

Field Goals, Balls, and Nets

Strand: Number and Number Sense

Topic: Using ratios to compare quantities

Primary SOL: 6.1 The student will represent relationships between quantities using ratios, and will use appropriate notations, such as $\frac{a}{b}$, a to b , and $a:b$.

Related SOL: 6.2a; 6.12a-d

Materials

- Field Goals, Balls, and Nets graphic organizer (attached)
- Ratios in Words, Pictures, and Notations activity sheet (attached)
- Statistics for the National Basketball Association and National Football League (attached)

Vocabulary

compare, decimals, fractions (earlier grades)

ratio (6.1, 6.2a, 6.12a-d)

Student/Teacher Actions: What should students be doing? What should teachers be doing?

1. Begin the lesson by asking students for the definition of the word *ratio*. Make sure they understand that a ratio is a comparison of any two quantities and that it is used to represent a relationship within or between sets. Emphasize that the two quantities in a ratio must be ordered in the same order as the quantities in the relationship. A ratio may be written using a colon ($a:b$), the word *to* (a to b), or fraction notation $\left(\frac{a}{b}\right)$.
2. Distribute the Field Goals, Balls, and Nets graphic organizer, and have students write the definition of *ratio* in their own words in the center oval. Direct students to write the four types of ratios in the four surrounding ovals and explain each comparison, as follows:

Ratio	Comparison
Part-to-Whole (within the same quantity)	compare part of a whole to the entire whole
Part-to-Part (within the same quantity)	compare part of a whole to another part of the same whole
Whole-to-Whole (different quantities)	compare all of one whole to all of another whole
Part-to-Part (different quantities)	compare part of one whole to part of another whole

3. Have students look at the given statistics from the National Basketball Association (NBA) and National Football League (NFL). Explain that in order to understand each type of

ratio fully, students will use the data in this chart to create ratios to represent various relationships. Model how to do this by choosing a specific ratio (e.g., the ratio of NBA home games to regular season games—a Part-Whole ratio), and demonstrate how to write this ratio in each notation. Then, lead the class in developing one ratio for each of the other three types.

4. Have students work independently to write an additional ratio for each of the four types, using the data in the chart. (*Note: Student answers will vary due to the large amount of data provided and multiple interpretations of the data.*)
5. Have selected students share and explain their ratios, defining all aspects of each.
6. Provide students with ratios expressed symbolically and have them translate that relationship in words as seen in the table below. For example, students are given Quantity A and Quantity B, and the following comparisons could be expressed.



Ratio	Example	Ratio Notation(s)
Part-to-Whole (within the same quantity)	compare the number of unfilled stars to the total number of stars in Quantity A	3:8; 3 to 8; or $\frac{3}{8}$
Part-to-Part ¹ (within the same quantity)	compare the number of unfilled stars to the number of filled stars in Quantity A	3:5 or 3 to 5
Whole-to-Whole ¹ (different quantities)	compare the number of stars in Quantity A to the number of stars in Quantity B	8:5 or 8 to 5
Part-to-Part ¹ (different-quantities)	compare the number of unfilled stars in Quantity A to the number of unfilled stars in Quantity B	3:2 or 3 to 2

¹Part-to-part comparisons and whole-to-whole comparisons are ratios that are not typically represented in fraction notation, except in certain contexts, such as determining whether two different ratios are equivalent.

7. Provide students with a similar example to those in the table where they are provided with a ratio and they need to create a relationship in words.

8. Provide students with the Ratios in Words, Pictures, and Notations activity sheet. Have students create their own symbolic representation of two quantities. Then write the ratio in words and provide the three ratio notations that correspond with their representations. For example, a student writes, “4 to 5,” meaning “four notebooks to every five pencils.” Then, the student must write the other ratio notations and write each ratio in words.

Assessment

- **Questions**
 - What is the significance of representing data as ratios?
 - In order to represent ratios in fraction form, must the fractions always be written in simplest form? Why, or why not?
 - Are there certain applications for which it would be more suitable to represent ratios in a specific form? If so, give examples.
- **Journal/Writing Prompts**
 - Describe a real-life situation in which you have seen ratios used.
 - Explain how fractions and ratios are similar and how understanding one concept can assist you to understand the other.
 - Explain how to translate a ratio written symbolically and write it into words and vice versa.
- **Other Assessments (include informal assessment ideas)**
 - Using anything in the room, students create a ratio using a symbolic representation and have other students guess the relationship in words.
 - Using manipulatives (e.g., two-color counters, linking cubes, etc.) have students use individual whiteboards to write a ratio and the relationship in words.

Extensions and Connections

- Create an activity in which students must match the four notations of a ratio to one comparison relationship written in sentence form.

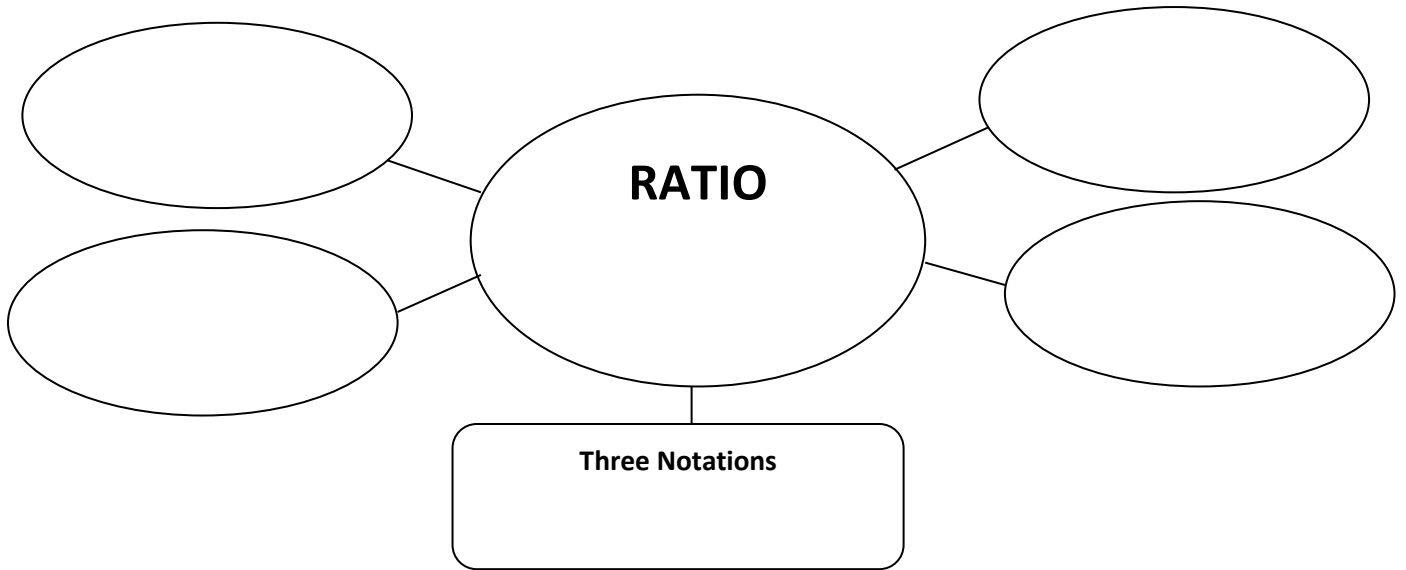
Strategies for Differentiation

- Pair students to jointly define the word *ratio*, then share with other pairs to further explore student understanding.
- Create fraction sentences, fraction form, a-to-b form, and a:b form paper cutouts that some students can place in the appropriate locations on the NBA organizer.
- Create index cards showing each of the relationships to assist students in recognizing them.

Note: The following pages are intended for classroom use for students as a visual aid to learning.

Field Goals, Balls, and Nets

Name _____ Date _____



Statistics for the National Basketball Association and National Football League

Categories	NBA Statistics	NFL Statistics
Regular Season Games	82	16
Home Games	41	8
Away Games	41	8
Number of Teams	30	32
Total Number of Play-off Games	7	7
Number of Divisions	6	8
Number of Conferences	2	2

Comparison	Ratio Sentence	Fraction Form	<i>a</i> to <i>b</i> Form	<i>a</i> : <i>b</i> Form
Part-to-Whole	1. Example: Half of the NBA's regular season games are home games.	$\frac{41}{82}$ or $\frac{1}{2}$	1 to 2	1:2
	2.			
Part-to-Part	1.			
	2.			
Whole-to-Whole	1.			
	2.			
Part-to-Part	1.			
	2.			

Ratios in Words, Pictures, and Notations

Using the table below, create your own symbolic representation of two quantities. Then write the ratio in words and provide the three ratio notations that correspond with your representations.

QUANTITY A:	QUANTITY B:
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Ratio	Ratio Notations	Words
Part-to-Whole (within the same quantity)		
Part-to-Part (within the same quantity)		
Whole-to-Whole (different quantities)		
Part-to-Part (different quantities)		