

Title: “Polygon Art is Everywhere”

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Abstract: Students need to already know how to find the perimeter and area of triangles, rectangles and trapezoids. Teacher should provide these formulas for students to use. Students cut out these shapes, tape them to construction paper, and let the sun fade the construction paper. Students will then find the areas of the polygons and then find the area that has been shaded. (Area of construction paper – total area of polygons = area that is shaded). Students explore the question: If the dimensions of one of the rectangles they cut out are doubled, how will the perimeter and area of the new rectangle compare to the original perimeter and area? Students will create questions for classmates giving them the area and one dimension of a rectangle and triangle.

Grade Level: 6-8

Mathematics Strand: Montana Standards of Mathematics Standard 5 Benchmark 3
Geometry using area and perimeter

Class time required: 3 sessions about 45 minutes each

Materials needed:

Construction paper

Scissors

Tape

Rulers

Graph paper

Technology:

Teacher may have students type stories in lesson 1 and their questions in lesson 2.

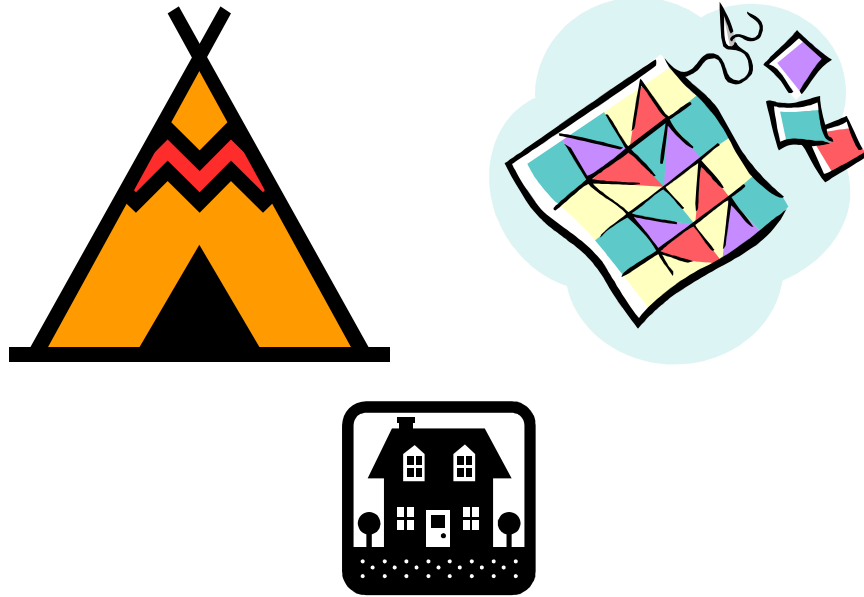
Teachers may also let students use calculators.

Objective:

Engage students in hands-on, critical thinking lessons to help them be successful on standardized tests that require conceptual understanding to solve complex problems.

For the Instructor:

Polygon Art Everywhere!



Lesson 1

Day 1

Have a class discussion and give examples of polygons they encounter in their everyday lives. Pictures and examples of where polygons are used could be presented to the class.

Students create an art project using polygons. Students need to cut out a set of at least 3 polygons, including a rectangle, triangle, and a trapezoid. Next, students will tape their polygons to a rectangular piece of construction paper. The construction paper should be placed in bright sunlight or under a sun lamp to allow fading to occur.

Day 2 (This can occur several days after the initial art project was completed.)

Challenge the students to determine the area on the background portion of the paper that has been faded by the light. All of the construction paper that is not covered by the cut-out polygon should be at least slightly faded and is considered the background portion of the paper.

Have small group discussions on how they solved the problem and then share with the rest of the class a process their group discussed.

Check student measurements and area calculations. Also determine if they used a correct process to find the faded area.

Possible extensions:

Have students exchange polygon art and find the background area of a classmate's polygon art.

Repeat the activity using circles!

Lesson 2

Working in small groups:

Give the students a challenge to find out what would happen if the dimensions of one of the rectangles they cut out is doubled. Provide them with graph paper so that they can draw models of various rectangles and the rectangles corresponding to doubling the dimensions. Ask them to compare the perimeters and areas of corresponding rectangles and describe any patterns they observe. Hold a class discussion of the results.

Next, have students use the dimensions and areas of one rectangle to write a story problem. In the story problem they might give the area and the rectangle's length or width. Another student will find the missing dimension. They might start with a rectangle and describe a corresponding rectangle whose dimensions are multiples of this rectangle. Another student will find the area of the new rectangle. They might start with a rectangle and ask for the dimensions of a rectangle with four times the area. Here there are numerous answers the other student can derive.

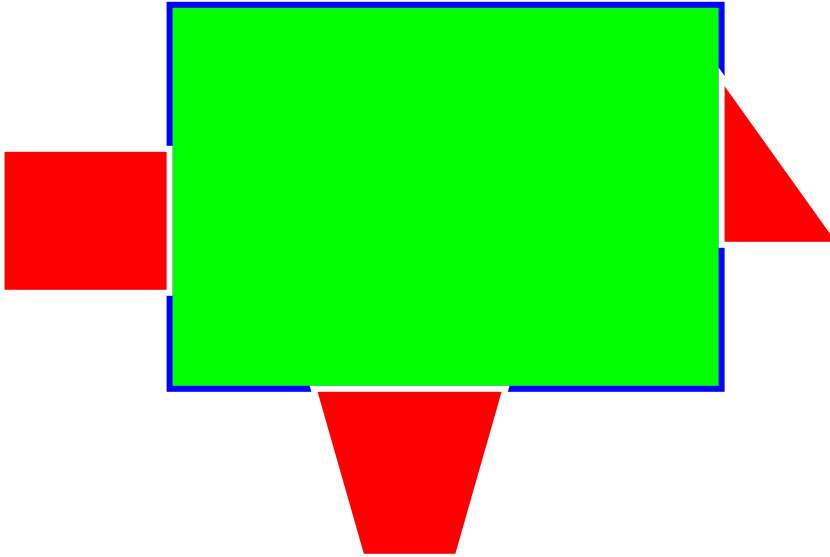
Example: Student's rectangle has an area of 20 square inches. The dimensions are 5 inches by 4 inches. In their story problem they might say the area is 20 square inches and the length is 5 inches, what is the width?

Example: Student's rectangle has an area of 20 square inches. The dimensions are 5 inches by 4 inches. In their story problem they might ask for the dimensions of a rectangle with 12 times the area but half the width of the original.

Lesson 3

Have the students complete the following four tasks.

1. Create a new art project by taking the shapes off the construction paper and lightly taping them around the outside of the construction paper. For example:



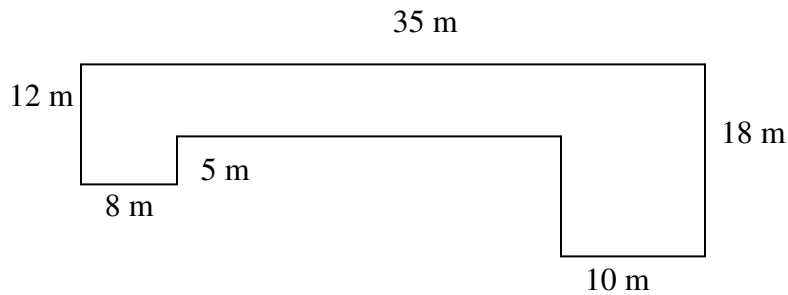
2. Find the total area of the new figure.
3. Find the perimeter of the new figure.
4. Reattach the shapes to the edge of the construction paper so that the perimeter and area of the new figure are maximum.

Discuss with the students the results of task 4. The areas stay fixed regardless of which edge of each polygon is attached to the edge of the construction paper. However, the perimeter is maximized when the smallest edge of each polygon is attached to the construction paper. Upon completion of Lesson 3, students should be ready to demonstrate their understanding of the lessons with the following assessment, reflecting the type of items they might see on the MontCAS test.

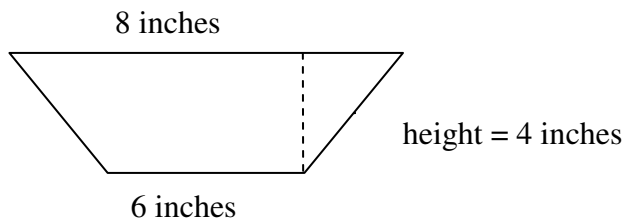
Name: _____

1. Shawn found a rectangular poster with an area of 7.5 square feet. One side of the poster was 3 feet long. How long was the other side?
a. 4.5 feet b. 22.5 feet c. 2.5 feet d. 2.5 square feet
2. What is the height of a triangle with an area of 48 square meters and a base of 8 meters?
a. 40 meters b. 6 meters c. 12 meters d. 384 meters
3. The perimeter of a rectangular smart board screen is 15 feet and the base is 4.5 feet. What is the height of the smart board screen?
a. 19.5 feet c. 10.5 feet c. 6 feet d. 3 feet

4. Find the area of the figure below.

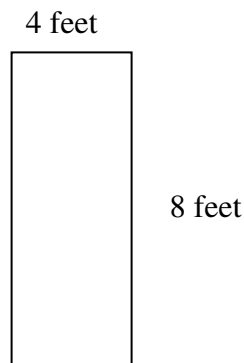


- a. 696 square meters b. 451 square meters
c. 395 square meters d. 88 square meters
5. Find the area of the trapezoid.



- a. 56 square inches b. 28 square inches
c. 192 square inches d. 3 square inches

6. The Smith family just adopted a new puppy and they want to double the size of their kennel. The diagram shows the size of the family's current kennel. They decide to double the length and width of the kennel. How will the perimeter of the new kennel compare with the current kennel?



- a. 2 times larger
b. 4 times larger
c. 1.5 times larger
d. 12 times larger
7. How will the area of the Smith's new kennel (from question #6) compare with the area of the current kennel?
- a. 2 times larger
b. 4 times larger
c. 1.5 times larger
d. 32 times larger

Constructed Response

8. Michelle is building a rectangular porch with a length of 15 feet and width of 30 feet. In her design she needs to set aside an area to install a rectangular hot tub. The hot tub is 6 feet by 7 feet.
- a. Draw and label a diagram showing the porch with space for the hot tub.
b. Find the area of the porch deck after the space for the hot tub is cut out.
c. Explain how you found the area in part b.

Answer Key

1. c

2. c

3. d

4. c

5. b

6. a

7. b

8. b. 408ft^2

a 2 points = correctly drawn and labeled
 1 point = correctly drawn and incorrectly or not labeled
 0 points = not drawn correctly

b 2 points = correct answer and labeled correctly
 1 point = correct answer
 0 points = incorrect answer

c 2 points = complete explanation
 1 point = incomplete explanation or incorrect answer with a complete explanation
 0 points = no explanation