



Brick Math Lesson of the Month July 2020 from Advanced Measurement and Geometry Using LEGO® Bricks

SUGGESTED BRICKS

| Size | Number |
|------|--------|
| 1x1 | 10 |
| 1x2 | 10 |
| 1x3 | 12 |
| 1x4 | 10 |
| 1x6 | 4 |
| 1x8 | 4 |
| 1x10 | 2 |
| 1x12 | 2 |
| 2x2 | 6 |
| 2x3 | 6 |
| 2x4 | 6 |

Note: Using a baseplate helps keep the bricks in place. One baseplate is suggested for these activities.

Teacher Lesson Guide: DISCOVERING THE FORMULA FOR AREA

Students will learn/discover:

- How to find the area of regular and irregular polygons
- The formula for area
- How to decompose shapes to find area

Why is this important?

Understanding the meaning of area is important in many real life problem-solving situations, such as creating a garden plot, building a pen for a pet, carpeting a room, and much more. Discovering the formula for area, instead of memorizing it, helps students relate this concept to surface area of three-dimensional shapes, which will follow in future mathematics instruction. The idea of area is introduced in approximately grade 3, but continues to be used throughout education in a problem-based approach. Formulating relationships among the topics of area, surface area, and volume all begin with a clear understanding of finding the amount of space inside a plane figure. In this chapter, students will discover the ways to write formulas to find the area of both regular and irregular shapes.

Vocabulary:

- **Area:** Space inside a two-dimensional (or plane) figure
- **Dimension:** A measure in one direction; the number of dimensions shows how many values are needed to locate points on a shape (i. e., a line has 1 dimension, a polygon has 2 dimensions, a cube has 3 dimensions)



- **Polygon:** Any closed shape with three or more straight sides
- **Regular polygon:** A polygon with all angles equal and all sides equal
- **Irregular polygon:** A polygon that does not have all angles equal and sides equal

How to use the companion student book, *Advanced Measurement and Geometry Using LEGO® Bricks—Student Edition*:

- After students build their models, have them draw the models and explain their thinking in the Student Edition. Recording the models on paper after building them with bricks helps reinforce the concepts being taught.
- Discuss the vocabulary for each lesson with students as they work through the Student Edition.
- Use the chapter assessments in the Student Edition to gauge student understanding of the content.

Part 1: Show Them How

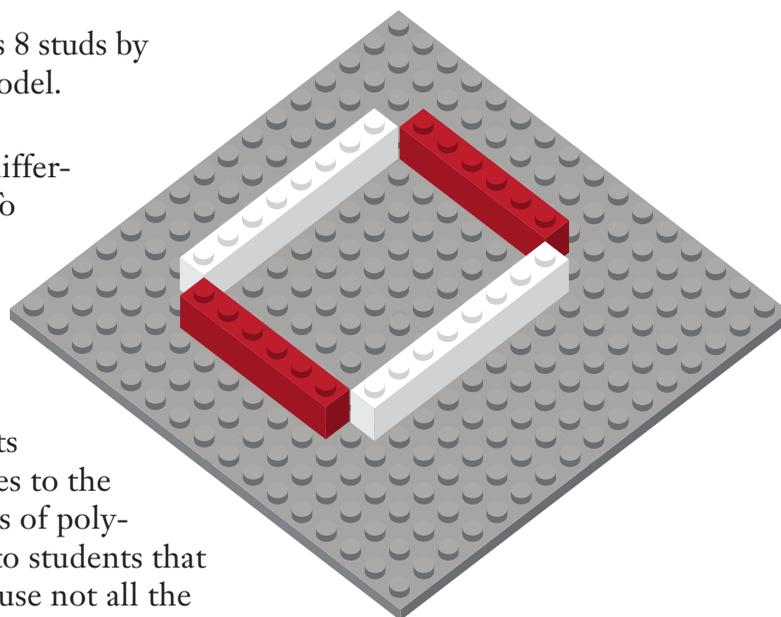
Ask students what they know about the term *area* (*answer*: students should understand that area is the distance inside a given shape or flat space).

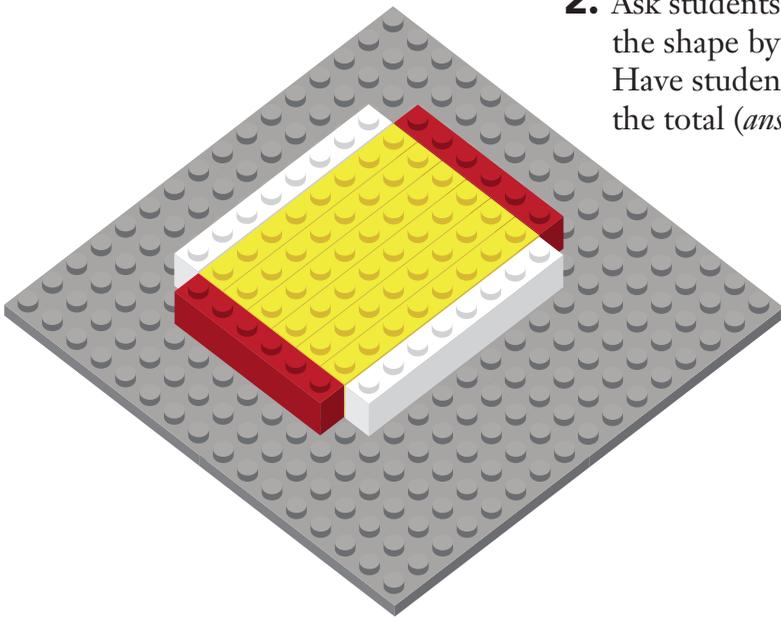
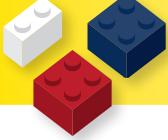
Problem #1: Exploring area of a rectangle

1. Build an interior rectangle that measures 8 studs by 6 studs. Have students build the same model.

Note: Shapes that model area are built differently from other models using bricks. To build the shapes for area, do not build exterior corners. The shape that models area is an interior shape with bricks around the edges.

Review the term *polygon* and ask students how the shape they have just built relates to the term *polygon*. Review definitions of types of polygons (regular and irregular). Point out to students that a rectangle is an irregular polygon because not all the sides are equal.





2. Ask students to determine the amount of space inside the shape by covering all the studs inside the shape. Have students count the studs in the interior and give the total (*answer*: 48 studs).

3. Ask students to look carefully at the shape and ask them to discuss some attributes of the shape. Students should notice that two of the sides are the same (the opposite sides are equal). Point out that this is an attribute of all rectangles. *Note*: This is a good time to review shape attributes.

4. Discuss the fact that area concerns two dimensions: length and width.

Ask students to use the length and width of the shape to determine the same number that they found when they filled in studs and counted them. Students should discover that they can use multiplication of length times width to reach the same result.

5. Discuss with students how to write a formula for this process (*answer*: $L \times W = A$).

After students have discovered the formula, ask students how many sides are used in the formula (*answer*: 2).

6. Discuss the term *dimensions*. Explain that since there are two dimensions, the answer is squared, therefore, the correct formula for area is $L \times W = A^2$.



Have students draw the model and label the length and width. Have students write the formula for area and write a math sentence for the area of the shape modeled, including the answer (*answer*: $8 \times 6 = 48 \text{ studs}^2$).



Student Workbook Pages:

DISCOVERING THE FORMULA FOR AREA

Part 1

Problem #1: Exploring area of a rectangle

1. Build an interior rectangle that measures 8 studs by 6 studs. Explain how a rectangle relates to the term *polygon*.

2. How much space is inside your shape? _____ studs

Hint: Cover all the studs inside the shape. Count the studs in the interior to find the total studs covered.

3. Look carefully at the shape and list some attributes of the shape.

4. Area concerns two dimensions: length and width.

What is the length of the shape inside your rectangle? _____

What is the width of the shape inside your rectangle? _____



Use the length and width of the shape to determine the same number that you found when you filled in studs and counted them. _____

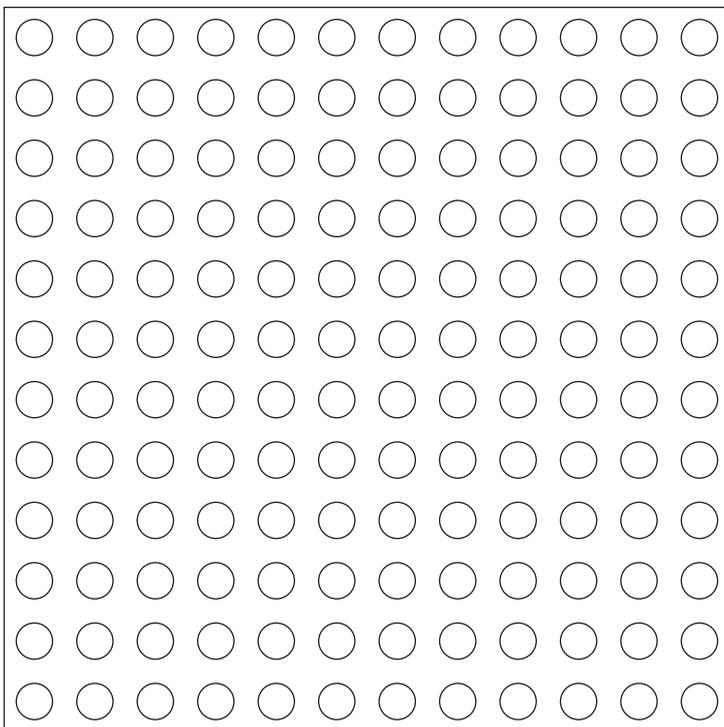
5. What mathematical equation can you use to find that number? _____

How many sides are used in the measure of this shape's area? _____

6. Define the term *dimensions*.

Since there are two dimensions involved in finding the area of a rectangle, the answer is squared, therefore, area is shown as A^2 .

Draw your rectangle. On the drawing, fill in the interior studs, and label the length and width measurements. Write the formula for area, and write a math sentence for the area of this rectangle with the answer in square units.





Formula: _____

Math sentence: _____