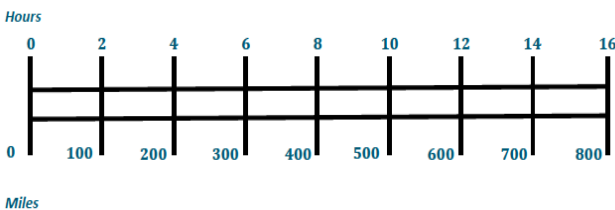


### Ratios and Unit Rates

In this 29-lesson module, students are introduced to ratios and rates and use ratio language and notation to solve real-world problems. Students will explore tape diagrams, double number line diagrams, ratio tables, equations and the coordinate plane to develop deep understanding, enabling them to become proficient and confident mathematicians in middle school.

#### Two Models Seen in the Module:

The Double Number Line Diagram



The Ratio Table

Number of Cups of Sugar	Number of Cups of Flour
2	3
4	6
6	9

### Key Words

**Ratio:** A pair of nonnegative numbers,  $A:B$ , where both are not zero, and describes a relationship between the quantities.

**Rate:** Indicates how many units of one quantity there are for every 1 unit of the second quantity.

**Unit Rate:** The numeric value of the rate, e.g. in the rate 2.5 mph, the unit rate is 2.5.

**Rate unit:** The unit of measure of the rate. (e.g. in the rate 2.5 mph, the rate unit is miles per hour)

**Equivalent Ratios:** Ratios that have the same value.

**Percent:** Percent of a quantity is a rate per 100.

**Associated Ratios:** Ratios that are related, e.g. if the ratio of the number of boys to the number of girls is 1:2, we can also determine the ratio of the number of girls to the total number of children is 2:3. We can further determine the ratio of the number of girls to the number of boys is 2:1.

**Double Number Line Diagrams:** A math model that is often used when quantities have different units and is a visual representation for showing multiple equivalent ratios.

**Ratio Table:** A table listing pairs of numbers that represent equivalent ratios.

**Tape Diagrams:** Drawings that look like a segment of tape, used to illustrate number relationships. Also known as strip diagrams, bar model, fraction strip, or length model.

### + How Can You Help At Home?

- Ask your child what they learned in school today and ask them to show you an example.
- Reinforce fast recall of multiplication and division facts by playing math games using flashcards. See how many facts your child can answer in 20 seconds. Then, see if they can answer more questions the next time by playing again!

#### What Came Before this Module:

In Grade 5, students studied multiplicative comparisons, which is the foundation for their understanding of comparing quantities in a ratio relationship. In addition, students worked to develop fluency in operations with whole numbers, fractions and decimals.

#### What Comes After this Module:

Students will divide fractions using various strategies and arithmetic operations.

### Key Common Core Standards:

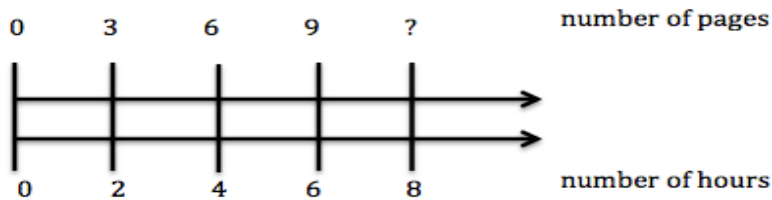
- **Understand ratio concepts and use ratio reasoning to solve problems.**
  - Use ratio language to describe the relationship between two quantities.
  - Use rate language in the context of a ratio relationship.
  - Solve real-world problems using ratio and rate reasoning.

## Model in the Spotlight!

### Double Number Line

Suppose you want to determine how many pages of homework Megan will complete in 8 hours if she can complete 3 pages in 2 hours, assuming she completes the homework at a constant rate.

*You can represent the situation using a double number line diagram to visibly show the ratio relationship of 3 pages for every 2 hours. If you extend the double number line diagram, you can see that in 8 hours, Megan will complete 12 pages of homework.*



Welcome to A  
*Story of Ratios!*

There are several models used in A *Story of Ratios* that will foster deep knowledge of important concepts in middle school mathematics.

### Read on to learn a little bit about *Eureka Math*, the creators of *A Story of Ratios*:

*Eureka Math* is a complete, PreK–12 curriculum and professional development platform. It follows the focus and coherence of the Common Core State Standards (CCSS) and carefully sequences the progression of mathematical ideas into expertly crafted instructional modules.

This curriculum is distinguished not only by its adherence to the CCSS; it is also based on a theory of teaching math that is proven to work. That theory posits that mathematical knowledge is conveyed most effectively when it is taught in a sequence that follows the “story” of mathematics itself. This is why we call the middle school portion of *Eureka Math* “*A Story of Ratios*.” The sequencing has been joined with methods of instruction that have been proven to work, in this nation and abroad. These methods drive student understanding beyond process, to deep mastery of mathematical concepts.

The goal of *Eureka Math* is to produce students who are not merely literate, but fluent, in mathematics. Your student has an exciting year of discovering the story of mathematics ahead!

#### Sample Problem from Module 1: (Example taken from Module 1, Lesson 8)

Your middle school has 900 students.  $\frac{1}{3}$  of the students bring their lunch instead of buying lunch at school. What is the value of the ratio of the number of students who do bring their lunch to the number of students who do not?



First I created a tape diagram. In the tape diagram  $\frac{1}{3}$  of the students bring their lunch instead of buying lunch at school. I determined that 300 students bring their lunch, leaving 600 students who buy their lunch. One unit of the tape diagram represents 300, and 2 units of the tape diagram represent 600. This creates a ratio of 1:2. As such, the value of the ratio of the number of students who bring their lunch to the number of students who buy their lunch is  $\frac{1}{2}$ .