**Finding Area of Rectilinear Figures: Part One**

*Adapted from North Carolina Department of Public Instruction*

**Student Objective:** “I can find the area of a complex figure by decomposing it into smaller rectangles.”

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| **Common Core Standards to Measure** | **Mathematical Practices Addressed** |
| **3.MD.7** Relate area to the operations of multiplication and addition  **d.**  Recognize area as additive. 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. | #4 Model with mathematics.  #7 Look for and make use of structure.  #8 Look for and express regularity in  repeated reasoning. |

**Materials:**

Geoboards

Rubber bands

“Areas of Rectilinear Figures” sheet

Interactive Notebooks (if used)

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| G  **Engage Students with the Goal** | State and Rate  Objective: “I can find the area of a complex figure by decomposing it into smaller rectangles.”  Students rate themselves to the goal (1, 2, 3, 4). | Setting Objectives and Providing Feedback |
| A  **Access Prior**  **Knowledge** | *In this lesson, students transition from finding the areas of rectangles to finding the areas of rectilinear figures (combined rectangles). This lesson expects students to break the figure into rectangles, and use the dimensions of smaller rectangles to determine the area. Some students may visualize the rectilinear figure as one large rectangle with a “piece missing,” consequently finding the dimensions of this larger rectangle, then subtracting the “missing” portion to find the area of the figure. This method can be explored if a student suggests it; however, the Standard specifies adding the area of multiple rectangles.*  Create an L-shaped rectilinear figure on a geoboard like the one below and show it to the class. Pose the following questions:  1-s2  *How is this shape like the ones we have been using for area?*  Possible responses: They all have right angles. We have been using rectangles, and this figure looks like rectangles “stuck together.”  *How is this shape different from the ones we have been using for area?*  Possible responses: This shape is not just one rectangle. We cannot find the dimensions for the whole shape.  *How do you suppose we find the area of this rectangle?*  We can count the number of square units in the figure. | Nonlinguistic Representations  Identifying Similarities and Differences |
| N  **New Information** | Continue talking about the figure. Have students take notes in their interactive notebooks as you think aloud together. Allow students to count aloud as each square unit is identified in the figure. Continue the discussion by asking:  *Is there another way we can find the area of the figure?*  We can break it into smaller rectangles.  If students do not suggest this method, continue to question/think aloud:  *I know that I can find area by using the dimensions of a rectangle. We said that this figures looks like two rectangles stuck together. Is there a way I can show both of the rectangles?*  *Where can I break this figure apart into two rectangles?*  Allow students to suggest a horizontal or vertical line and draw it or on the figure or use another rubber band to show the separation.  *How can I now find the dimensions and areas of the rectangles?*  Choose one student for each step of the process: find the length, find the width, and calculate the area.  Record each step on the board or document projector. This calculation should be displayed during the student activity for reference.  Conclude by asking: *How can I find the area of the whole figure? How can I check my work?* | Cues, Questions, and Advance Organizers  Summarizing and Note-Taking |
| A  **Application** | *The main activity requires students to record each step they used to calculate the area in order to ensure they are not simply counting the number of square units in the figure. The teacher should monitor this process closely as the students are working.*  Introduce the activity. You may want to model this as well.  *Today, you will work in pairs to build and find the areas of figures with only right angles. Each person will build a figure on the geoboard, draw the figure, and find the area. When you are done, you will pass the geoboard to your partner. They will draw your figure and label the dimensions in their interactive notebook. They will then calculate the area of the figure, showing each step of their problem solving process, just like what is on the board. When you are done, compare your answers and strategies for each person’s figure.*  Distribute geoboards and rubber bands. Guide students in creating a chart on in their notebooks like the one below:   |  |  |  | | --- | --- | --- | | Figure | Area | How I Solved | |  |  |  |   Designate pairs, or have student choose partners, and direct the students to begin the activity. Remind the students not to remove their figures from the board when they have finished. As students are working, visit each pair to monitor the understanding of directions, answer any questions, watch for different problem solving strategies, identify interesting figures, and listen for misunderstandings or difficulties.  When students have finished, choose several interesting figures to share. Display them to the class and pose the following questions: -*Where can I break this figure apart into two rectangles?* Allow students to suggest a horizontal or vertical line and draw it or on the figure or use another rubber band to show the separation.  -*How can I now find the dimensions and areas of the rectangles?*  Choose one student for each step of the process: find the length, find the width, and calculate the area. Record each step on the board or document projector.  -Address the student pair that solved the problem.  *Did you solve it in the same way? If not, how did you find the area?*  Record the responses on the board and ask How do these strategies compare?  Repeat for the other figures. If any further misunderstandings or difficulties were observed while students were working, address them here.  For independent application: Distribute the “Finding Areas of Rectilinear Figures” sheet and have students to complete it. | Cues, Questions, and Advance Organizers  Cooperative Learning  Homework and Practice  Generating and Testing Hypotheses  Providing Feedback |
| G  **Revisit the Goal** | To summarize their learning, have students explain in their own words how to find the area of a figure with right angles that is not a rectangle. They can use pictures, numbers, and/or words in their explanation.  State and Rate  Objective: “I can find the area of a complex figure by decomposing it into smaller rectangles.”  Students rate themselves to the goal (1, 2, 3, 4). | Setting Objectives and Providing Feedback  Summarizing and Note-Taking |

**Evaluation:**

**Formative**- Pose questions and observe students as they work.

**Summative**- Assess student understanding from the “Finding Areas of Rectilinear Figures” sheet.

**Differentiation:**

**Intervention-** Students can outline/color each rectangle with a different color band or marker to distinguish the smaller rectangles inside the figure.

**Extension-** Have students make their own rectilinear figures from centimeter grid paper and glue them onto index cards. Have students cut out 2 copies of a figure and mount one copy on the front of the card. Glue the second copy on the back. Have students record one way of finding the area of the figure and record it on the back of the card. Put the cards in a work station for practice.

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Areas of Rectilinear Figures**

Create a figure in each grid. (It must have only right angles.)

Separate each figure into two rectangles.

Label the dimensions of the rectangles.

Find the area of the figure.

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My thinking:

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My thinking: