Mississippi Mathematics Manipulatives Manual

Featured Activity

"How Close to 100?"

3.OA.7 & 3.MD.7

Spring 2021

Carey M. Wright, Ed.D.
STATE SUPERINTENDENT OF EDUCATION

Nathan Oakley, Ph.D.
CHIEF ACADEMIC OFFICER

Wendy Clemons
EXECUTIVE DIRECTOR
Office of Secondary Education, Dropout Prevention, & Professional Development

Marla Davis, Ph.D.
STATE DIRECTOR OF CURRICULUM AND INSTRUCTION
Office of Secondary Education

Tommisha Johnson
K-12 MATHEMATICS CONTENT DIRECTOR
Office of Secondary Education

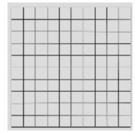
As we continue our efforts to develop high-quality instructional materials (HQIM) and resources, the Mississippi Department of Education (MDE), through the Academic Education Office, would like to showcase instructional practices and activities that foster conceptual understanding through the use of 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:
Pamela Franklin,
Jackson Public Schools (JPS)

How Close to 100?



MANIPULATIVE(S):

- 10 x 10 Grid Paper (See the "Resources" section below for Gameboard link.)
- 2 Number Cubes
- 2 Colored Pencils/Crayons

GRADE LEVEL OR COURSE TITLE:	DOMAIN AND CLUSTER HEADING:
CCRS Mathematics Grade 3	Operations and Algebraic Thinking (OA): Multiply and divide within 100 Measurement and Data (MD): Geometric measurement: Understand concepts of area and relate area to multiplication and to addition

STANDARD(S):

3.OA.7: ***Fluently*** multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. Know from memory all products of two one-digit numbers; and fully understand the concept when a remainder does not exist under division.

3.MD.7: Relate area to the operations of multiplication and addition.

a. Find the area of a rectangle with whole-number side lengths by tiling it and show that the area is the same as would be found by multiplying the side lengths.
b. Multiply side lengths to find areas of rectangles with whole-number side lengths (where factors can be between 1 and 10, inclusively) in the context of solving real world and mathematical problems and represent whole-number products as rectangular areas in mathematical reasoning.
c. Use tiling to show in a concrete case that the area of a rectangle with whole number side lengths a and b + c is the sum of a × b and a × c. Use area models to represent the distributive property in mathematical reasoning.
d. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real world problems. Recognize area as additive.

PREREQUISITE SKILLS:

- Know how to add and subtract fluently within 20 and recall single-digit sums from memory.
- Know how patterns and relationships are found in the multiplication table.
- Know the relationship between multiplication and division is an inverse relationship.
- Know multiplication is used to find the sum of equal groups.
- Know division is used to find the number of objects in a share or the number of equal shares.
- Know how to partition rectangles into equal-sized groups of rows and columns using square units.
- Know problem-solving structures for area/arrays and for equal sized groups.
- Know how to skip count by 5s, 10s, and 100s.
- Know multiplication facts for all single digits 1 through 9, and 10.
- Know how to find areas of rectangles.
- Know how to add areas of rectangles.

ACTIVITY:

Note: Activity Sheet Attached

Note: Prior to this activity, students should have been introduced to creating rectangular arrays using grid paper.

1. Group students in pairs.
2. Provide each student with his or her own gameboard or 10 x 10 paper grid *(*Gameboard link provided in the "Resources" secion below and on the attached Activity sheet*)* and colored pencil (a crayon or fine tip marker may also be used).
3. Provide both students with a pair of six-sided numbered cubes to share*. Note: To use the virtual dice roller (see link in resources), have students to select "use dice 1" and "use dice 2" at the top of the page.*
4. **Optional:** Have students identify which cube will determine the rows (C1), and which cube will determine the columns (C2). This will allow students to create rectangular arrays written as (rows x columns). *Note: It may help to write on the cubes with a permanent marker or provide students with two different colored number cubes.*
5. The students will take turns rolling the numbered cubes. The first player rolls the two numbered cubes (C1 & C2); the numbers that come up are the dimensions (length and width) of the rectangle. Have the player use the dimensions to make a C1 x C2 rectangle anywhere he/she chooses on the 10 x 10 grid. To do this, the player uses his/her colored pencil to color/shade the area of the C1 x C2 rectangle; finally, the first player records the number sentence (multiplication) used to find the area of his/her rectangle.

6. The second player takes his/her turn and completes the same step as the first player outlined in step 3.
7. The players will take turns rolling the numbered cubes and completing steps outlined in step 3. The goal is to fill up the grid to get as close to 100 square units as possible.
8. The game ends when both players have rolled the numbered cubes and cannot build/draw any more arrays/rectangles on the grid.
9. The winner is the player whose total area of all the rectangles is closest to 100. Some students may add the areas of all the rectangles. Some students may subtract the "blank"/white squares from 100. Some students may simply count the number of "blank"/white squares. The student(s) with the least number of white squares remaining will also have the largest number of squares colored in.

QUESTIONS TO CONSIDER:

- Which whole number products between 1 and 6 are not possible in this game? Justify your response.
- Of the products from 1 to 36 that are not possible, is there anything you notice about the numbers in this list (i.e., common characteristics)?
- What strategies are you utilizing to help you win the game when placing your rectangle on the grid?
- How many other rectangles are possible for a given product? For example, if you rolled a 4 and a 6 for a product of 24, what additional rectangle dimensions are possible other than 4 x 6?
- How can you organize your thinking to ensure that you have considered all possible rectangles?

RESOURCES:

- Mississippi Mathematics Scaffolding Document (Grade 3, Page 7; and Pages 27-30)
- 2016 MCCRS for Mathematics
- Math Task: How Close to 100? - by youcubed at Stanford University
- Gameboard: How Close to 100? - by youcubed at Stanford University
- How to Play Video: How Close to 100? - by Duane Habecker
- Virtual Dice Roller-teacherLed.com

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.

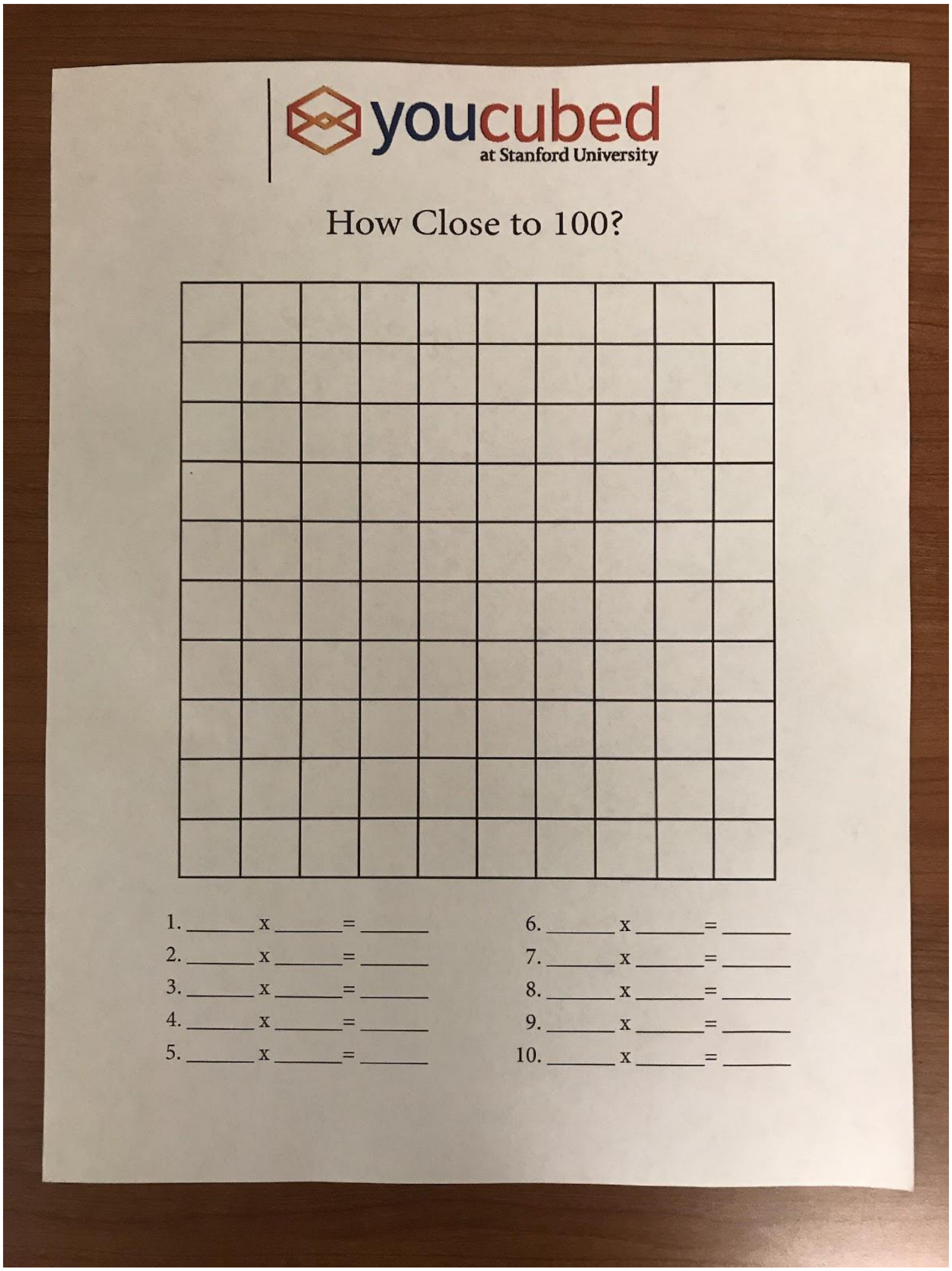
- CMSE Manipulatives

BEYOND THE ACTIVITY:

- **Extension**: Add a third number cube to the game. As each player takes a turn, two of the cubes are added together to get a factor between 2 and 12, while the second factor is the number on the third cube. This expands the possible products from 1-36 to 2-72. The game board could be increased (Ex. 12 x 12. How close to 144?) or other larger sizes. Students could explore rectilinear shapes by combining two or more of their rectangles and finding the area. For example, in the picture shown, a student could outline the rectilinear shape composed in the red and blue regions and find the area by counting non-overlapping squares or by adding the areas of the red and blue rectangles to get an area of 44 square units.
- **Misconceptions:**
  1. Students may confuse area with perimeter.
  2. Students may think that area for any shape can be found by "multiplying the sides".
  3. Students may confuse rows with columns.

Activity Sheet

Gameboard: How Close to 100? - by youcubed at Stanford University



Sample of Activity