

# Exploring Rectangles

## Assessment

Ellie Rothing  
Linda Page

1. What is the perimeter of each square?

$$S = 2 \text{ in.} \qquad P =$$

$$S = 10 \text{ in.} \qquad P =$$

$$S = 25 \text{ in.} \qquad P =$$

2. Write an algebraic expression to find perimeter of any square.

3. What is the area of each square?

$$S = 2 \text{ in.} \qquad A =$$

$$S = 10 \text{ in.} \qquad A =$$

$$S = 25 \text{ in.} \qquad A =$$

4. Write an algebraic expression to find area of any square.

Complete each table and answer the questions.

5.

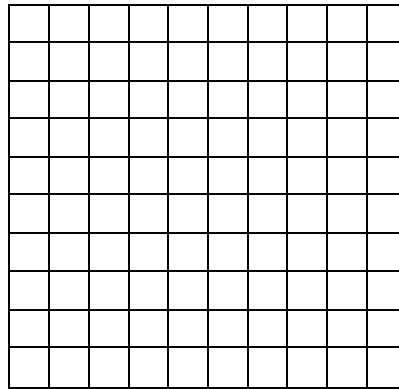
<b>Area of Square (Units squared)</b>	<b>Length of Side (Units)</b>
1	
4	
9	
16	
25	
36	
49	

6,

<b>Area of Square (Units squared)</b>	<b>Length of Side (Units)</b>
	12
400	
10,000	
	10
	15

7. What can you say about each number in the first column?

8. Using the grid below, draw 3 different rectangles with a perimeter of 16 units.



What is the area of each rectangle? What formula could you use to find the area?

- a.
- b.
- c.

9. Given the perimeter of 36 units, how many different size rectangles can you make?

What is the area of each rectangle?

Width	Length	Area

10. Describe how the area changes as the dimensions of each rectangle changes.



# EXPLORING RECTANGLES

ELLIE ROTHING

LINDA PAGE

August 3-7, 2007

“Written as part of the BITL III grant which was funded by the Office of the Commissioner of Higher Education” in Montana.

## **Abstract:**

In this activity, students learn to find perimeter and area of squares and rectangles. Students use geoboards, dot paper, and graph paper to model squares and rectangles with different areas. The purpose of this activity is to demonstrate that a square has a greater area than a rectangle with the same perimeter.

## **Grade Level and Mathematics Strand:**

This activity is appropriate for 6<sup>th</sup> graders and fits with Strand 4 Geometry.

## **Class Time Required:**

Two class periods of about 45 minutes each.

## **Materials:**

Geoboards, rubber bands, dot paper, graph paper, pencils, straightedge, calculator.

## **Objectives:**

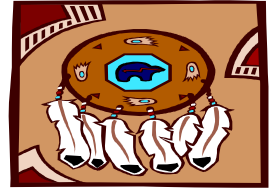
1. To find area and perimeter of squares and rectangles.
2. To identify the formula to find perimeter and area of a square or rectangle.

## **Technology:**

A calculator can be used to find the side or area of a square. In addition, the computer program GeoGebra can be utilized to construct shapes.

On the web, go to [www.GeoGebra.org](http://www.GeoGebra.org)





## Pg. 2 Exploring Rectangles

Sitting Bull, a Lakota chief, awoke one morning and noticed his ponies were becoming very skinny. They were growing weaker and weaker by the day. They would be too weak to travel to rendezvous with the neighboring Cheyenne to trade.

The chief summoned the tribe's holy man and asked why his ponies looked so sickly. The trusted adviser said that they were not sick—they were starving!!

The chief replied, "How could that be?"

He had one mile of fence line by seventeen miles of fence line enclosing the pasture to feed his ponies. Surely, his animals had an ample food supply. He knew that he had only 36 miles of fence to work with and NO more!

The wise man replied, "Oh, my son, it's not how much you have, it's how you use it."

"What do you mean, oh, Wise One?" the perplexed chief asked.

"Think about it, my son....."

The chief pondered for several days. He could not understand the wise words of the holy man. That night he had a vision. It finally occurred to him....."*It's how you use it.*" He had several dreams that night.

When he awoke the next morning, he had a smile on his face. Sitting Bull finally understood what he had to do. He called his fellow tribesmen together and asked them to dig up the fence and reshape his pasture.

After two weeks, the ponies became strong and healthy again.

## Lesson 1, Day 1:

### Introduction:

- Brainstorm with students what all squares have in common:

- \* 4 right angles and 4 congruent sides.
- \* Opposite sides are parallel.

- **Ask** how all squares are alike and how they could be different.

- **Distinguish** between similar and congruent squares.

-Introduce the term perimeter and area.

- \* The teacher draws 3 different squares on the board, each with different dimensions.
- \* Students calculate perimeter and area of each.
- \* Introduce the algebraic formula for perimeter and area.
- \* Clarify how to label correctly.
- \* Define square numbers.

### Activity 1:

1. Pass out geoboards and rubber bands.
2. Explore geoboards by creating a variety of squares with different sizes.
3. Use geoboards to make squares with areas of 4, 9, and 16 square units.
4. Copy the table below.

Length of Side (units)	Perimeter of Square (units)	Area of Square (square units)
		4 sq. units
		9 sq. units
		16 sq. units

5. Using the 3 squares that you made on the geoboard, complete the table.

### Activity 2:

1. Pass out the dot paper and straightedge.
2. Students construct 3 squares with areas larger than 16 square units.
3. Students make a second table like the one above and complete it.  
(Technology: students may use calculators to determine area.)
4. Follow up: Discuss patterns, perimeter, and area relationships.

## Lesson 2, Day 2:

### Introduction:

-Ask students to define a rectangle.

\* 4 right angles.

\* Opposite sides are parallel.

-Choose 4 students to come to the board and draw a rectangle.

Pg. 4 Exploring Rectangles

- Brainstorm with students what similarities and differences there are between each rectangle.

- \* **Ask** what the difference is between a square and a rectangle.
- \* **Ask** if all rectangles are similar (like squares are).
- \* **Clarify** that a square is a rectangle.

**Activity 1:**

1. Pass out geoboards and rubber bands.
2. Explore geoboards by creating a variety of rectangles with different sizes.
3. Use geoboards to create 3 rectangles with the following dimensions:
  - a) 1 x 5
  - b) 2 x 4
  - c) 3 x 3
4. Copy the table below.

Length of Sides (units)	Perimeter of Rectangle (units)	Area of Rectangle (square units)
1 x 5		
2 x 4		
3 x 3		

5. Complete the table and label correctly.
6. Discuss:
  - Did perimeter change? Did area change?
  - What relationship did you observe between the shape and the area of each rectangle?

**Activity 2:**

1. Pass out the graph paper and straightedge.
2. Students construct all possible rectangles with a perimeter of 24 units each.

Pg. 5 Exploring Rectangles

- Troubleshooting—
  - Explain that  $l + w + l + w = 24$  units. Therefore,  $l + w = 12$ .
  - Make a T-chart with rectangle dimensions:

<i>w</i>	<i>l</i>
1	11
2	10
3	9
4	8
5	7
6	6

3. Once rectangles are constructed, find each area and complete table.

Length of Sides (units)	Perimeter of Rectangle (units)	Area of Rectangle (square units)
1 x 11		
2 x 10		
3 x 9		
4 x 8		
5 x 7		
6 x 6		

Pg. 6 Exploring Rectangles

3. Students discover that as the dimensions of a rectangle become that of a square, the area increases and its area is greatest as a square.
4. As an extension, students use the mathematics software GeoGebra to do constructions of squares and rectangles.

**Word Problem:**

Sitting Bull had 36 miles of fencing. He had realized through his visions that the dimensions of the original pasture were not providing enough area to feed the hungry horses. The tribesmen were asked to create a pasture that would provide the most area for the animals. What shape would provide the ponies with the most pasture? What were the dimensions of the new pasture? How much more grazing land do the ponies have now than when the pasture was 1 x 17 miles?