

Title: Cover It Up... With Area!

Link to Outcomes:

- **Problem Solving** Students will demonstrate their ability to solve problems in mathematics including problems with open-ended answers and with real-life applications in a cooperative atmosphere.
- **Communication** Students will demonstrate their ability to communicate mathematical concepts through writing and oral discussions.
- **Reasoning** Students will demonstrate their ability to reason mathematically. They will make conjectures, gather evidence, and build arguments.
- **Connections** Students will demonstrate their ability to connect geometric concepts with real-life situations.
- **Measurement** Students will demonstrate and apply concepts of measurement using standard and non-standard units. They will apply measurement to real-world problem-solving situations.

Brief Overview:

This is a series of activities involving methods of finding area. The use of manipulatives, cooperative learning, literature, and real-life applications are emphasized as students explore this geometric concept.

Grade/Level:

Grades 3 and 4

Duration/Length:

This lesson will take 5 to 6 class periods.
The activities for the fifth day may take longer than anticipated.

Prerequisite Knowledge:

Students will need a basic understanding of the following:

- calculating the perimeter of polygons.
- identifying the characteristics of polygons.
- interpreting and recording data using graphs (bar graph, pictograph...).

Objectives:

- Create and compare polygons with same area.
- Calculate area of polygons using whole square units.
- Make connections between geometry and arithmetic operations.
- Construct number meanings using real-world experiences and manipulatives.
- Demonstrate connections between geometry and arithmetic operations.
- Verify area of squares, rectangles, and irregular polygons by counting square units.
- Work cooperatively in groups.

Materials/Resources/Printed Materials:

- Two Bad Ants, Chris Van Allsburg © 1988 Houghton Mifflin
- The Patchwork Quilt, Valerie Flournoy © 1985 Dial Books
- Sealable plastic bag of 30 small square crackers (Wheat Thins, Cheez-Its...)
- “Comparing Picnic Blankets” - Student Resource 1
- “Picnic Area” - Student Resource 2
- “Centimeter graph paper” - Student Resource 3
- Centimeter tiles
- Geoboards and rubber bands
- “Geoboard Polygons” - Student Resource 4
- “Geoboard Dot Paper” - Student Resource 5
- “Patchwork Quilt” - Student Resources 6-7
- Markers, crayons, or colored pencils
- “Blanket for Baby” - Student Resource 8

Development/Procedures:

Day 1:

- Read Two Bad Ants by Chris Van Allsburg to the class.
- Ask students to create a “picnic blanket” for ants using 4 square crackers. Discuss the different perimeters and shapes made using 4 squares.



- Repeat procedure using 8 crackers and 12 crackers.
- Use an overhead of “Comparing Picnic Blankets” (Student Resource 1) to compare two different blankets with an area of 12.
- Ask each student to create a “picnic blanket” using 24 crackers. Then ask each student to find a partner who has a blanket of a different shape.
- Ask pairs of students to discuss similarities and differences in the two blankets. They should complete “Comparing Picnic Blankets” (Student Resource 1) to record their discussion.
- Introduce the word “area” and its definition. (Area measures the number of square units that covers a surface.)
- Ask each student to complete “Picnic Area” (Student Resource 2).
- Ask each student to write a journal entry summarizing the day’s math experience with area.

Day 2:

- Review concept of area using a warm-up activity and/or by reading and discussing the students' journal entries from Day 1.
- Brainstorm about occupations in which people need to measure the area of surfaces. (Examples include: carpenter, tiler, quilt maker, landscaper, bricklayer...)
- Ask students to use "Centimeter Graph Paper" (Student Resource 3) and centimeter tiles to cover a given area ("cover an area of 10 square units"). Select students to transfer their "solutions" to overhead centimeter grids using overhead pens.
- Ask each student to pretend to be a tile layer who has been asked to design a new entrance walkway to the school. The completed walkway must have an area of 36 square units. The students will then use the graph paper to draw three possible floorplans to submit to the school building committee for consideration.
- Transfer these designs to centimeter graph paper. The walkway should be designed with three different colors that form repeating pattern. Now, have the students select the floorplan they think is their best one.

Day 3:

- Review concept of area using a warm-up activity and/or read and discuss the students' tile designs from Day 2.
- Model use of geoboard on overhead. Allow students time to explore with the geoboard.
- Use geoboard to construct smallest square possible to see how 1 square unit is represented. Then model with students to make other 4-sided figures with "different" areas.
- Ask each student to construct a 4-sided regular polygon. Have them calculate the area. Discuss ways used to calculate area. Be sure discussion includes the concept that $\text{Area} = \text{length} \times \text{width}$.
- Ask students to use geoboards to complete "Geoboard Polygons" (Student Resource 4).
- Use an overhead of "Geoboard Dot Paper" (Student Resource 5) to model how to find area of polygons with more than four sides using whole square units.
- Instruct students to create their own polygon with more than four sides on geoboards. Each student's partner will then transfer the figure onto "Geoboard Dot Paper" (Student Resource 5) and determine its area. **Note to teacher:** Ask students to refrain from using diagonals at beginning levels of area.
- Have students write journal entries to explain how they determined the area of their partners' polygons.

Day 4:

- Read The Patchwork Quilt, by Valerie Flourney to the class.
- Instruct students to create their own patch for a class quilt on “Patchwork Quilt” (Student Resource 6). Upon completing patch, students will complete assessment questions on “Patchwork Quilt” (Student Resource 7).
- Create a classroom quilt using students individual patches.
- Ask students to work in cooperative groups to compute area of the entire quilt and then the area of each color used in the class quilt.
- Generate a class discussion about the area of each color on the class quilt. Record the data using a graph (bar graph, pictograph...).

Day 5:

- Assess student’s understanding of area using the “Blanket for Baby” performance task (Student Resource 8).

Evaluation:

Students can be evaluated based on the following criteria:

- group participation and performance - Check daily for individual participation and on-task behavior.
- writing activities - Check for adherence to writing standards which include topic, audience, purpose and form. Also check for the proper use of mathematical reasoning and language.
- concept attainment - Assess student comprehension of area through group discussions, individual and group work, and writing activities.

Extension/Follow Up:

- Use Windows on Math videodisc program, Volume 2, “The Emergency Quilting Bee” © 1995 Optical Data, if available.
- Use the computer and logo programming software (or other drawing program) to create patchwork quilt squares.
- As an art extension, the students could create the class quilt using fabric and sew the quilt.
- Students could create a mosaic and then find the area of their design.
- As a social studies extension, invite people within the community such as a bricklayer, tile layer, or quilt maker to discuss the use of area within their occupation.
- As a writing extension, students could write how area is used in real-world situations.
- Students may write poems about an ant’s picnic.
- Students could use pentominoes to form polygons and find their areas.

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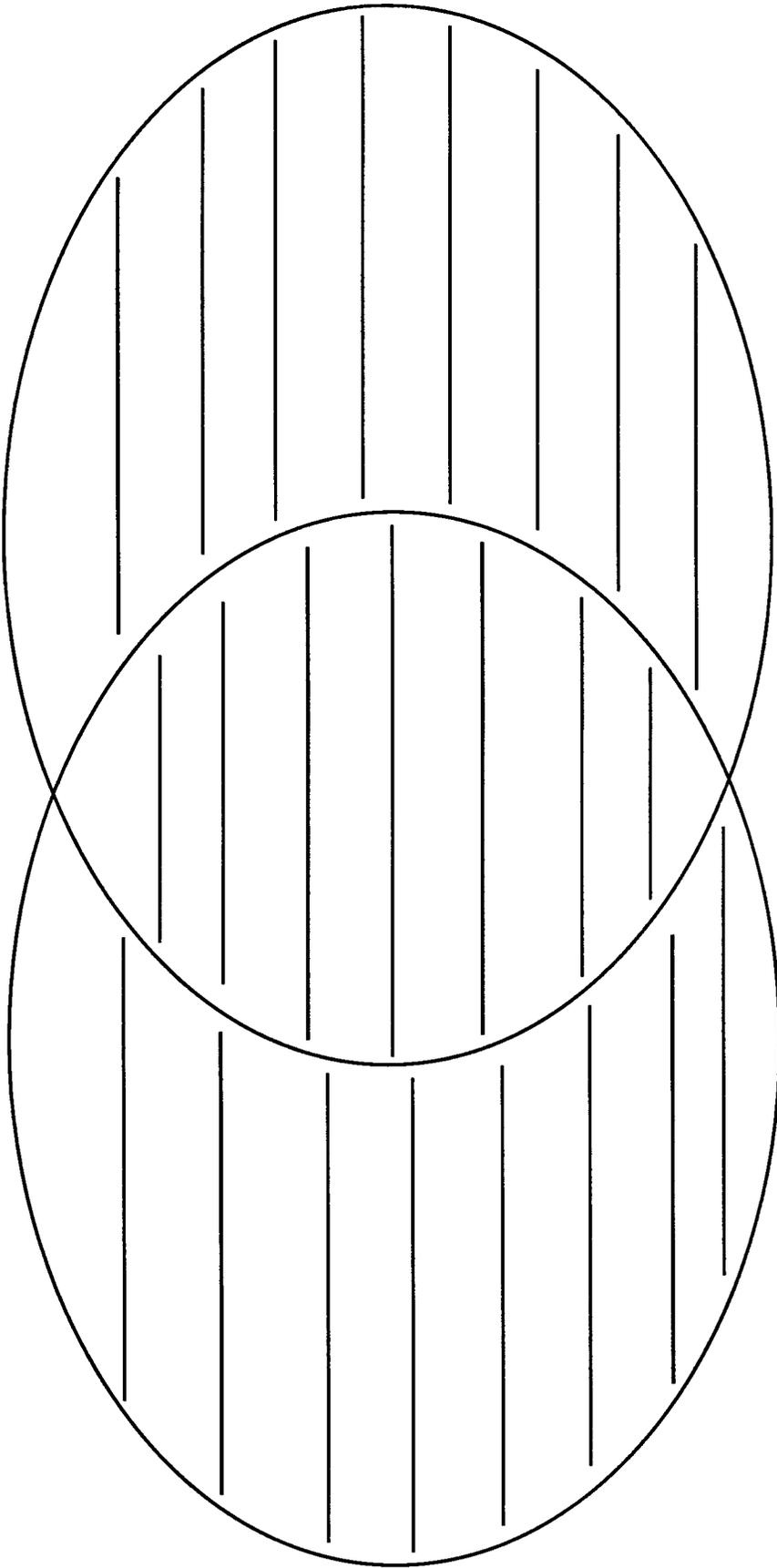
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COMPARING PICNIC BLANKETS

[Blank writing area]

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PICNIC AREA



These hungry ants seem to have found just the perfect “area” to have a square meal!

Directions

Area measures the number of square units in a shape. Find the area of each ant family’s picnic blanket by counting the number of squares on the blanket, then answer the questions.

1. Which pairs of blankets have the same area?

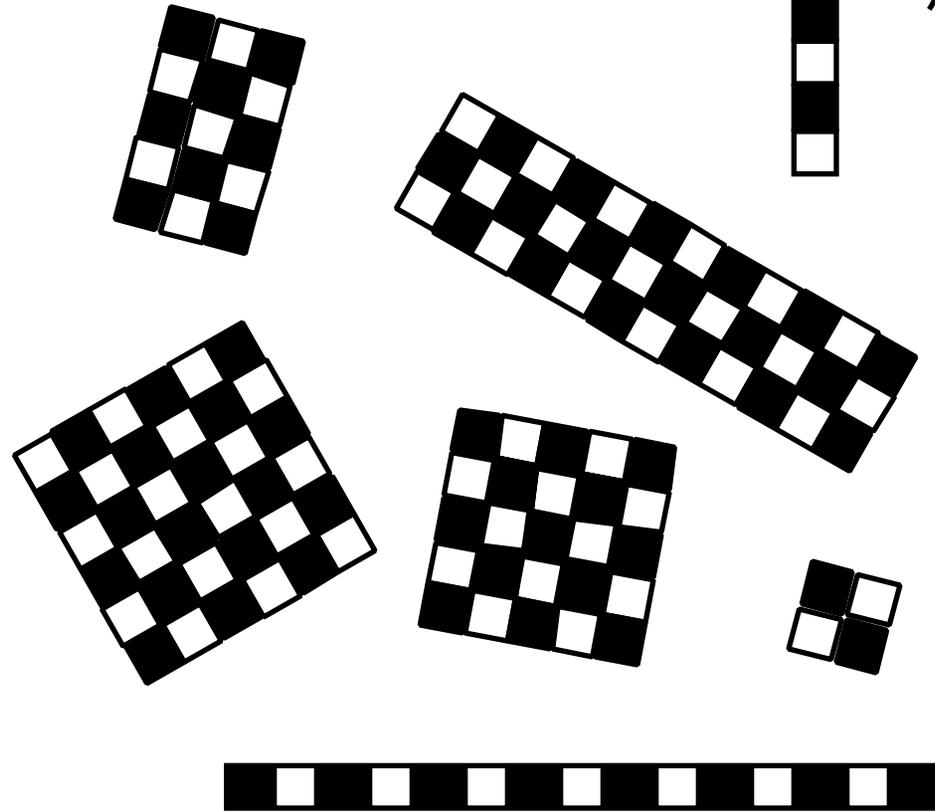
_____ and _____

_____ and _____

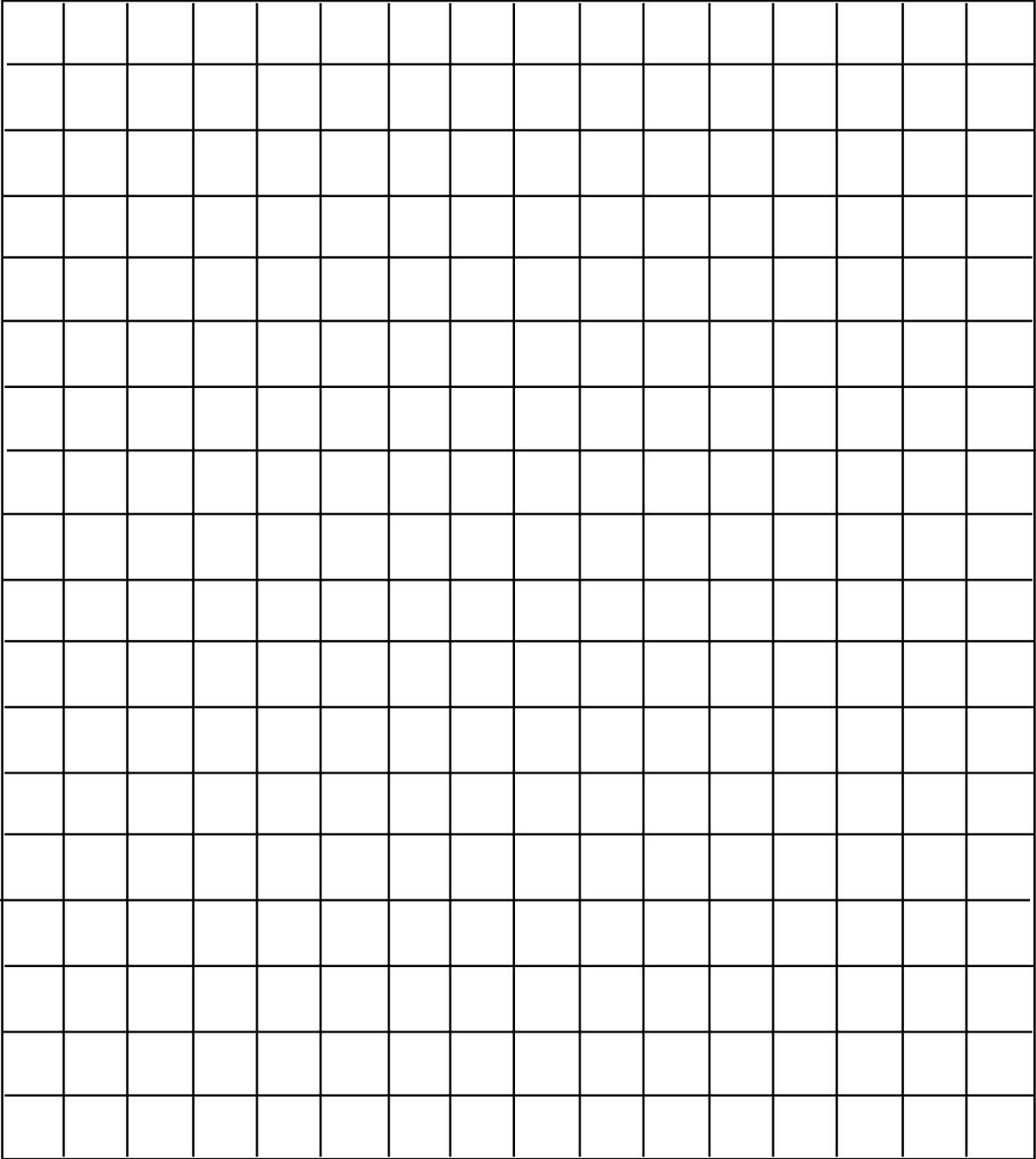
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2. What are the perimeters of each of the blanket pairs? Are they the same? Why or why not?

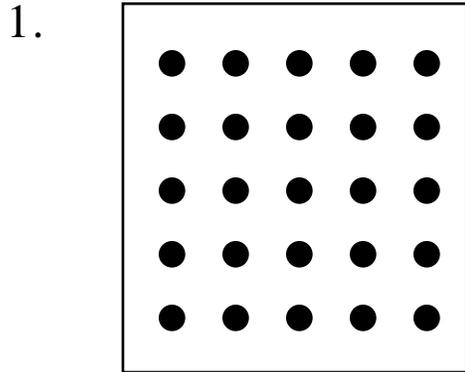
3. If you put all of the blankets together, what would their total area be? Draw a diagram of how you would put them together. Did you make a regular or irregular polygon?



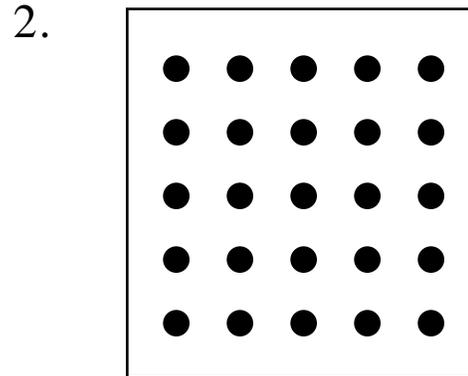
CENTIMETER GRAPH PAPER



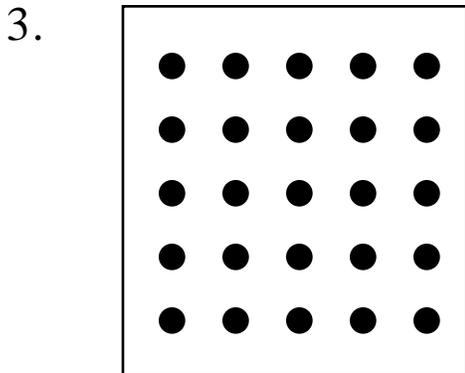
Geoboard Polygons



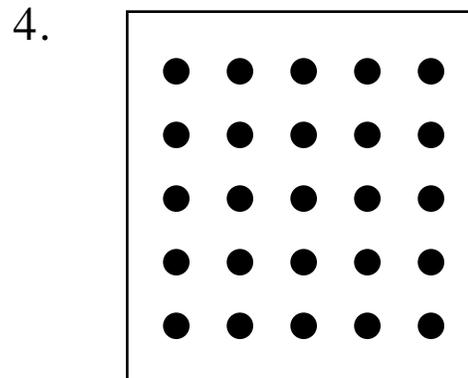
Make a figure with:
9 square units of area
16 units of perimeter



Make a figure with:
12 square units of area
20 units of perimeter

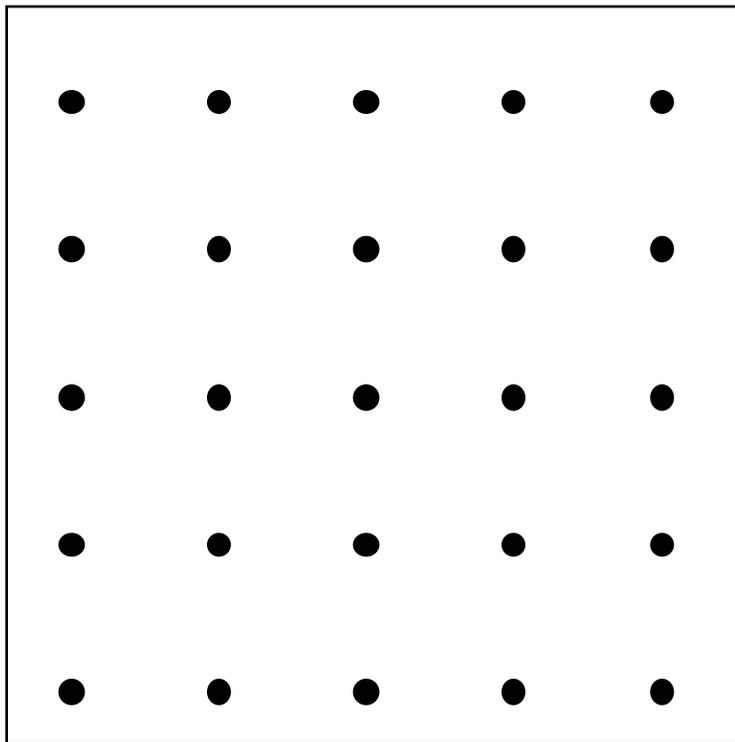
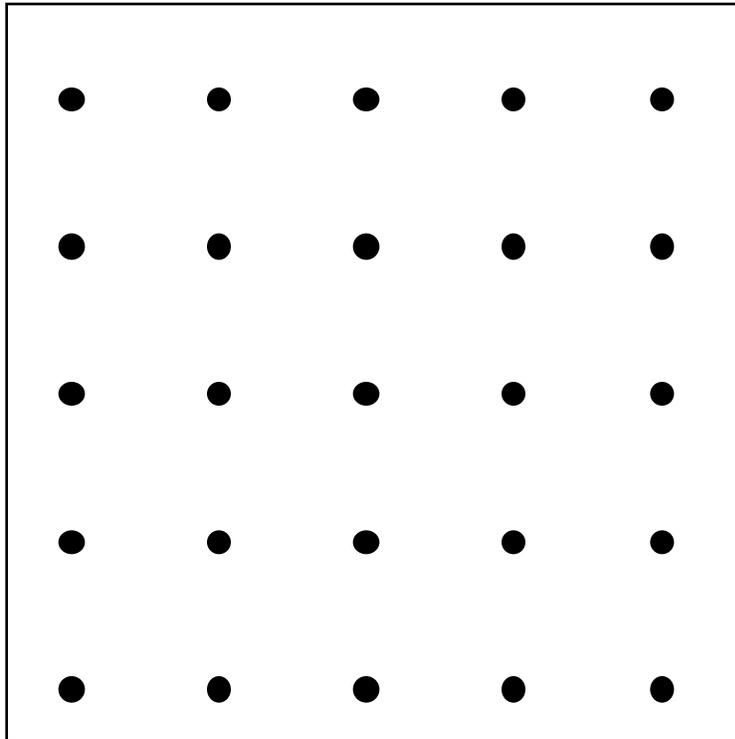


Make a figure with:
9 square units of area
12 units of perimeter



Make a figure with:
14 square units of area
20 units of perimeter

Geoboard Dot Paper



PATCHWORK QUILT

Design your quilt patch by using some or all of the following colors:

Red
Yellow

Blue
Green

Orange

Patchwork Quilt

Calculate the area of each color on your patch.

	<u>Color</u>	<u>Area</u>
1.	_____	_____
2.	_____	_____
3.	_____	_____
4.	_____	_____
5.	_____	_____

Which color covers the most area?

Which color covers the least area?

Write a number sentence explaining the total area of your quilt square.

Area Performance Task Blanket for Baby

Mom is going to have a new baby! You and grandma want to make the baby a blanket. Use the graph paper provided to create the baby's blanket.

Use the following criteria to create the baby's blanket:

- the length of the blanket is eight square units.
- the width of the blanket is six square units.
- the blanket should have at least three different colors which form a pattern.

Find the perimeter of the blanket. _____

Write a number sentence to show how you found the perimeter.

Find the area of the blanket. _____

Write a number sentence to show how you found the area.

Your grandmother doesn't understand why you need to know about area or perimeter to make a blanket. Write grandma a letter explaining why you think area and perimeter are important when making a blanket.
