MISSISSIPPI DEPARTMENT OF EDUCATION

Ensuring a bright future for every child

Mississippi Mathematics Manipulatives Manual

Featured Activity

"The Right PYT"

8.G.7

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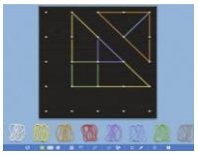
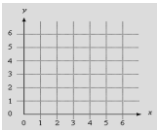
As we continue our efforts to develop high-quality instructional materials (HQIM) and resources, the Mississippi Department of Education (MDE), through the Academic Education Office, would like to showcase instructional practices and activities that foster conceptual understanding through the use of 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:
Courtney Jones, Ed.S.,
Jackson Public School District

The Right PYT

MANIPULATIVE(S):

- Colored Rubber Bands
- Geoboard or Geoboard app
- Grid Paper

GRADE LEVEL OR COURSE TITLE:

CCR Mathematics Grade 8

DOMAIN AND CLUSTER HEADING:

Geometry (G):

Understand and apply the Pythagorean Theorem.

STANDARD(S):

8.G.7: Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real world and mathematical problems in two and three dimensions.

PREREQUISITE SKILLS:

- Know how to write coordinates as ordered pairs.
- Know how to count units within the coordinate plane.
- Know how to use substitution to make equations true.
- Know how to simplify numeric terms using exponents.
- Know legs are the sides of a right triangle that are adjacent to the right angle.
- Know the hypotenuse is the side of a right triangle that is opposite the right angle.
- Know the hypotenuse is the longest side of a right triangle.
- Know irrational numbers cannot be written as a quotient of two integers where the denominator is not 0.
- Know how to decompose polygons into triangles.
- Know the Pythagorean Theorem states that if a and b are the lengths of the legs of a right triangle and c is the length of the hypotenuse, then $a^2 + b^2 = c^2$.
- Know how to solve equations using the square root property.

ACTIVITY:

Note: Activity Sheet Attached

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

1. Arrange student desks to resemble the 1st quadrant of the coordinate plane, aligned as a square or rectangular array, before class begins.

2. Complete a coordinate seating chart of the class for ease in providing feedback as students label their triangles. ***Note:*** You may want to complete the coordinate seating chart based on your preference beforehand and assign student seating as they enter the classroom.
3. Distribute "The Right PYT" materials to students. Offer students the option to use geoboards or the geoboard app in addition to grid paper. ***Note:*** If students select the Geoboard App option, provide them with The Math Learning Center's link for Geoboard, https://apps.mathlearningcenter.org/geoboard/ (Consider that s*ome students are uncomfortable with their sketching skills; they will be able to create and label their right triangle using the geoboard app.)*
4. Ask students to create a right triangle. Students may choose to use grid paper or geoboards/geoboard app. ***Note:*** Ensure students using the geoboard app understand how to utilize the writing tool at the bottom of their screen.
5. Guide students in making a connection to how their desks are arranged as a grid and/or geoboard. Allow students to travel around the classroom to determine student locations and correlate those locations to the grid paper and/or geoboard.
6. Direct students to follow each step as listed in the "The Right PYT" activity.

QUESTIONS TO CONSIDER:

- Can we apply the Pythagorean theorem to any kind of triangle?
- How do we determine which leg is the hypotenuse?
- What method can we use to determine the length of legs *a* and *b*?
- Do legs *a* and *b* have to be the same length to apply the Pythagorean theorem?
- Is it possible to determine the length of the hypotenuse without using the Pythagorean theorem? Explain.
- How did we use the Pythagorean theorem to solve real-life problems today?
- What other problems can be solved using the Pythagorean theorem?

RESOURCES:

- Mississippi Mathematics Scaffolding Document (Grade 8, Page 28)
- 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.

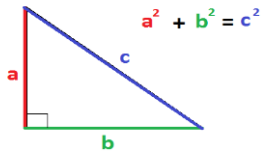
- CMSE Manipulatives

BEYOND THE ACTIVITY:

- **Accommodation(s):** Tactile and visual learners can create right triangles using grid paper, the geoboard, or the geoboard app. They can view their creation on paper, a geoboard and/or an electronic device.
- **Extension**: Once students have discussed how the Pythagorean theorem helped them determine the distance between classmates who were seated diagonally, students may brainstorm other scenarios in which they can visualize a right triangle. Students may be prompted to create and share these scenarios and use the Pythagorean theorem to determine a solution. As students begin to understand how and when to use the Pythagorean theorem, they become better equipped to work through less relatable/generic problems by making connections to their personal creations.

Activity Sheet

The Right PYT



Name: _____ **Date:** _____ **Block:** _____

Read all text carefully and completely.

1. Sketch a right triangle that does not sit on the x or y-axis.
2. Label all vertices using an ordered pair.
3. Determine which classmate is represented by each ordered pair. For example, if "Matthew" is seated on the first row in the third seat, the ordered pair (1,3) would represent his location. List their names above the appropriate ordered pair.

4. Identify legs "***a***" and "***b***" of your triangle. Let "***b***" be the horizontal leg ↔ and "***a***" be the vertical leg ↕.

5. Determine the length of leg *a*. _____

Fill in the blanks using the appropriate names.

6. Leg "***a***" represents the distance between _____ and _____. They are _____ units apart.

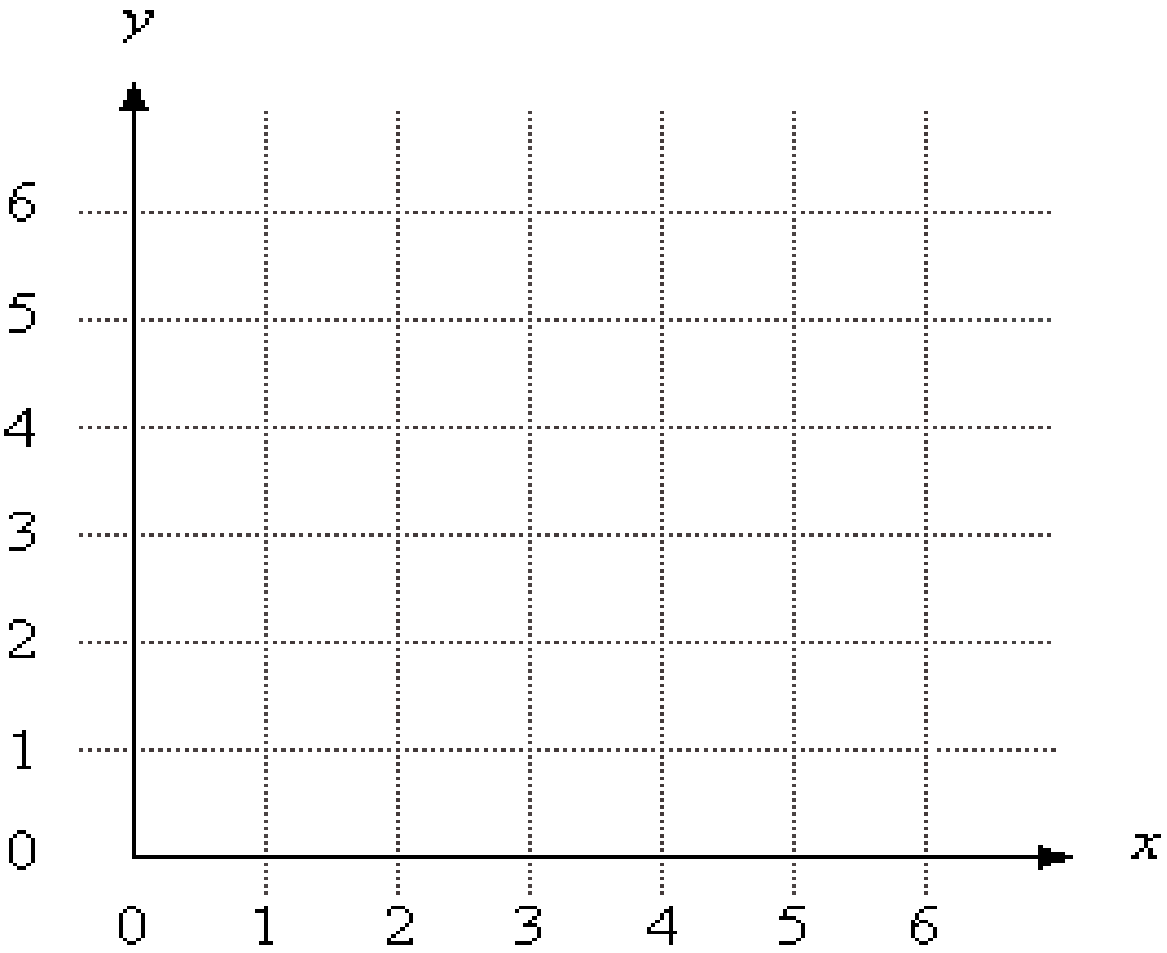
7. Determine the length of leg "***b***". _____

Fill in the blanks using the appropriate names.

8. Leg "***b***" represents the distance between _____ and _____. They are _____ units apart.

9. Leg "***c***" represents the _____. The _____ represents the distance between _____ and _____.

10. How do we determine the length of leg "***c***"?
    _____
11. Determine the length of leg "**c**". Justify.


y
6
5
4
3
2
1
0
0
1
2
3
4
5
6
x

(1,5)	(2,5)	(3,5)	(4,5)	(5,5)
(1,4)	(2,4)	(3,4)	(4,4)	(5,4)
(1,3)	(2,3)	(3,3)	(4,3)	(5,3)
(1,2)	(2,2)	(3,2)	(4,2)	(5,2)
(1,1)	(2,1)	(3,1)	(4,1)	(5,1)

Coordinate Seating Chart