

6-4: Covering and Surrounding

Unit Goals, Focus Questions, and Mathematical Reflections

Unit Goals

Area and Perimeter Understand that perimeter is a measure of linear units needed to surround a two-dimensional shape and that area is a measure of square units needed to cover a two-dimensional shape

- Deepen the understanding of area and perimeter of rectangular and nonrectangular shapes
- Relate area to covering a figure
- Relate perimeter to surrounding a figure
- Analyze what it means to measure area and perimeter
- Develop and use formulas for calculating area and perimeter
- Develop techniques for estimating the area and perimeter of an irregular figure
- Explore relationships between perimeter and area, including that one can vary considerably while the other stays fixed
- Visually represent relationships between perimeter and area on a graph
- Solve problems involving area and perimeter of rectangles

Area and Perimeter of Parallelograms and Triangles Understand that the linear measurements of the base, height, and slanted height of parallelograms and triangles are essential to finding the area and perimeter of these shapes

- Analyze how the area of a triangle and the area of a parallelogram are related to each other and to the area of a rectangle
- Recognize that a triangle can be thought of as half of a rectangle whose sides are equal to the base and height of the triangle
- Recognize that a parallelogram can be decomposed into two triangles. Thus the area of a parallelogram is twice the area of a triangle with the same base and height as the parallelogram
- Know that the choice of base of a triangle (or parallelogram) is arbitrary but that the choice of the base determines the height
- Recognize that there are many triangles (or parallelograms) that can be drawn with the same base and height
- Develop formulas and strategies, stated in words or symbols, for finding the area and perimeter of triangles and parallelograms
- Find the side lengths and area of polygons on a coordinate grid
- Solve problems involving area and perimeter of parallelograms and triangles
- Solve problems involving area and perimeter of polygons by composing into rectangles or decomposing into triangles

Surface Area of Prisms and Pyramids and Volume of Rectangular Prisms Understand that the surface area of a three-dimensional shape is the sum of the areas of each two-dimensional surface of the shape and that the volume of a rectangular prism is a measure in cubic units of the capacity of the prism

- Extend the understanding of the volume of rectangular prisms
- Relate volume to filling a three-dimensional figure
- Extend understanding of the strategies for finding the volume of rectangular prisms to accommodate fractional side lengths
- Relate finding area of two-dimensional shapes to finding the surface area of three-dimensional objects
- Develop strategies for finding the surface area of three-dimensional objects made from rectangles and triangles

CONNECTED MATHEMATICS PROJECT

- Solve problems involving surface area of prisms and pyramids and volume of rectangular prisms

6-4 Covering and Surrounding: Focus Questions (FQ) and Mathematical Reflections

Investigation 1 Designing Bumper Cars: Extending and Building on Area and Perimeter	Investigation 2 Measuring Triangles	Investigation 3 Measuring Parallelograms	Investigation 4 Measuring Surface Area and Volume
<p>Problem 1.1 Designing Bumper Car Rides: Area and Perimeter FQ: What are the formulas for finding the area and perimeter of a rectangle? Explain why they work.</p> <p>Problem 1.2 Building Storm Shelters: Constant Area, Changing Perimeter FQ: For a fixed area, what are the shape and perimeter of the rectangles with the greatest and least perimeters?</p> <p>Problem 1.3 Fencing in Spaces: Constant Perimeter, Changing Area FQ: For a fixed perimeter, what are the shape and area of the rectangles the greatest and least area?</p>	<p>Problem 2.1 Triangles on Grids: Finding Area and Perimeter of Triangles FQ: What is a formula for finding the area of a triangle?</p> <p>Problem 2.2 More Triangles: Identifying Base and Height FQ: Does it make any difference which side is used as the base when finding the area of a triangle?</p> <p>Problem 2.3 Making Families of Triangles: Maintaining the Base and the Height FQ: What can you say is true and what can you say is not true about triangles that have the same base and height?</p> <p>Problem 2.4 Designing Triangles Under Constraints FQ: What conditions for a triangle produce triangles that have the same area? Do they have the same shape? Explain.</p>	<p>Problem 3.1 Parallelograms and Triangles: Finding Area and Perimeter of Parallelograms FQ: What is a strategy for finding the area of a parallelogram? Explain why the strategy works.</p> <p>Problem 3.2 Making Families of Parallelograms: Maintaining the Base and the Height FQ: What can you say about two parallelograms that have the same base and height?</p> <p>Problem 3.3 Designing Parallelograms Under Constraints FQ: Under what conditions will two or more parallelograms have the same area? Do these parallelograms have the same shape? Explain.</p> <p>Problem 3.4 Polygons on Coordinate Grids FQ: How can you find the area of a polygon drawn on a coordinate graph? On grid paper?</p>	<p>Problem 4.1 Making Rectangular Boxes FQ: What is a strategy for finding the surface area of a rectangular prism? Explain why the strategy works.</p> <p>Problem 4.2 Filling the Boxes: Finding Volume FQ: What is a strategy for finding the volume of a rectangular prism? Explain why the strategy works.</p> <p>Problem 4.3 Designing Gift Boxes: Finding Surface Area FQ: What is a strategy for finding the surface area of three-dimensional object? Explain why the strategy works.</p>
<p>Mathematical Reflections</p> <p>1a. Explain what area and perimeter of a figure means.</p> <p>1b. Describe a strategy for finding the area and perimeter of any two-dimensional shape.</p> <p>1c. Describe how you can find the area of a rectangle. Explain why this method works.</p> <p>1d. Describe how you can find the perimeter of a rectangle. Explain why this method works.</p> <p>2a. Consider all the rectangles with the same area. Describe the rectangle with the least perimeter. Describe the rectangle with the greatest perimeter.</p> <p>2b. Consider all the rectangles with the same perimeter. Describe the rectangle with the least area. Describe the rectangle with the greatest area.</p> <p>2c. Explain how graphing relationships between length and perimeter or length and area helps explain patterns between area and perimeter.</p>	<p>Mathematical Reflections</p> <p>1a. Describe how to find the area of a triangle. Explain why your method works.</p> <p>1b. Describe how to find the perimeter of a triangle. Explain why your method works.</p> <p>2a. Does the choice of the base affect the area of a triangle? Does the choice of the base affect the perimeter of a triangle? Explain why or why not?</p> <p>2b. What can you say about the area and perimeter of two triangles that have the same base and height? Give evidence to support your answer?</p> <p>3. How is finding the area of a triangle related to finding the area of a rectangle? How is finding the perimeter of a triangle related to finding the perimeter of a rectangle?</p>	<p>Mathematical Reflections</p> <p>1a. Describe how to find the area of a parallelogram. Explain why your method works.</p> <p>1b. Describe how to find the perimeter of a parallelogram. Explain why your method works.</p> <p>2a. Does the choice of the base change the area of a parallelogram? Does the choice of the base change the perimeter of a parallelogram? Explain why or why not?</p> <p>2b. What can you say about the shape, area, and perimeter of two parallelograms that have the same base and height? Give evidence to support your answer?</p> <p>3. How is the area of a parallelogram related to the area of a triangle and a rectangle? How is the perimeter of a parallelogram related to the perimeter of a triangle and a rectangle?</p>	<p>Mathematical Reflections</p> <p>1a. What information do you need to find the volume of a rectangular prism? Describe a strategy to find the volume of a rectangular prism.</p> <p>1b. What information do you need to find the surface area of a rectangular prism? Describe a strategy to find the surface area of a rectangular prism.</p> <p>2a. Describe a strategy for finding the surface area of three-dimensional shapes made from rectangles and triangles.</p> <p>2b. How does knowing the area of two-dimensional figures help you find the surface area of a three-dimensional shape?</p>