**Eddie’s Dog Pen**

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| In this lesson, students find the area of different sized dog pens when given a fixed area. Students determine which pen would give Eddie the maximum amount of space and justify their choices. |

**NC Mathematics Standards:**

**Measurement and Data**

**NC.4.MD.3** Solve problems with area and perimeter.

* Find areas of rectilinear figures with known side lengths.
* Solve problems involving a fixed area and varying perimeters with a fixed perimeter and varying areas.
* Apply the area and perimeter formulas for rectangles in real world and mathematical problems.

**Standards for Mathematical Practice:**

1. Make sense of problems and persevere in solving them.

2. Reason abstractly and quantitatively.

3. Construct viable arguments and critique the reasoning of others.

7. Look for and make use of structure.

**Student Outcomes:**

* I can solve problems involving the perimeter and area of rectangles.
* I can model and create rectangles with the same perimeter and different areas.
* I can recognize the patterns that exist when finding the sum of the lengths and widths of rectangles.

**Math Language:**

* area
* perimeter
* square foot
* length
* width
* unit

**Materials:**

* slideshow
* square tiles
* grid paper
* paper/pencil

**Launch:**

1. Introduce Problem (5-10 minutes)

Ask students if they have a pet. Have several students share the name and type of pet they have. Introduce students to Eddie by showing students a picture of Eddie on the presentation. Point out that Eddie was living on the back porch. However, he has recently gotten in trouble for messing up the couch cushions, bringing rocks onto the porch, and sleeping on the couch. Therefore, I am going to build a pen for Eddie so he can sleep outside instead of on the back porch.

2. Read the problem aloud.

*I purchased 24 feet of metal fencing in order to build an outside dog pen. What are the possible dog pens that I could build for Eddie? Which dog pen do you think would be the best for Eddie? Explain your reasoning.*

**Explore:**

1. Solving the Problem (15 – 20 minutes)

Give students time to work individually and with their group to solve the problem. As students work, observe students to see how they are solving the problem. Encourage students to share their strategies and describe how they are solving the problem.

Observe:

* How do students determine the dimensions of the dog pens?
* How students represent and solve the problem (square tiles, grid paper, table/list, equations)?
* Do students see a pattern as they determine the different dog pens?
* How do students determine if they have all of the possible rectangles? Do they recognize any patterns?
* How do students determine which dog pen is the best for Eddie? How do they explain their reasoning?
* Do students connect perimeter to the concept of area? Do students see that the larger area is created by making a square?

Carefully select students to present to the class. Look for students who recorded the dog pen possibilities using pictures or grid paper as well as students who compiled the possibilities into an organized list or a table.

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| --- | --- | --- | --- |
| **Perimeter** | **Length** | **Width** | **Area** |
| 24 ft | 11 ft | 1 ft | 11 sq ft |
| 24 ft | 10 ft | 2 ft | 20 sq ft |
| 24 ft | 9 ft | 3 ft | 27 sq ft |
| 24 ft | 8 ft | 4 ft | 32 sq ft |
| 24 ft | 7 ft | 5 ft | 35 sq ft |
| 24 ft | 6 ft | 6 ft | 36 sq ft |

**Discuss:**

1. Discussion of Solutions (15 – 25 minutes)

Bring the group back together and have the selected students share their strategies for solving the problem.

Possible points to address:

* Models used to determine each pen’s perimeter and area (pictures, grid paper, organized list or table).
* Connections between the representations, perimeter of the rectangles, and the area of the rectangles.
* How students determined all of the possible rectangles.
* Which pen was the best for the dog and students’ justifications.
* Which pens have the largest areas (the square or 6 x 6 pen will have the largest area).

Summarize today’s lesson focusing on fixed perimeter and the strategies that students used to determine the possible pens. Have students share what they have learned about solving area and perimeter problems. Press students on why this problem had so many possible answers and how to recognize this in future problems.

**Evaluation of Student Understanding:**

**Informal Evaluation:**

* Observe and monitor students as they solve the problem. How are they making sense of the problem?

**Extensions:**

*My father gave me 6 additional feet of metal fencing for the dog pen. How does this change the size of the dog pens? What are the possible dog pens that I could build for Eddie?*

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| --- | --- | --- | --- |
| Perimeter | Length | Width | Area |
| 30 ft | 14 ft | 1 ft | 14 sq ft |
| 30 ft | 13 ft | 2 ft | 26 sq ft |
| 30 ft | 12 ft | 3 ft | 36 sq ft |
| 30 ft | 11 ft | 4 ft | 44 sq ft |
| 30 ft | 10 ft | 5 ft | 50 sq ft |
| 30 ft | 9 ft | 6 ft | 54 sq ft |
| 30 ft | 8 ft | 7 ft | 56 sq ft |

**Possible Misconceptions/Suggestions:**

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| **Possible Misconceptions** | **Suggestions** |
| * Students do not find all of the possible dimensions.
 | * Ask students to see if they could determine a way to make an organized method in order to determine if they’ve found all of the possible solutions.
* Ask if students notice patterns or a connection between the dimensions and the amount of fencing.
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**Eddie’s Dog Pen**



I have 24 feet of metal fencing to build an outside dog pen for Eddie.

1. What are the possible dog pens that I could build for Eddie?
2. Which dog pen do you think would be the best for Eddie? Explain your reasoning.