

Ratios and Proportional Relationships

6.RP.A*

Cluster A

Understand ratio concepts and use ratio reasoning to solve problems.

STANDARD 1

6.RP.A.1: Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *For example, “The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak.” “For every vote candidate A received, candidate C received nearly three votes.”*

STANDARD 2

6.RP.A.2: Understand the concept of a unit rate a/b associated with a ratio $a:b$ with $b \neq 0$, and use rate language in the context of a ratio relationship. *For example, “This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is $\frac{3}{4}$ cup of flour for each cup of sugar.” “We paid \$75 for 15 hamburgers, which is a rate of \$5 per hamburger.”¹*

¹Expectations for unit rates in this grade are limited to non-complex fractions.

STANDARD 3

6.RP.A.3: Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.

- Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.
- Solve unit rate problems including those involving unit pricing and constant speed. *For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?*
- Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means $\frac{30}{100}$ times the quantity); solve problems involving finding the whole, given a part and the percent.
- Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.

*Major cluster

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Cluster A: Understand ratio concepts and use ratio reasoning to solve problems.

Grade 6 Overview

The focus for this cluster is the study of ratio concepts and the use of proportional reasoning to solve problems. Students learn how ratios and rates are used to compare two quantities or values and how to model and represent them. Sixth graders find out how ratios are used in real-world situations and discover solutions to percent problems using ratio tables, tape diagrams, and double number lines. Students also convert between standard units of measure.

Standards for Mathematical Practice

SFMP 1. Make sense of problems and persevere in solving them.

Sixth graders interpret and solve ratio problems.

STANDARD 1 (6.RP.A.1)

Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. For example, “The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak.” “For every vote candidate A received, candidate C received nearly three votes.”

In this standard, students learn to compare two quantities or measures such as 6:1 or 10:2. These comparisons are called ratios. Students discover that ratios can be written and described in different ways. For instance, 6:1 uses a colon to separate values.

Ratios can also be stated with words such as 6 to 1, or as a fraction such as $\frac{6}{1}$. Standard 1 focuses on understanding the concept of a ratio, however, students should use ratio language to describe real-world experiences and use their understanding for decision making.

What the TEACHER does:

- Help students discover that a ratio is a relationship or comparison of two quantities or measures. Ratios compare two measures of the same types of things such as the number of one color of socks to another color of socks or two different things such as the number of squirrels to birds in the park. Ratios compare parts to a whole (part:whole) such as 10 of our 25 students take music lessons. Ratios can also compare a part of one whole to another part of the same whole (part:part) such as the ratio of white socks in the drawer to black socks in the drawer is 4:6. Ratios are expressed or written as a to b , $a:b$, or $\frac{a}{b}$.
- Compare and model ratios with real-world things such as pants to shirts or hot dogs to buns. Ratios can be stated as the comparison of 10 pairs of pants to 18 shirts and can be written as $\frac{10}{18}$, 10 to 18, or 10:18 and simplified to, $\frac{5}{9}$, 5 to 9, or 5:9. Ensure that students understand how the simplified values relate to the original numbers.
- Ask students to create or find simple real-world problems to use in their learning such as, “*There are 2 Thoroughbred horses and 6 Appaloosa horses in the field. As a ratio of Thoroughbreds to Appaloosas it is: $\frac{2}{6}$ or 2 to 6 or 2:6 or simplified as $\frac{1}{3}$, 1 to 3, or 1:3. Or, there are 14 girls and 18 boys in our math class. As a ratio of girls to boys it is: $\frac{14}{18}$, 14 to 18, or 14:18 or simplified as $\frac{7}{9}$, 7 to 9, or 7:9.*” Invite students to share their real-world examples of ratios and use ratio language to describe their findings such as, “*for every vote candidate A received, candidate C received nearly three votes.*” The problems students select or write can also be used as cyclical reviews with distributed practice throughout the school year.
- Focus on the following vocabulary terms: *ratio*, *compare*, and *simplify*.

What the STUDENTS do:

- Understand that a ratio is a comparison between quantities.
- Determine when a ratio is describing part-to-part or part-to-whole comparison.
- Describe ratio relationships between two quantities using ratio language.
- Use the different ratio formats interchangeably (4:5, 4 to 5, $\frac{4}{5}$).

Addressing Student Misconceptions and Common Errors

Some sixth graders may confuse the order of the quantities such as when asked to write the ratio of boys to girls in the sentence, “*There are 14 girls and 18 boys in our math class.*” Instead of writing 18:14, some students may write 14:18. Other students may not recognize the difference between a part-to-part ratio and a part-to-whole ratio such as, “*There are 14 girls compared to 18 boys in the class (14:18 part-to-part); however, 14 of the 32 students in our class are girls (14:32 part-to-whole).*” To address these common misconceptions, ask students to label the quantities they are comparing such as 14 girls/18 boys.