

## QUILT PATCH PROOF

### Performance Standard 9C.F

Construct a convincing argument that the same amount of fabric is needed for each color of a quilt being made in a specific design and that one template will make both parts of the design, justify the relationship between vertical angles as well as justify the sum of the interior angles of a triangle is  $180^\circ$ .

- *Mathematical knowledge:* Demonstrate quadrilateral and triangle relationships, angles and sum of angles in a triangle;
- *Strategic knowledge:* Solve the problem using all elements in a systematic process;
- *Explanation:* Explain completely what was done and why it was done.

### Procedures

1. ***In order to construct convincing arguments and proofs to solve problems (9C)***, students should experience sufficient learning opportunities to develop the following:
  - Make and test conjectures about various quadrilateral and triangle relationships, including the triangle inequality.
  - Justify the relationship between vertical angles.
  - Justify that the sum of the angles of a triangle is 180 degrees.
2. The teacher needs to give each student a copy of the “Square Quilt Patch” sheet and a copy of the directions. Students will need a pencil and a straightedge to proceed.
3. Have the students read and do the first two steps on the direction sheet.
4. The teacher explains the situation and what needs to be done by saying, “Ms. Andrews is making a quilt using the quilt square pattern you have just made. She will make many quilt squares using this pattern and two colors and/or patterns of fabric. She will sew all the squares together forming a design for her quilt.” (The teacher may need to explain that quilts are often made of a fabric called calico. The calico prints come in many varieties and colors. The person making the quilt often chooses contrasting colors and/or different prints to create a certain pattern or design. Quilts are usually made a square at a time and then the squares are sewn together to form the overall design.) “When Ms. Andrews showed the pattern she designed to a friend, her friend said that would be a good pattern to use because she’d need only one template to cut both triangles in the pattern. Her friend had another reason for thinking this was a good pattern. She told Ms. Andrews she’d need to purchase exactly the same amount of both fabrics. Ms. Andrews isn’t sure her friend is correct. Your task is to prove to Ms. Andrews that her friend is correct.”
5. The teacher should go over the directions and answer any questions the students may have.
6. The teacher should look for additional drawings of the square quilt patch. Students who make additional drawings will be able to see the bigger design of the quilt.
7. The directions ask the students to use all they know about the relationships between triangles and quadrilaterals (e.g., the area of a triangle is  $\frac{1}{2}$  the area of a parallelogram, vertical angles are congruent, and the sum of the angles of a triangle is  $180^\circ$ ) to construct an argument. The argument needs to show that the same amount of fabric will be needed and that one template can be used for both triangular designs.
8. The proof should contain the justification for the relationship between vertical angles and the sum of the interior angles of a triangle being  $180^\circ$ .
9. The student should show all their work and do all their writing on either the direction sheet or the quilt patch sheet.

### Examples of Student Work not available

### Time Requirements

- Two class periods

### Resources

- Pencil
- Straightedge
- “Square Quilt Patch” task sheet
- Copy of the directions
- Colored pencils (optional)
- Mathematics Rubric

NAME \_\_\_\_\_ DATE \_\_\_\_\_

## SQUARE QUILT PATCH

### Student Task Sheet

#### Directions

1. Find the midpoint of line segment **AB**. Folding point **A** to point **B** and then slightly creasing the midpoint can do this. Label this point **P**.
2. Use a straightedge and draw a line segment from point **P** to point **D** and from point **P** to point **C**. You now have an isosceles triangle inscribed in a square. Shade  $\square$  **DPC**. Leave  $\square$  **APD** and  $\square$  **BPC** unshaded. (If colored pencils are used, color  $\square$  **DPC** one color. If  $\square$  **APD** and  $\square$  **BPC** are colored, both must be colored with the same color but that color must be different from the color used to shade  $\square$  **DPC**.)
3. The perimeter of the square is 12 inches.
4. Use all you know about the relationship between triangles and quadrilaterals to construct an argument for using only one template and purchasing the same amount of fabric for both triangular designs.
5. As you construct your argument, be certain to justify the relationship between vertical angles and the sum of the interior angles of a triangle equaling  $180^\circ$ .
6. Be certain to show all the work you do. Clearly state your arguments and the proof you have for them. Use this page and the quilt patch sheet to show your work and write your argument.

#### Square Quilt Patch

