LESSON PLAN – Find the area of a rectangle by multiplying the lengths of two sides

Subject/Topic/Unit: Math/Area/Healthy Living

Grade Level: Third Grade

I. Main Ideas/Conceptual Understanding/Goals

Area is a measurement of how much surface is covered. The area of a rectangle can be found by multiplying the lengths of the sides.

II. Specific Objectives

Students will be able to find the area of a rectangle by multiplying the lengths of two sides.

CCSS.MATH.CONTENT.3.MD.C.7a
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

CCSS.MATH.PRACTICE.7. Look for and make use of structure.

CCSS.MATH.PRACTICE.8. Look for and express regularity in repeated reasoning.

Vocabulary: repeated addition, multiplication, dimensions, rows and columns, array

III. Procedures

A. Introduction/Motivation

Lesson Overview: This lesson builds on learners’ prior work finding the area by counting individual squares and using repeated addition to find the area of a rectangle. In this lesson learners will use the dimensions of a rectangle to determine its area. Learners will develop an understanding that the side lengths correspond to the number of unit squares in each row or column. Learners will learn to describe the area of rectangles using language such as "4 rows of 8 squares imply that the area is 4 * 8 or 32 square units." This lesson lays the foundation for learners’ subsequent work with finding the area of complex rectilinear figures.

Warm-up:

The teacher should have the warm-up power point slide displayed for the learners to see at the beginning of the class. The teacher should provide each learner with a Student Worksheet and several pieces of centimeter graph paper (to be used for the main task). In the warm-up the learners are expected to begin to notice how the area of the rectangle can be found by using either repeated addition (of the rows or columns) or by multiplying the units in each row by the units in each column. The teacher can use the guiding questions to illicit student thinking during the warm-up.
Warm-up question:

How many ways can you explain how to find how many fruit bins there are in the fruit stand?

Guiding questions:

Is there another way to find how many fruit bins there are at the farmer’s market?

Show how you can use repeated addition in two different ways.

What does this array of fruit bins have in common with the area of the rectangle?
How Much Fruit Is Needed Daily?

The amount of fruit you need to eat depends on age, sex, and level of physical activity. Recommended daily amounts are shown in the chart.

<table>
<thead>
<tr>
<th>Daily recommendation*</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Children</strong></td>
<td></td>
</tr>
<tr>
<td>2-3 years old</td>
<td>1 cup**</td>
</tr>
<tr>
<td>4-8 years old</td>
<td>1 to 1 ½ cups**</td>
</tr>
<tr>
<td><strong>Girls</strong></td>
<td></td>
</tr>
<tr>
<td>9-13 years old</td>
<td>1 ½ cups**</td>
</tr>
<tr>
<td>14-18 years old</td>
<td>1 ½ cups**</td>
</tr>
<tr>
<td><strong>Boys</strong></td>
<td></td>
</tr>
<tr>
<td>9-13 years old</td>
<td>1 ½ cups**</td>
</tr>
<tr>
<td>14-18 years old</td>
<td>2 cups**</td>
</tr>
<tr>
<td><strong>Women</strong></td>
<td></td>
</tr>
<tr>
<td>19-30 years old</td>
<td>2 cups**</td>
</tr>
<tr>
<td>31-50 years old</td>
<td>1 ½ cups**</td>
</tr>
<tr>
<td>51+ years old</td>
<td>1 ½ cups**</td>
</tr>
<tr>
<td><strong>Men</strong></td>
<td></td>
</tr>
<tr>
<td>19-30 years old</td>
<td>2 cups**</td>
</tr>
<tr>
<td>31-50 years old</td>
<td>2 cups**</td>
</tr>
<tr>
<td>51+ years old</td>
<td>2 cups**</td>
</tr>
</tbody>
</table>

*These amounts are appropriate for individuals who get less than 30 minutes per day of moderate physical activity, beyond normal daily activities. Those who are more physically active may be able to consume more while staying within calorie needs.

**Key Consumer Message** Make half your plate fruits and vegetables.

http://www.choosemyplate.gov/food-groups/fruits-amount.html

After the warm-up and before the main task the teacher should discuss the information above with students.
B. Study/Learning

Main Task:

The teacher should have the main task power point slide displayed for the learners to see after the warm-up. After presenting the question the teacher should make sure that each student has several pieces of 1 inch centimeter graph paper. The teacher should circulate around the room asking learners the guiding questions during the main task. The learners should be able to construct viable arguments to support why their answers are reasonable. The learners should be able to precisely communicate that to the area of each fruit stand they have multiplied the number of square fruit bins along the length of the stand by the number of fruit bins along the width of the stand. Learners can work on the main task either individually or in small groups. Once the teacher notices that most learners have solved the task, the teacher should draw the classes' attention to the front of the room for a whole-class debriefing discussion.

Main task question:

Eight farmers are bringing their fruit to the local farmers' market to sell. Each farmer will put their fruit into fruit crates and arrange the crates to make a fruit stand. Each crate is 1 square foot. The dimensions of each farmer's stand can be found in the table below. Find the area of each farmer's fruit stand. Use your centimeter graph paper and a scale of 1 cm = 1 foot to model the farmers' fruit stands.

<table>
<thead>
<tr>
<th>Farmer</th>
<th>Fruit Stand Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>6 feet by 3 feet</td>
</tr>
<tr>
<td>B</td>
<td>4 feet by 12 feet</td>
</tr>
<tr>
<td>C</td>
<td>3 feet by 8 feet</td>
</tr>
<tr>
<td>D</td>
<td>10 feet by 4 feet</td>
</tr>
<tr>
<td>E</td>
<td>6 feet by 2 feet</td>
</tr>
<tr>
<td>F</td>
<td>6 feet by 8 feet</td>
</tr>
<tr>
<td>G</td>
<td>5 feet by 6 feet</td>
</tr>
<tr>
<td>H</td>
<td>7 feet by 5 feet</td>
</tr>
</tbody>
</table>
Guiding Questions:

What mathematical terms apply in this task?

What strategies might you use?

How can you test if your approach worked?

What might be another way to think about the problem?

How to the dimensions of the fruit stands relate to square units?

Does the longest fruit stand have the largest area? How do you know?

Order the farmers’ stands from the least to the greatest area.

Common Misconceptions/Errors:

Students do not recognize the relationship between the area of a rectangle and its dimensions.

Students add the dimensions of the rectangle instead of recognizing they represent an array of square units and require multiplication.

Students think a longer rectangle has more area.

Possible Solution Paths:

Students draw unit squares based on the dimensions and use strategies (e.g., counting, repeated addition, or multiplication) to determine the total.

Students recognize the dimensions of a rectangle represent the number of rows and columns of unit squares and multiply to find the area.
C. Culmination

Task Debrief: Once the teacher notices that most learners have solved the task, the teacher should draw the classes' attention to the front of the room for a whole-class debriefing discussion. The teacher should use the task debrief to facilitate classroom discussion about the task and as an opportunity for learners to share their different approaches to the task. The teacher should pose the same guiding questions used while circulating during the task. The learners should be able to construct viable arguments to support why their sis reasonable. The learners should be able to precisely communicate how they determined the area of each farmer's fruit stand.

Closing Questions: Ask students to write their answers to the closing questions on their worksheets.

1. What operations can you use to find the area of a rectangle?

2. How is using repeated addition to find the total related to using multiplication?

3. How are the length and width of the rectangle related to its area?

Indicators of understanding: Learners understand that area is a measurement of how much surface is covered. Learners also understand that area is the number of unit squares needed to cover a figure. Additionally, learners understand that a rectangle is composed of unit squares organized into an array. Moreover, learners understand that side lengths correspond to the number of square units in each row or column. Finally, learners understand that the area of a rectangle can be determined by multiplying the lengths of the sides.

Big Idea: After the task debrief the teacher should ask learners what they think the most important mathematical concepts that the learned in the lesson were. The teacher should guide the learners to summarize the big idea of the lesson to be that area is a measurement of how much surface if covered. Additionally, area can be found by counting square units. Also, the area of a rectangle can be found by multiplying the length by the width of the rectangle. Finally, repeated addition is one way to think about multiplication.
D. Follow-up

Ticket out the door: Explain how to find the area of these rectangles.

Student Practice Sheet: There are three levels of practice sheets for the learners. Practice Sheet A is intended for learners who do not fully understand the big idea(s) of the lesson, Practice Sheet B is intended for learners who showed understanding but would benefit from added practice, and Practice Sheet C is intended for learners who displayed strong understanding of the big idea(s) and are ready to develop a deeper understanding.

IV. Materials/Resources

Interactive whiteboard or computer with projector

1 centimeter graph paper (several sheets per student)

Lesson Plan power point

Student Worksheets (1 per student)

Practice Sheets (A, B, and C)

V. Evaluation related to objectives

Warm-up question

Main task question

Task Debrief questions

Closing questions

Big idea summary

Ticket out the door

Practice sheets (A, B, and C)