Name: _____ **Date:** _____

6.1 Working with Ratios

For comparison purposes in science (and in many other fields), it is often useful to simplify a numerical result into a ratio. Most people find that whole number ratios are the easiest to interpret. For example, the ratio **5:4** is quicker to read, write, and understand than the ratio **2.5:2**, even though these ratios are equivalent:

$$\frac{5}{4} = \frac{2.5}{2}$$

One Friday night, Jerod went out to dinner and a movie with his family. His parents ended up spending $82.40 for dinner, and it cost $45 for everyone to see the movie. What is the ratio of the money spent for the movie to the money spent on food? Please give the answer as a whole-number ratio.

1. Write the given information as a ratio. Here we want $ movie: $ food; $45: $82.40
2. Write the ratio as a fraction: $\frac{\$45}{\$82.40}$
3. Divide top and bottom by the smallest number: $\frac{\$45 \div \$45}{\$82.40 \div \$45} = \frac{1}{1.831}$
4. Round the decimal (when there is one) to the nearest whole number: $1.831 \approx 2$. The fraction from step #3 is rewritten as 1/2.
5. Write as a ratio: 1:2.

The whole number ratio of the money that Jerod's family spent on the movie to the money they spent on food is 1:2.

Part A: Rewrite each as a simple whole-number ratio.

1. 67 : 128
2. 15.8 : 2.6
3. 15,007 : 33,045
4. 322.8 : 89
5. 203 : 1,088

Part B: Answer each with a simple whole number ratio.

6. Theresa's doll collection has only brunette and blonde dolls. Eight of the dolls are brunettes, while twenty-five of them have blonde hair. What is the ratio of blondes to brunettes in this doll collection?
7. In Herbert Hoover Middle School, there are 1,285 students. Eight hundred six of the students are girls, while 479 are boys. What is the ratio of girls to boys?

8. After it rained one Saturday, Gail and Terry decided to collect earthworms. They planned to sell them for fishing bait. Deciding that they could charge more money for the larger worms (those over 7 centimeters long) they began counting and sorting. Of the 356 worms they had collected, just 82 of them were over 7 centimeters long. What is the ratio of short worms to long worms?

In some situations, this method for writing whole-number ratios does not provide enough information. In the example of Jerod going out with his family for dinner and a movie, if only the estimated whole-number ratio (2:1) is given, we might believe that his family spent twice as much money on food as it did on the movie. Maybe this estimate is enough, if only a very general idea is needed. But if Jerod's parents would like a better idea of how they spent their money (maybe for budgeting purposes), they might use the following approach (note that the first three steps are the same as with the first method):

1. Write the given information as a ratio. Here we want \$ movie: \$ food; \$45: \$82.40.
2. Write the ratio as a fraction: $\frac{\$45}{\$82.40}$
3. Divide top and bottom by the smallest number: $\frac{\$45 \div \$45}{\$82.40 \div \$45} = \frac{1}{1.831}$
4. Round the decimal part of the fraction from (3) to the nearest tenth. $1.831 \approx 1.8$
5. Write the decimal from (4) as a mixed number, and reduce to lowest terms if possible. $1.8 = 1\ {}^{8}/_{10} = 1\ {}^{4}/_{5}$
6. Rewrite the mixed number from (5) as an improper fraction. $1\ {}^{4}/_{5} = {}^{9}/_{5}$
7. Replace the decimal part of the fraction in (3) with the fraction from (6). Here, that gives $\frac{1}{\frac{9}{5}}$, which means "the reciprocal of ${}^{9}/_{5}$"; in other words, ${}^{5}/_{9}$.

NOTE: The result in this step will always be either 1/fraction (in which case the reciprocal is required), or ${}^{\text{fraction}}/_{1}$, in which case the fraction is being divided by 1, and the result is the fraction itself.

8. Write as a ratio: 5:9

The whole number ratio of the money that Jerod's family spent on the movie to the money they spent on food is 5:9. This means that for about every \$5 the family spent on the movie, they spent about \$9 on food.

Part A: Rewrite each as a simpler whole-number ratio, using the method of rounding to the nearest tenth as shown in the last example.

1. 167 : 108
2. 5.8 : 12.6
3. 3,450 : 5,007
4. 32.28 : 112.5
5. 2,043 : 888

Part B: Answer each with a simple whole-number ratio.

6. Sonya's troll collection has only red-headed and purple-headed trolls. Seventy-seven of the trolls have red hair, while just forty-six of them have purple hair. What is the ratio of red-headed trolls to purple-haired trolls in this collection?

7. In Everett Middle School, there are 508 students. Two hundred seventy-seven of the students are boys, while 231 are girls. What is the ratio of girls to boys?

8. Tim and Rocco were asked to clean out their little brother's toy box. While they were doing this, they found that many of their own markers were mixed in with their brother's. They sorted them into two piles, and to their surprise, only 17 of the 109 markers actually belonged to their brother. What is the ratio of Tim and Rocco's markers to their little brother's markers?