Geoboard Discovery

Lesson Summary:
Students will investigate the areas of parallelograms, rectangles, and triangles using a geoboard and rubberbands. Students will develop formulas for areas, investigate the heights of figures, and examine the areas of similar figures.

Key Words:
Geoboard, area, rectangle, triangle, parallelogram

Background knowledge:
This is a great activity for beginners exploring area. Students must only know what a rectangle, parallelogram, and triangle are.

Learning Objective:
Students will discover the formulas for the areas of parallelograms, rectangles, and triangles.

Materials:
Geoboards for each group
Rubberbands
Worksheets for each student

Suggested Procedure:
Pass out geoboards and rubberbands. Remind students that each square on a geoboard is one square unit. Discuss how to make different shapes on the Geoboard. Allow for some play time. Then pass out worksheets and split students into groups of two or three. Have them complete the activity.

Assessment:
Check students shapes on the Geoboard. Collect worksheets.
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Activity One: Rectangles

Team member’s names: __________________________________________________

Goal: To discover the area of rectangles using a geoboard.

*Remember that when using a geoboard that we are working with square units that each
have a value of 1.

1. Construct a rectangle on your geoboard using a rubberband.
   a. Loop your rubber band around one peg.
   b. Pull the rubberband and loop it around three other pegs to form a rectangle.
      (Make sure you create a rectangle, and not a square.)

   Your figure should look something like this:
   
   *   *   *   *   *
   *   *   *   *   *
   *   *   *   *   *
   *   *   *   *   *

2. Discover the area of your rectangle.
   a. Use your remaining rubberbands to break your rectangle down into multiple
      square units. Your figure should look similar to this:

   
   *   *   *   *   *
   *   *   *   *   *
   *   *   *   *   *
   *   *   *   *   *
   
   b. Using your knowledge of the geoboard, and the area of a square unit,
      determine the area of your rectangle and record it here.

      How has the area found relate to the length and width of the rectangle?
c. Try this method again using a larger rectangle similar to this one:

![Rectangle diagram]

```
  * * * * * * *
  * * *   * *
  * * *   * *
  * * *   * *
  * * * * * * *
```

d. Again, break this rectangle down into multiple square units, so it looks like this:

![Rectangle diagram with dashed lines]

```
  * * *   * *
  * * *   * *
  * * *   * *
  * * *   * *
  * * * * * * *
```

e. Record the square units and the area of this rectangle here.

```
Square units: __________________________
Area: __________________________
```

How has the area found relate to the length and width of the rectangle?

f. Look at your findings and use the knowledge you already know to develop a formula for finding the area of a rectangle. If necessary, make additional rectangles on your geoboard and calculate their areas using the same method you just used.
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Activity Two: Parallelograms

Group members’ names: ______________________________________________________

Goal: Construct various parallelograms and finding their areas.

Using the Geoboard and rubberbands:

Part 1:

1. Select 4 pegs A, B, C, and D so that $\overline{AB} \parallel \overline{CD}$ and $\overline{CA} \parallel \overline{DB}$.

2. Let the distance from peg to peg be 1 inch.

3. Connect a rubberband from points A to B to C to D.

4. Record the base. ____________.

5. Record the height. ____________.

6. Can you create a rectangle with the same area as the parallelogram?

__________________________________________________________________________

__________________________________________________________________________

7. From your previous knowledge of the area of rectangles, can you determine the area of the parallelogram?

Explain! ___________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________
8. How are the base and height of a parallelogram related to the base and height of a rectangle?

_____________________________________________________________.

9. Can you come up with the formula for the area of a parallelogram?

_____________________________________________________________.

Part 2.

10. Turn your geoboard 90 degrees.

11. What is your base and height of the parallelogram now? ______________

_____________________________________________________________.

12. Does the area formula you found in #8 still work? Do you get the same result for the area?

_____________________________________________________________.

13. If necessary make additional parallelograms on the geoboard and calculate their areas using the same method you just used.
Geoboard Discovery
Activity Three: Triangles

Group members’ names:____________________________________________________

Goal: Construct various triangles and finding their areas.

Using the Geoboard and rubberbands:

Part 1:
1. Select 3 pegs on the geoboard and label them points A, B, and C.
2. Let the distance from peg to peg be 1 inch.
3. Connect a rubberband from points A to B to C to make a ΔABC.
4. Record the height of ΔABC. __________________.
5. Record the base of ΔABC. __________________.
6. From your previous knowledge of a parallelogram, can you determine the area of the triangle?
   Explain! ____________________________________________________
   ____________________________________________________
   ____________________________________________________
7. Can you come up with the formula for the area of a triangle?
   __________________.
Part 2.

8. Try another problem by moving point A to a different peg.

9. Record the base, height, and area of your newly made triangle.

________________________________________________________________________
________________________________________________________________________

10. Does the area formula you found in #7 still work?

________________________________________________________________________

11. If necessary make additional triangles on the geoboard and calculate their areas using the same method you just used.