms. To get rid of the decimal point, we need to move it over one place to right in both the numerator and denominator. Our ratio becomes:

$\frac{20.8}{32} = \frac{208}{320}$ and now reduce:

$\frac{208}{320} = \frac{52}{80} = \frac{13}{20}$.

Ex. 5 Write the ratio of $6\frac{2}{3}$ inches to $7\frac{1}{5}$ inches.

Solution:

In this example, we will get a complex fraction for our ratio, so we will need to rewrite it as a division problem and simplify:

$$\frac{6\frac{2}{3}\,\text{inches}}{7\frac{1}{5}\,\text{inches}} = \frac{6\frac{2}{3}}{7\frac{1}{5}} = 6\frac{2}{3} \div 7\frac{1}{5} = \frac{20}{3} \div \frac{36}{5} = \frac{20}{3} \bullet \frac{5}{36} = \frac{5}{3} \bullet \frac{5}{9} = \frac{25}{27}.$$

Objective d: Applications.

Ex. 6 In a recent survey, nine out of ten people said they would prefer to stay in San Antonio than to move to Austin.

a) Write the ratio of the number of people wanting to stay in San Antonio to the total surveyed.

b) Write the ratio of the number of people wanting to move to Austin to the number of people wanting to stay in San Antonio.

Solution:

a) $\frac{9}{10}$

b) 1 out of 10 wants to move to Austin, so our ratio is $\frac{1}{9}$.