

LESSON PLAN – Find the area of plane figures using length and width by visualizing and counting unit squares

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

Grade Level: Third Grade

I. Main Ideas/Conceptual Understanding/Goals

The area of rectangular shapes can be found by subdividing the shapes into rectangles and counting how many square units are inside of the rectangles. There is a relationship between the length and width dimensions and the area of a rectangle.

II. Specific Objectives

Students will be able to determine the area of a plane figure by tiling rectilinear shapes with

CCSS.MATH.CONTENT.3.MD.C.6

Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units).

CCSS.MATH.PRACTICE.3. Construct viable arguments and critique the reasoning of others.

CCSS.MATH.PRACTICE.6. Attend to precision.

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

Vocabulary: linear, attribute, area, square units

III. Procedures

A. Introduction/Motivation

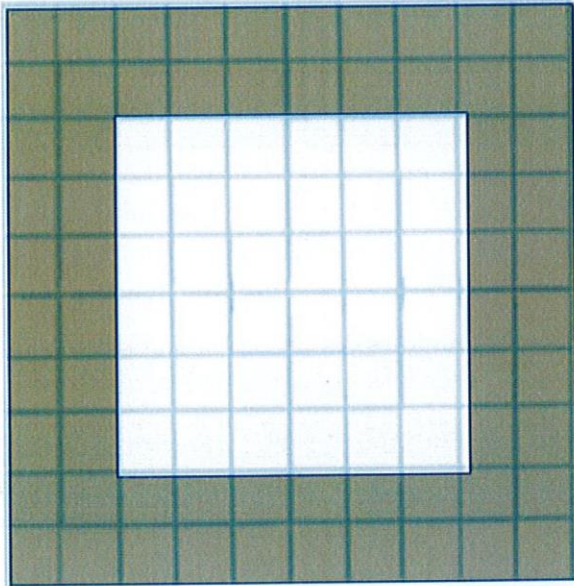
Lesson Overview: This lesson advances learners' understanding of the concept of area by counting unit squares inside rectilinear shapes. In the main task learners will determine the area of various shapes. Learners will need to design a fitness center arrangement given the dimensions of 4 pieces of fitness equipment that they will need to put into their fitness centers. Learners will be connecting the attribute of length and width of rectangles to the attribute of area in this lesson. The mathematical concepts in this lesson lay the foundation for learners' future work with multiplying length and width of rectangles to find the area.

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 for this lesson. In the warm-up the learners are expected to determine the area of the fitness trail. The teacher can use the guiding questions to illicit student thinking during the warm-up. After the warm-up the teacher should display the USDA exercise recommendations and discuss the importance of exercising.

Warm-up question:

In an effort to encourage students and community members to exercise more, Einstein Elementary School is going to create a paved fitness trail around the school's campus. Determine the area of the fitness trail.



Guiding questions:

What are some possible ways we can count the square tiles that make up the area of the fitness trail?

Does knowing the length of the fitness trail help us at all?

Does knowing the width of the fitness trail help us at all?

How much physical activity is needed?

Physical activity is important for everyone, but how much you need depends on your age.

ADULTS

(18 to 64 years)

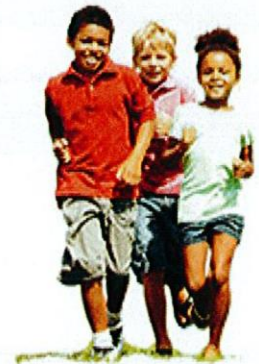
Adults should do at least 2 hours and 30 minutes each week of aerobic physical activity at a moderate level OR 1 hour and 15 minutes each week of aerobic physical activity at a vigorous level. Being active 5 or more hours each week can provide even more health benefits. Spreading aerobic activity out over at least 3 days a week is best. Also, each activity should be done for at least 10 minutes at a time. Adults should also do strengthening activities, like push-ups, sit-ups and lifting weights, at least 2 days a week.



CHILDREN AND ADOLESCENTS

(6-17 years)

Children and adolescents should do 60 minutes or more of physical activity each day. Most of the 60 minutes should be either moderate- or vigorous intensity aerobic physical activity, and should include vigorous-intensity physical activity at least 3 days a week. As part of their 60 or more minutes of daily physical activity, children and adolescents should include muscle-strengthening activities, like climbing, at least 3 days a week and bone-strengthening activities, like jumping, at least 3 days a week. Children and adolescents are often active in short bursts of time rather than for sustained periods of time, and these short bursts can add up to meet physical activity needs. Physical activities for children and adolescents should be developmentally appropriate, fun, and offer variety.



YOUNG CHILDREN

(2-5 years)

There is not a specific recommendation for the number of minutes young children should be active each day. Children ages 2-5 years should play actively several times each day. Their activity may happen in short bursts of time and not be all at once. Physical activities for young children should be developmentally appropriate, fun, and offer variety.

Physical activity is generally safe for everyone. The health benefits you gain from being active are far greater than the chances of getting hurt. Here are some things you can do to stay safe while you are active:

- ▶ If you haven't been active in a while, start slowly and build up.
- ▶ Learn about the types and amounts of activity that are right for you.
- ▶ Choose activities that are appropriate for your fitness level.
- ▶ Build up the time you spend before switching to activities that take more effort.
- ▶ Use the right safety gear and sports equipment.
- ▶ Choose a safe place to do your activity.
- ▶ See a health care provider if you have a health problem.



Source: choosemyplate.gov

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 can pass out grid paper, rulers, scissors, and colored pencils to aid in students' exploration of the problem. 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 solution is reasonable. The learners should be able to precisely communicate the number of unit squares that fit into each garden. 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:

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Your class has been asked to design the new fitness center at school. The fitness center is 30 feet long by 30 feet wide and has an area of 900 square feet. Decide which fitness equipment to put in the fitness center and where to place each piece of equipment. Be sure to leave space for people to walk around and to include a door.



Fitness Equipment	Dimensions
Treadmill	5 feet long by 3 feet wide
Elliptical	4 feet long by 2 feet wide
Stationary Bike	3 feet long by 2 feet wide
Weight bench	4 feet long by 3 feet wide

Guiding Questions:

How did you decide what the problem was asking you to find?

How do the length and width of the pieces of equipment help us determine its area?

When designing the arrangement, what pieces should be near each other and why?

How much room did you leave for people to walk around in the fitness center?

Does the placement of the equipment make sense in relation to where your door is?

How much floor space (area) is left after all the pieces of equipment has been placed?

How does moving the equipment to a different place affect the area in the fitness center?

How could you prove your solution makes sense?

Could you prove your strategy makes sense by solving the problem in another way?

Common Misconceptions/Errors:

Learners may not recognize that the dimensions of the equipment create rectangles.

Learners may draw the equipment as L shapes instead of rectangles.

Learners may not recognize that the floor plan of the fitness center is a view from above.

Learners may group all of the equipment into 1 corner, not considering the need to move around in the fitness center.

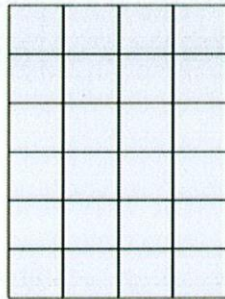
Possible Solution Paths:

There are many ways that learners can complete this task. Learners may wish to shade in unit squares on the grid to represent different pieces of equipment. Alternatively, they may draw an outline of the piece of equipment and label it.

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 solution is reasonable. The learners should be able to precisely communicate the number of triangles that fit into each waffle shape.

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



1. What are the dimensions of this shape?
2. How does the length and width of the rectangle determine its area?

Indicators of understanding: The learner understands how to determine the attributes of length and width of rectangles. The learner understands that length is the number of rows of a rectangle. The learner understands that width is the number of columns of a rectangle. The learner understands how the attributes of length and width determine the attribute of area of a rectangle.

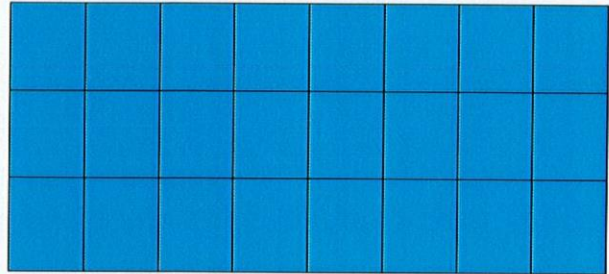
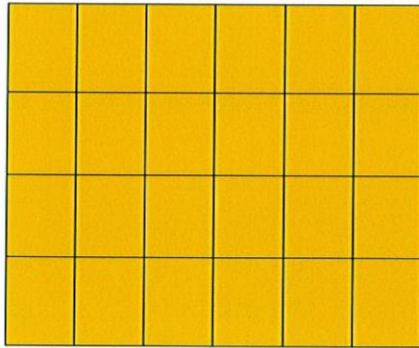
Big Idea: After the task debrief the teacher should ask learners what they think the most important mathematical concepts that they learned in the lesson were. The teacher should guide the learners to summarize the big idea of the lesson to be the area of a rectangular shape can be found by using its length and width. For example, a shape that is 3 feet long and 5 feet wide is made up of 3 rows of square feet and 5 square feet in each row. When measuring the area of flat shapes with unit squares, we say that the shape has a certain number of square units.

D. Follow-up

Ticket of the Door:

Which floor plan has a larger area?

Explain how the attributes of length and width determine the area of 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
- Square Grid Paper
- Rulers
- Colored pencils
- Scissors
- 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)