MISSISSIPPI DEPARTMENT OF EDUCATION

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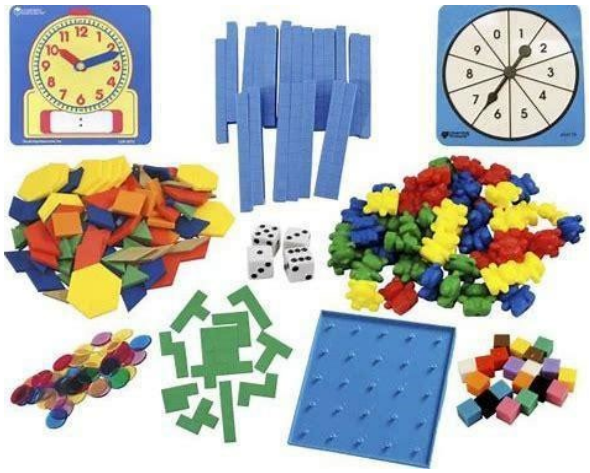
Mississippi Mathematics Manipulatives Manual

Featured Activity



"How Many Ways Can You Compare?"

6.RP.1

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As we continue our efforts to develop high-quality instructional materials (HQIM) and resources, the Mississippi Department of Education (MDE), through the Academic Education Office, would like to showcase instructional practices and activities that foster conceptual understanding through the use of manipulatives in the mathematics classroom.

The **Mississippi Mathematics Manipulatives Manual** features activities meant to serve as short, hands-on procedures that may be implemented before, during, or after a lesson to support the teaching and learning process of the Mississippi College- and Career-Readiness Standards (MCCRS) for Mathematics. Alignment with the MCCRS Scaffolding Document has been included for additional support. Teachers may contact staff at the MDE if they would like to borrow manipulatives for classroom use.

Teachers may modify these activities to meet the needs of the students they serve and their instructional delivery model (virtual, in-person, or hybrid).

Special Thanks:
Jennifer Gaston, Ed.S.,
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How Many Ways Can You Compare?

MANIPULATIVE(S):

- Colored Blocks or Linking Cubes
- Dry Erase Board and Marker
- List of equivalent ratios and comparisons *(See step #1 in the "**Activity**" section below for more details.)*

GRADE LEVEL OR COURSE TITLE:

CCRS Mathematics Grade 6

DOMAIN AND CLUSTER HEADING:

Ratios and Proportional Reasoning (RP):
Understand ratio concepts and use ratio reasoning to solve problems

STANDARD(S):

6.RP.1: Understand the concept of a ratio and use ratio language to describe a 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."*

PREREQUISITE SKILLS:

- Understand that a ratio is a pair of nonnegative numbers, *A:B*, where both are not zero, and are used to indicate a relationship between two quantities.
- Know that for the ratio *A:B*, the value is the quotient of *A/B*.
- Understand that the order of the numbers is important to the meaning of the ratio. Switching the numbers changes the relationship.
- Know that descriptions of a ratio relationship include words such as "to", "for each", and "for every".
- Know how to reason abstractly and quantitatively.
- Know how to solve problems using multiplicative comparisons.

ACTIVITY:

1. Prior to the lesson, prepare a list of comparisons for students to use during this Activity. These can include part to whole (e.g., red cubes to total cubes, primary colored cubes to total cubes), part to part (e.g., blue cubes to yellow cubes, primary colored cubes to secondary colored cubes), and whole to part (e.g., total cubes to orange cubes). For steps 9-11 below, you will need to prepare a list of equivalent ratios for students to find. For example, if students have 3 blue cubes and 15 total cubes, that extends to "for every" 3 blue cubes, "there will be" a total of 15 cubes. 1/5; 3/15; 6/30, etc.

2. Ensure students have a mixture of colored cubes. For whole group instruction, all students must have the same amount of each colored cube. (*Note: students may work in pairs or groups of no more than four.)*
3. Ask students to count and label their cubes according to color or other designated attributes (e.g., *4 red, 2 primary colors*…)
4. Explain to students that a ratio is a pair of non-negative numbers that represent the relationship between two quantities in a similar group.
5. Present three different ways of writing ratios to the students by using the word "to", a colon, or by writing in fraction notation, (e.g., 4 to 5, 4:5, ⅘).
6. Give students opportunities to compare part to whole, part to part, and whole to part ratio relationships by displaying a prepared comparison and having students record it on their dry erase board as a ratio. (*Note: Explain the importance of stating the numbers in the correct order with their labels .)*
7. Select students or groups that have modeled the ratio differently, to show their board to the rest of the class until all three ways are modeled. If students did not model the ratio in three different ways, ask them to demonstrate or verbally express another way to write the comparison/ratio until all three ways are given.
8. Repeat steps 6-7 until students have a good understanding on how to convert ratios given in word form to any of the three numerical forms.
9. Explain that the ratios may be extended by realizing that "for every" number of a colored cube, students must have a specific number of the other color or total cubes. For example, if students have 4 yellow cubes and 6 black cubes, that extends to "for every" 4 yellow cubes, there will be 6 black cubes. 2/3, 8/12; 16/24, etc. (*Note: At this point, it may be necessary to review the process of creating equivalent ratios for some students.)*
10. Using the prepared list of comparisons, prompt students to create equivalent ratios to extend their knowledge of ratios. For example, if students have 5 orange cubes and 10 total cubes, ask students to find how many orange cubes should be in a total group of 50 cubes.
11. Select students or groups of students that have correctly modeled their thinking, to show their board to the rest of the class and to justify their thinking verbally.
12. Repeat steps 9-10 until students have a good understanding of how ratios can be extended to mean that "for every" number of a colored cube, students must have a specific number of the other color or total cubes. For example, if students have 3 blue cubes and 15 total cubes, that extends to "for every" 3 blue cubes, "there will be" a total of 15 cubes. 1/5; 3/15; 6/30, etc.

QUESTIONS TO CONSIDER:

- How many ways can you write a ratio?
- How are equivalent fractions related to ratios?
- If the ratio of green cubes to orange cubes is 5 to 6, how many orange cubes would you need if you had 15 green cubes? How do you know this?

RESOURCES:

- Mississippi Mathematics Scaffolding Document (Grade 6, Page 1)
- 2016 MCCRS for Mathematics

Optional: The University of Mississippi's Center for Mathematics and Science Education has an extensive inventory of math (and science and technology) tools and manipulatives that teachers may borrow for classroom use at no charge. Click the link below to access the inventory list and complete a check-out request.

- CMSE Manipulatives

BEYOND THE ACTIVITY:

- **Assessment:** According to research, an estimated 3 out of 10 people are left-handed. Write and label a ratio to compare these quantities and explain what this ratio means.