Math & Science Collaborative Lesson Plan

Northwest Educational Service District 189
Together We Can

Lesson Title: What is Area?

Unit Learning Target (Standard/Performance Expectation(s)) **4.3.E** Demonstrate that rectangles with the same area can have different perimeters, and that rectangles with the same perimeter can have different areas.

Building Block or Lesson Learning Target: Demonstrate and explain the concept of Area and how to calculate it for a rectangle

Previous Lesson Learning Target: Demonstrate and explain the concept of Perimeter and how to calculate it from geometric shapes

Student Success Criteria:

Find and draw five different factor sets of thirty-six

Target Introduction/ Thinking Question *

Henry needs to replace a rectangle of carpet in his bedroom that measures 4 feet on one side by 5 feet on the other side. How many square feet does he need? You may use color tiles to help you plan your answer.

Lesson Progression (Flow) with Talk-Structures (Student Discourse)

As a review of our last lesson, who can explain what perimeter is?
How is it measured? Can anyone explain what area means?
How do we measure Area? What operations can we use to calculate Area?
(Introduce Styrofoam Square Feet) (Introduce Marked Rope)
Proceed through the Area versus Perimeter Lesson with pauses for student discussions at each step and then to make predictions towards the next step.
Start with the 1 by 9 Square foot shape.
Add one sq. Foot vertically to each end – 2 by 8
Add a third sq. foot vertically to each end – 3 by 7
Add a fourth sq. foot vertically to each end – 4 by 6
End this lesson with a 5 by 5 square figure.
Ask many follow up questions to check for misconceptions and understanding of what was demonstrated.

Key terms for this lesson

Perimeter
Area
Square Units
Length and Width
Base and Height
Dimensions

Formative Task or Question*
Designed to elicit student misconception(s)

How are Perimeter and Area different?
What is measured in 1 dimension?
What is measured in 2 dimensions?
Do we ever count the sides of the squares inside a shape?

Forms of Student Discourse to include:

Student to Teacher
Student to Student
Student to Small Group
Small Group to Small Group
Large Group

Lesson Closure

Henry would like to see all the different rectangles that he could make with 36 square feet of carpet. Draw all your answers on this quarter inch graph paper. Each square represents 1 square foot.

Exit Task*

Graph paper drawing

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Do the Math for the Thinking Question

4 feet times 5feet = 20 **square** feet

4 square feet + 4 square feet + 4 square feet + 4 square feet + 4 square feet = 20 square feet

5 square feet + 5 square feet + 5 square feet + 5 square feet = 20 square feet

Lesson Anticipated Misconceptions:

Students continuing to use addition to calculate area.
Confusing sides of squares on the inside versus just using the outside edges.
Confusing 2 dimensions with 1 dimension measurements.

Lesson Instructional Adjustment(s) (if needed)
Tied to common misconception(s)

Making sure students do not misuse the square feet examples

Students not understanding the rope did not change

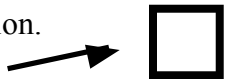
Manipulatives and materials to include and have ready to support the lesson *

Quarter inch graph paper
Color tiles
Styrofoam Square feet with Duct taped edges
21 foot rope marked and connected to make a continuous 20 foot loop

* Opportunity for formative assessment

Area versus Perimeter - Which is Greater ?

You need: 21 ft. piece of cotton rope. 1 sheet of Styrofoam (4 x 8) 1 roll elect. tape. 1 roll Black duct tape.
Tape each end of the rope with clear plastic packing tape. This will keep the ends from fraying.
Cut eleven 3 inch pieces of electrical tape (11) and then cut each one in half lengthwise to get 22 - 3 inch pieces.
Measure in 6 inches from one end of the rope and mark with a pen. (You need some tying off end parts)
Mark off slightly more than 12 inch segments. [12 & 3/8"] (This will allow for bending around the square feet)
Place and roll an electrical tape strip around the rope at each mark. Overlay the 1st and last mark and tape once.

Cut the Styrofoam sheet into 32 individual square feet.
Wrap each square foot with duct tape on the edges to protect them from disintegration.
Cut the overlapping corners and fold onto each side so each looks like this example. 

Begin the lesson by defining, discussing, and demonstrating Perimeter. (Use an unmarked piece of string)
Perimeter is: the distance around the connected sides of a shape. (1 dimension = length)
The students need to see that even if the string is wrapped around an object it is still only length. It can be made into a square, rectangle, triangle, circle, etc., but it is still representing a total distance.
"How long is it around the outside of _____ ?" "Then the Perimeter of this _____ is ?"

Next, pass out a square to each student. Do not tell them what it is, but ask them what they think it is.
Once they have discovered that each one represents a square foot, discuss what can be measured in square feet.
"How many square feet are in your desk top?" "How many square feet in our white (black) board?" Etc.

Take one square and demonstrate that the area is one Square foot, while the perimeter is 4 feet. Therefore, in this case the perimeter number is greater than the area number. (4 to 1) If necessary, repeat this with 2 connected square feet. (6 to 2) Even up to 1 square yard. (counting only the outside feet - 12 to 9)
Discuss the inside sides of squares and why they are not counted.

Now, produce the taped rope. Demonstrate that it is 20 feet long.
Take one of the squares and place it in the loop so the taped marks are at the corners of the square. Ask a student to do the same at the other end of the loop. Turn this sideways and hold it up so the whole class can see this. Now ask 7 other students to come up and hold their squares in the loop.

This demonstrates that the perimeter of a 9 square foot rectangle is 20 feet long. (9 X 2 plus 1 X 2) or L+W X 2
Have the 7 students step to the side. Place a second square foot in each end of the loop and have the 7 students return and place their squares in the loop. They will see a need for 5 more students to place their squares in the loop. Remind the students that the perimeter has not changed! Only the shape of the rectangle has changed.
This process can be repeated until all students are in the loop, or until you have used 25 square feet. *For a class larger than 25 students you may want to use a longer marked rope.*

Close this lesson by discussing how to get the maximum (square) and minimum ("1 by" rectangle) area from a given perimeter. *Another lesson could examine circles vs squares , but this could wait for decimal fraction work.*
The following lesson can examine the maximum and minimum perimeter that can be found from a given area.