

## A Pen for Puppy: Grade 3

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### Lesson Overview

In this lesson, students will develop an understanding of area measurement by counting unit squares and then apply to building a pen for a puppy. In fourth grade students will use the area formula. This 3<sup>rd</sup> grade measurement lesson connects to the 3<sup>rd</sup> grade science lesson on insulators and conductors in which students design an insulated dog house for puppy.

### Alignment

#### Math Standards

- 3.MDA.5: Understand the concept of area measurement.
- Recognize area as an attribute of plane figures;
  - Measure area by building arrays and counting standard unit squares
  - Determine the area of a rectilinear polygon and relate to multiplication and addition

#### Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason both contextually and abstractly.
3. Use critical thinking skills to justify mathematical reasoning and critique the reasoning of others.
4. Connect mathematical ideas and real-world situations through modeling.
5. Use a variety of mathematical tools effectively and strategically
6. Communicate mathematically and approach mathematical situations with precision.
7. Identify and utilize structure and patterns

#### ELA Inquiry Standards

Standard 1: Formulate relevant, self-generated questions based on interests and/or needs that can be investigated.

Standard 3: Construct knowledge, applying disciplinary concepts and tools, to build deeper understanding of the world through exploration, collaboration, and analysis.

#### ELA Writing

Standard 2: Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.

### **ELA Communication**

Standard 1: Interact with others to explore ideas and concepts, communicate meaning, and develop logical interpretations through collaborative conversations; build upon the ideas of others to clearly express one's own views while respecting diverse perspectives.

## **Connections**

### **Content Area (2 or more) Connections**

Math

Science

### **Content Connections**

This 3<sup>rd</sup> grade measurement lesson in which students design a pen for a puppy connects to the 3<sup>rd</sup> grade science lesson on insulators and conductors in which students design an insulated dog house for puppy.

**Active Learning Strategies (for Purposeful Reading, Meaningful Writing, and Productive Dialogue)** [Brainstorm](#) , [Partner Talk](#) , [Exit Ticket](#)

### **Computational Thinking**

- Formulating problems in a way that enables us to use a computer and other tools to help solve them. Students may use the computer to build arrays for computing area.
- Logically organizing and analyzing data in rows and columns to compute area.

*These skills are supported and enhanced by a number of dispositions or attitudes that are essential dimensions of CT. These **dispositions or attitudes** include:*

- Confidence in dealing with complexity
- Persistence in working with difficult problems
- Tolerance for ambiguity
- The ability to deal with open ended problems
- The ability to communicate and work with others to achieve a common goal or solution

## **Lesson Plan Part A**

**Time Required** – One 60 minute classes

**Disciplinary Vocabulary** – plane figures, attribute, area, squares, arrays, rectilinear

**Materials Needed:**

- Color Tiles
- Grid Paper

**Formative Assessment Strategies:** Teacher observation of student modeling and student dialogue

**Misconceptions:** Watch for students who confuse area and perimeter.

## Engage

Trish found a puppy who was not wearing a collar, so she took it home with her. Trish’s mom put an ad in the paper hoping that someone would claim the puppy, however, no one did. Trish’s parents allowed her to keep the pup if she promised to be responsible for its care. They decided to build a pen and cover the ground within it with pet turf so that the pup would have a safe place to play. Pet turf is an artificial grass that withstand pets’ claws and paws. What are some questions the family might ask before building the pen?

**Brainstorm** Possible Questions:

1. How big is the spot they will use?
2. What is the shape of the spot?
3. How much will materials cost?
4. What is the shape of the pet turf?

**Pet Turf**



1 Meter

The family decides on a rectangular shaped space in the backyard that is 9 meters long and 4 meters wide. Pet turf is sold in 1-meter squares. How many squares will be needed to cover the space for the puppy’s pen?

Give students grid paper, square color tiles, or allow them to provide their own method to show how many squares of pet turf to purchase. Some students may automatically connect to arrays. If a student knows the formula, make sure that they are able to demonstrate conceptual understanding.

## Explore

- Have students work in pairs to complete the same process with rectangular shaped pens having different dimensions, but the same number of squares (36 squares).
- Have students illustrate the different combinations (3 x 12, 2 x 18, 6 x 6, 1 x 36)

- Ask: What would be possible combinations of dimensions of rectangular shaped pens if there were 24 squares? 35 squares?
- [Partner Talk](#) : What are some things you are noticing about the number of unit squares within rectangular shaped figures? (Listen and respond to students' insights and misconceptions)

### Explain

- In this phase use formal language – plane figures, attribute, area, squares. Connect the concept of area to arrays, multiplication, and counting unit squares. Students do not use the formula to determine area until 4<sup>th</sup> grade.
- Provide students with additional practice with finding area of rectangles by building arrays and counting unit squares.
- [Exit Ticket](#) Students answer: What are some ways to find the area of a plane figures?

### [Lesson Plan](#) Part B

**Time Required** – One 60 minute classes

**Disciplinary Vocabulary** – plane figures, attribute, area, squares, arrays, rectilinear

**Materials Needed:**

- Color Tiles
- Grid Paper

**Formative Assessment Strategies:** Teacher observation of student modeling and student dialogue

**Misconceptions:** Watch for students who confuse area and perimeter.

### Engage

- Give students 36 square color tiles. Have the students connect the squares to form a polygon that is not a rectangle and then sketch the figure on grid paper. Students will come up with different combinations.

### Explore

- Have students put together at least 3 combinations, draw a sketch on grid paper and determine the area.

- To compare/contrast these figures with rectangles, have students complete a T-chart: Like a rectangle/not like a rectangle. *Sample answers: like – all sides are straight, and all angles are right angles; not like – rectangles have 4 sides and these have more than 4 sides.*
- Check students work for misconceptions to be clarified in the Explain phase.

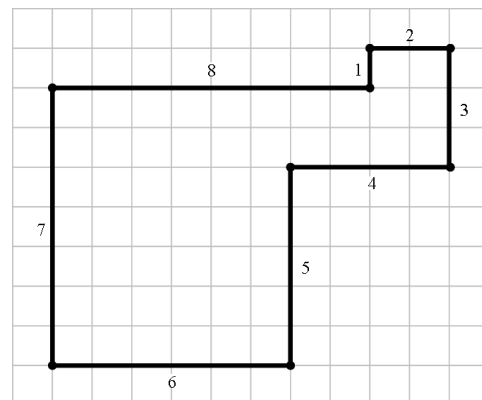
## Explain

- Explain to students that the polygons that they formed are not rectangles because they have more than 4 sides. The figures that they formed are rectilinear because all sides are straight, and all angles are right angles, but they have more than 4 sides. Note that rectangles are rectilinear, but not all rectilinear figures are rectangles.

**Rectilinear figure is a polygon (straight sided figure) all angles are right angles.**

<http://www.corestandards.org/Math/Content/mathematics-glossary/glossary/>

- Give groups of students a copy of this polygon and have them to determine the area by counting squares, each square measures one square centimeter.
- Next, have them to use arrays to determine the area and describe their process. (Partition in to non-overlapping rectangles and then use arrays)
- Dialogue: Talk with your group about another way you can find the area of this polygon using arrays?
- Have groups compare their processes with that of the other groups in the class.
- Quick write: What are some ways to find the area of rectilinear figures that are not rectangles?
- Provide students with additional practice determining the area of rectilinear figures.
- Connect the concept of area of rectilinear polygons to arrays, multiplication, and counting unit squares. Students do not use the formula to determine area until 4<sup>th</sup> grade.



**Extension:** (Requires additional instructional time)

Tell students that they work for Pet Turf Landscapes and have been called to create a wonderful space for Trish's puppy. Allow students to come up with the size and design of two puppy pens, one that is rectangular and one that is rectilinear.

Prepare a presentation to Trish's family that includes:

- a. the area of both designs
- b. the number of pet turf squares needed for each design
- c. the amount of fencing needed to enclose the pens for each if there is a 1- meter wide gate. (note – perimeter will be covered in detail in a future lesson)
- d. A description of and the advantages of each design.