**Ben’s Pen**

*Adapted from North Carolina Department of Public Instruction*

**Student Objective:** “I can find and compare all the areas of rectangles given a fixed perimeter.”

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| **Common Core Standards to Measure** | **Mathematical Practices Addressed** |
| **3.MD.8** Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.   | #1 Make sense of problems and persevere in solving them.#5 Use appropriate tools strategically. #6 Attend to precision. |



**Materials:**

36 large paperclips per pair

Centimeter grid paper

Markers/Crayons

Book: Chickens on the Move by Pollack and Belviso

“Ben’s Back Yard” sheet

Interactive Notebook (if used)

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| G**Engage Students with the Goal** | State and RateObjective: “I can find and compare all the areas of rectangles given a fixed perimeter.” Students rate themselves to the goal (1, 2, 3, 4). | Setting Objectives and Providing Feedback |
| A**Access Prior****Knowledge** | Have students copy the graphic organizer into their interactive notebooks and work with a partner to write down what they know in relation to area and perimeter. Tell students that they are going to work with area and perimeter today during the lesson.Perimeteredu_venn_diagram_blankArea | Nonlinguistic RepresentationsCooperative LearningIdentifying Similarities and Differences |
| N**New Information** | *Before beginning the lesson, have students count out 24 paperclips and clip them together into a loop to model the different fences in the story. If the book is not available, read the scenario below while students act out the changes in the fence with the paper clip loops.***Scenario:** *Grandpa brings chickens and the materials to make a 24 ft. long chicken coop to Tom, Gordon, and Anne. The first coop they make is a 9 x 3 coop (pause for students to create each coop with the paper clips), but it is too skinny. The next day, they make it a little wider, and the coop is now 8 x 3, but now the chickens are too close to the garden and get wet when the garden is watered. Tom, Gordon, and Anne move the coop up the hill and build it to be 6 x 6. The chickens have much more room, but it is too far up the hill. The children finally settle on a triangular coop that measures 8 feet on each side to fit under the apple tree near the house.*Read the story aloud, stopping to allow the students to model the fence each time it changes using the paper clip loop and for the teacher to record the dimensions and perimeter.Ask: *The first chicken coop is 9 x 3. How many square feet do the chickens have to roam inside? How do we know?* Continue with the different sized chicken coops during the story.Continue the discussion by asking:• *What stayed the same throughout the story? What changed throughout the story?*• *If you were the children in the story, which coop would you choose? Why?* | Identifying Similarities and Differences Homework and PracticeNonlinguistic Representations |
| A**Application** | *Before beginning the activity, have students add 12 paper clips to their loops for a total of 36. Distribute the grid paper while the students are adding the paper clips.*Introduce the activity: *Ben’s Mom agreed to adopt a new puppy for the family. Before Ben can bring Eddie home, he needs to build an exercise pen for him in the backyard. Ben has 36 feet of fencing. Find all of the rectangular pens that Ben can make.*Provide directions. Students should: model each rectangular pen with the paper clip loop, record the pen on the grid paper, label each pen with the perimeter (P) and the area (A). Allow students to work in pairs to complete the activity. Calculators may be used.*Students may need assistance with organizing their answers when reporting.*Ask: *How many different pens can Ben make? How can we be sure?*Have students read the dimensions of their pens. List the dimensions of each rectangular pen on the board, starting with the rectangle with a side measure of 1 foot. Continue until all 9 rectangles have been listed. It may be necessary to remind students that a 13 x 5 rectangle is the same as a 5 x 13 rectangle in size.*What is true about the perimeters of all of the pens? How do we know?*We used all 36 paper clips in the fencing each time.*What is true about the areas of each of the pens?*Have students provide area measures for each of the pens and record on the board.*What do you notice about the area measurements?*Students should notice that the areas become larger as the rectangle approaches a square.*It is not necessary for the class to reach a consensus about the best pen for Ben’s back yard here. The purpose of the discussion is for the students to think about the areas of the pens and which size pen would best fit in the back yard.*Display the “Ben’s Back Yard sheet”. Discuss the items in the back yard.*Which pen should Ben choose? Why?*Have students discuss with their partners. Ask the class the number of votes for each pen, recording the votes on the board. Ask each group why they chose that particular pen.Draw the most popular pen on the Ben’s Back Yard sheet. Ask the class if the pen is a good fit for the backyard and why or why not. Student reasoning should include the amount of space left in the backyard and the amount of space taken by the pen.Computer activity (time permitting): <http://www.mathplayground.com/area_perimeter.html> | Generating and Testing HypothesesHomework and PracticeProviding FeedbackNonlinguistic Representations |
| G**Revisit the Goal** | Have students work a problem in their interactive notebooks to demonstrate understanding. *Suppose Lily had 20 feet of fencing. Find the pens he could make and explain how you found your answer.* Have students work individually and share their work with a partner.State and RateObjective: “I can find and compare all the areas of rectangles given a fixed perimeter.” Students rate themselves to the goal (1, 2, 3, 4). | Setting Objectives and Providing FeedbackSummarizing and Note-Taking |

**Evaluation:**

**Formative** - Monitor students as they work, asking questions that allow them to demonstrate their understanding.

**Summative** - Review student work from the “Ben’s Back Yard” sheet.

**Differentiation:**

**Intervention-**Students may focus on the factors of 24 or 36 instead of the addends of 24 or 36. Provide the hint of dividing 24 or 36 in half, and finding addends to equal that number to find the dimensions of the rectangle.

**Extension-** Challenge students to find all of the pens for 40 or more feet of fencing.

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

Ben’s Back Yard

Which pen should Ben choose to put in his back yard for Eddie? Explain/justify your reasoning.

