Math & Science Collaborative Lesson Plan

Northwest Educational Service District 189
Together We Can

Lesson Title: **Perimeter and area**

Unit Learning Target (Standard/Performance Expectation(s)) **4.3.E** ***CCSSM 3.MD.8***

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:
Find several different rectangles with the same given area.

Previous Lesson Learning Target:
Demonstrate and explain how to find the perimeter and area of a rectangle.

Student Success Criteria:
Students will be able to draw and label at least three shapes with an area of 36 square units, but with different perimeters.

Target Introduction/ Thinking Question * How many rectangles can you draw with the same area of 12 square units?

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

From a given rectangle, students will find the area and explain how they found their solution. Was there a formula involved?
What is the perimeter of the rectangle? Is there a formula to use?
From a series of rectangular handouts, students will represent on paper each rectangle's perimeter and area.

Take students through the Area versus Perimeter lesson with Styrofoam square feet and the 20 foot marked rope loop. (attached)

Students will find and create on quarter-inch graph paper, as many different rectangles as they can find with an area of 24 square units (4.1.B)

Key terms for this lesson
Area
Perimeter
Length
Width
Base height
A = L x W

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

All examples do not look like 3 by 4 units rectangles.

Forms of Student Discourse to include:
Student to Student
Student to small group
Large group discussion

Lesson Closure
Sharing and comparing solutions for 24 square units

Exit Task*
Draw and label the perimeter of different rectangles that have an area of 36 square units. (4.1.B)

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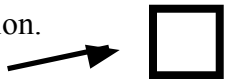
Do the Math for the Thinking Question	**Lesson Anticipated Misconceptions:**
1 x 12 = 12 2 x 6 = 12 3 x 4 = 12 (4 x 3 = 12, 6 x 2 = 12, 12 x 1 = 12 are all commutative examples)	Confusing perimeter and area definitions Reversing the use of terms of measurement Not using correct labels – "units" and "square units"

Lesson Instructional Adjustment(s) (if needed) *Tied to common misconception(s)*	**Manipulatives and materials to include and have ready to support the lesson ***
Review of definitions of perimeter and area Discussion of how the two terms are different Area versus Perimeter lesson review	Color tiles Quarter-inch graph paper Marked rope and Styrofoam square feet examples

* 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.