Area and Perimeter: Projects and Puzzles

1) Draw two different rectangles with areas of 12 square cm.

2) Draw two different rectangles with perimeters of 12 in.

3) Which is larger, a rectangle with area 10 square in., or a rectangle with area 40 square cm? Make a drawing to show you're correct.

4) Draw a triangle with sides 6, 8, and 10 cm. What is its perimeter? Its area?

5) Can you find a rectangle whose area number equals its perimeter number? (It is possible.) Can you find a formula or pattern for all such rectangles?

6) Measure the area and perimeter of a rectangle in our school.

7) Of all the rectangles with perimeter 40 cm, which has the greatest area? Explain. Is there one with the least area? Explain!

8) King Cuadro had a square window. It measured 1 meter by 1 meter. He told his carpenter that this window let in too much light. He wanted a new window,
"just as high, just as wide, with half the area, and still in the shape of a square."
Surprisingly, the carpenter, who was a *very* good problem solver, fulfilled all these requirements. Explain how! Draw the new window! Give the area and perimeter of the new window.

9) Can a geometric figure with finite area have an infinite perimeter?

10) A square with sides of 1 inch will have an area of 1 square inch. But what about an equilateral triangle with sides of 1 inch? What will its area be? (It helps to know your way around a 30-60-90 triangle!) How about the area of a regular pentagon with sides of 1 inch? Is there a formula for problems like this? Where does that formula come from?

Please use a ruler for all your drawings, work neatly, and label all your work. Use well-written sentences to explain what you did. Remember to use appropriate units. For example, "The area of this rectangle is 24 square inches." Have fun!

Halloween Hodgepodge

1) Many children enjoy doubling numbers, starting at one: 1, 2, 4, 8, 16... How far can you go? What do you notice about the digits in the ones column as the pattern continues? By the way, these numbers are called "powers of two." Older students might enjoy exploring powers of other numbers. What patterns can you find?

2) Let's say you have some cubes and you want to color one or more of the faces of the cube black. How many different ways can you do it so that you'll be able to tell them apart, even if they're turned around?

3) Most of us know the square numbers: 1, 4, 9, 16, 25... Five is the sum of two squares because $5 = 1 + 4$. Can you find other numbers that are the sum of two squares? What's the smallest number you can find that's the sum of two squares in two different ways? A lot of us know the prime numbers too: 2, 3, 5, 7, 11, 13, 17... Some primes are the sum of two squares, for example five or thirteen, and some aren't. Can you make a list of primes that are and aren't? Can you find a rule for this?

4) Heracles lies on Monday, Tuesday and Wednesday. Theseus lies on Thursday, Friday and Saturday. On all other days they tell the truth. "Yesterday was one of my lying days," said Heracles. "Yesterday was one of my lying days too," said Theseus. What day of the week is it? Explain! What if each had said that yesterday was one of his truth-telling days? Could any conclusion be drawn? (Source: Raymond Smullyan, *What is the Name of This Book?*)

5) A woman has two cubes at her desk. Every day she arranges both cubes so that the front faces show the current day of the month. She uses two cubes for each day. So for the ninth day, she might use a ZERO on one cube and a NINE on another. What numbers are on the faces of the cubes to allow this?

6) "October 2, 2001" in MMDDYYYY format is a palindrome (a string that reads the same forwards as it does backwards). Pretty cool, check it out: 10/02/2001 in that format would be 10022001. When was the last date before October 2, 2001 that is also a palindrome?

7) Find different arrangements of the 13 pieces on the following page to form two different figures: a (non-square) rectangle and a square. Each shape must use all 13 pieces as part of the shape.

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