MISSISSIPPI DEPARTMENT OF EDUCATION

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Mississippi Mathematics Manipulatives Manual

Featured Activity

“Seeing Slope”

8.F.4

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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:
Elise Brown
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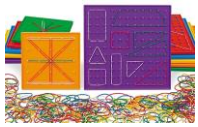
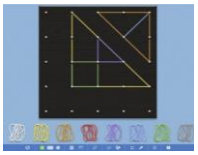
Seeing Slope


MANIPULATIVE(S):

- Chart/Poster Board Paper
- Geoboard *with colored rubber bands* or Geoboard app
- Markers

GRADE LEVEL OR COURSE TITLE:

CCRS Mathematics Grade 8

DOMAIN AND CLUSTER HEADING:

Functions (F):

Use functions to model relationships between quantities.

STANDARD(S):

8.F.4: Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two *(x, y)* values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.

PREREQUISITE SKILLS:

- Know the equation $y = mx + b$ defines a linear function whose graph is a line.
- Know the rate of change is the amount of change in the dependent variable produced by a given change in the independent variable.
- Know the *y-intercept* is the point where the graph crosses the *y-axis*.
- Know the initial value of a linear function is the value of the *y*-variable when the *x*-value is zero.
- Know how to reason abstractly and quantitatively.
- Know how to model with mathematics.

ACTIVITY:

Note: Prior to this activity, students should have been introduced to the Pythagorean theorem and the right triangle.

1. Provide each student or pair of students with a piece of chart paper, colored markers, a coordinate Geoboard with at least 3 rubber bands (*use 3 different color rubber bands when possible).*

a. If a virtual manipulative is preferred, provide students with The Math Learning Center's link for a virtual Geoboard, https://apps.mathlearningcenter.org/geoboard/

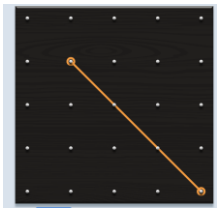


Image 1

2. Provide students with two points on the geoboard. Then have students to place one of the three rubber bands around both pegs to create a diagonal as shown in the image above. (*see Image 1*)
3. Then have students model the **rise** of the diagonal using the second rubber band. (*see Image 2*)

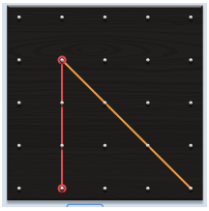


Image 2

4. Next, ask students to use a third rubber band to model the **run** of the diagonal, this should complete the triangle. (*see Image 3*)

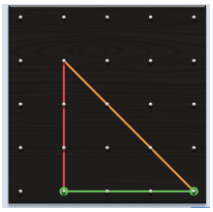


Image 3

5. Now have students to use markers/color pencils that correspond to the color of the rubber bands (when possible) to fill in the slope formula $m = \frac{rise}{run}$ indicating the vertical change or **rise**, Y_2-Y_1 over the horizontal change or **run**, X_2-X_1.
6. Once students have identified the slope (rate of change), have students to select two different points on the same diagonal and repeat step 5.
7. Ask students to discuss their findings. ***Note:*** *Provide purposeful questions to guide students in conducting a meaningful discussion.*
8. Repeat steps 2-6 using a diagonal that will yield a slope that is negative, zero, and undefined in value.

QUESTIONS TO CONSIDER:

- *Before the Activity*: What is "rate of change"? How do we find it?
- *During the Activity*: On your Geoboard, what is the "rise"? What is the "run"?

- *After the Activity*: How would the rate of change be different if we used a different pair of points on the same line?
- Can you find a different linear function with the same rate of change? What do you notice about these functions?
- Is there a better/quicker way to find the slope without graphing? What is it?
- Does it matter if we begin with the vertical difference (the rise) or the horizonal difference (the run)? Justify your response.

RESOURCES:

- Mississippi Mathematics Scaffolding Document (Grade 8, Page 18)
- 2016 MCCRS for Mathematics
- Virtual Geoboard-The Math Learning Center

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:

- **Accommodation(s):** Use colors to signify "rise" and "run". Provide index cards with thesetwo words written on them in the corresponding colors and have students align them with the colored rubber bands when counting.
- **Extension(s)**: (1) Have students find the y-intercept, (2) Students can create a graph from a variety of function representations, such as verbal descriptions, tables, or equations, and (3) Allow pairs of students to create their own linear functions and then compare with other pairs of students to compare slope values.