$$\text{Area of semicircle} = \frac{1}{2}A = \frac{1}{2}\pi r^2$$
$$\approx \frac{1}{2}\cdot 3.14(5\text{ in.})^2 \qquad \text{In this case, } r = \frac{1}{2}d = \frac{1}{2}\times 10\text{ in.} = 5\text{ in.}$$
$$= 39.25\text{ in.}^2$$

Area of the figure = 100 in.^{2} – 39.25 in.^{2} = 60.75 in.^{2}

The area of the figure is 60.75 in.^{2}

Now work margin exercise 13.

CALCULATOR

Entering π on a Calculator

Many calculators will have a [π] key (may also be accessed using [SHIFT] [EXP] or [SHIFT] [10^x]) which can be used in calculating circumferences involving π. Be aware, though, that the value of π inserted by a calculator will be rounded to a minimum of 10 decimal places. As the problems in this section were calculated using π = 3.14, you may see slight differences in the answers due to rounding. For example, a circle with radius 6 has a circumference of 37.68 ft when calculated using π = 3.14. Alternatively, to find the circumference using a calculator, press the keys

[2] [×] [π] [×] [6]. Then press [=].

The display will read 37.699111843... (your calculator may display more or less digits depending on its settings). Rounding this value to two decimal places gives us 37.70 ft. Even though the two circumferences differ by 0.02, both answers are considered correct.

Margin Exercise Answers

1. 32 ft **2.** 85 ft **3.** 58 cm **4. a.** 29 m **b.** $217.50 **5.** 69.08 m **6.** 66.82 in. **7.** 24.28 ft **8.** 28 mm^2 **9.** 36 cm^2 **10.** 28.26 ft2 **11.** 30 ft^2 **12.** 44 m^2 **13.** 21.87 cm^2

6.7 Exercises

Concept Check

Fill-in-the-Blank. Complete each sentence using information found in this section.

1. A closed plane figure with at least three sides in which each side is a line segment is a/an _____.

2. A four-sided polygon with both pairs of opposite sides parallel is a/an _____.

3. The perimeter of a circle is called the _____.

4. When measuring area use _____ units.

5. The measure of the interior of a plane figure is the _____ of the figure.

6. $A = \frac{1}{2}bh$ is the formula for the area of a/an _____.

True/False. Determine whether each statement is true or false. If a statement is false, explain how it can be changed so the statement will be true. (**Note:** There may be more than one acceptable change.)

7. a. Every square is a rectangle.

b. Every rectangle is a square.

8. A trapezoid has only one pair of parallel lines.

9. The height of a triangle is the distance between the base and the vertex opposite the base.

10. The area formula for a triangle is $A = a + b + c$.

Practice

Calculate the perimeter of each figure described. Use $\pi = 3.14$.

1. A parallelogram with sides of length 15 cm and 7 cm.

2. A parallelogram with sides of length 42 mm and 34 mm.

3. A rectangle with sides of length 24 cm and 34 cm.

4. A rectangle with sides of length $3\frac{1}{4}$ ft and $2\frac{5}{6}$ ft.

5. A square with sides of length $4\frac{1}{2}$ km.

6. A square with sides of length 11 m.

7. A triangle with sides of length 21 in., 67 in., and 55 in.

8. A triangle with sides of length 7.5 in., 17 in., and 13.6 in.

9. A trapezoid with sides of length 14.2 yd, 10.1 yd, 8 yd, and 15.8 yd.

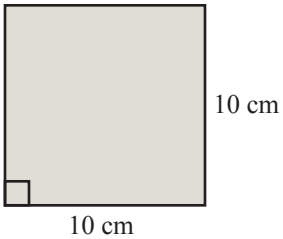
10. A trapezoid with sides of length 31 ft, 39 ft, 45 ft, and 51 ft.

11. A circle with radius 0.5 m.

12. A circle with diameter 14 m.

Calculate the perimeter of each figure. See Examples 1 through 4.

13.



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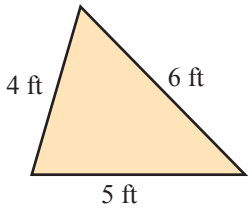

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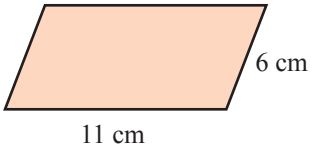

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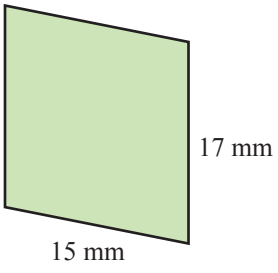

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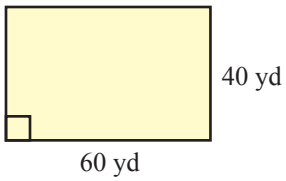

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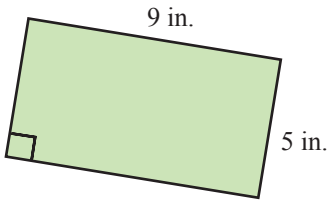

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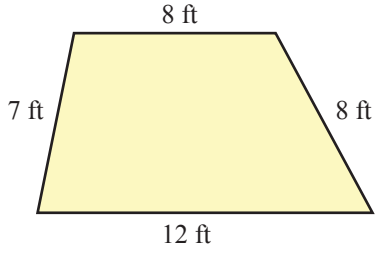

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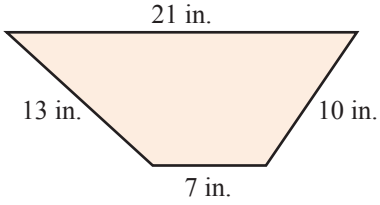

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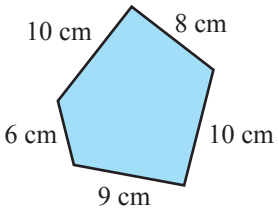

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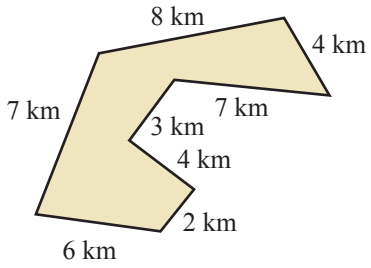

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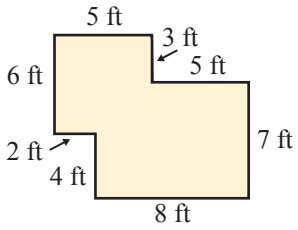

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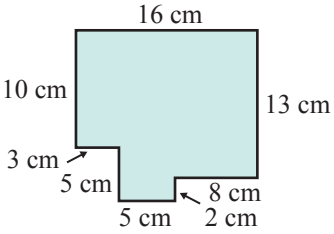

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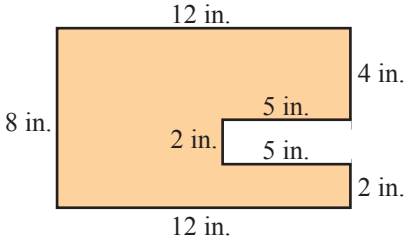

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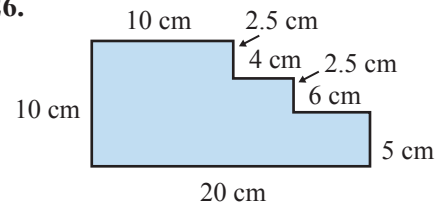
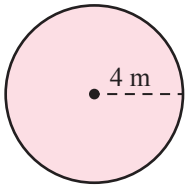


Calculate the perimeter of each figure. Use $\pi = 3.14$. See Examples 5 through 7.

27.



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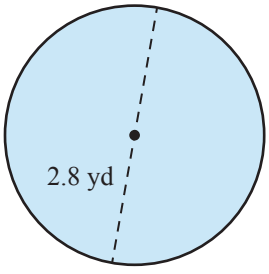

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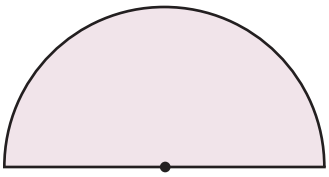

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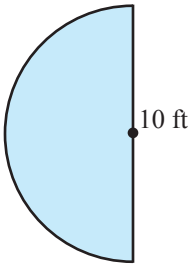

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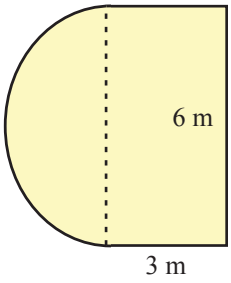

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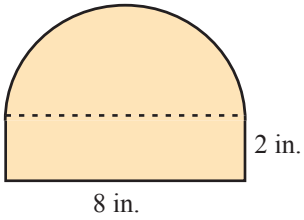

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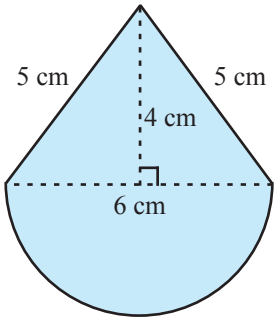

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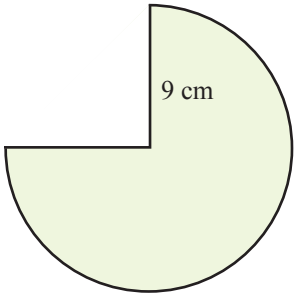


Calculate the area of each figure described. Use $\pi = 3.14$. See Examples 8 through 10.

35. A square with sides of length 9 ft.

36. A square with sides of length 6 in.

37. A rectangle with length 21 km and width 25 km.

38. A rectangle with length $1\frac{1}{4}$ mi and width $2\frac{1}{2}$ mi.

39. A parallelogram with height 2.3 ft and base 11.9 ft.

40. A parallelogram with height 5 m and base 12 m.

41. A triangle with height $\frac{8}{9}$ in. and base $\frac{5}{12}$ in.

42. A triangle with height 16.4 cm and base 8.2 cm.

43. A trapezoid with height 10 cm and parallel sides of length 15 cm and 18 cm.

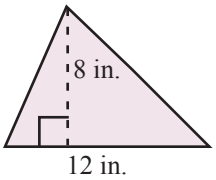
44. A trapezoid with height 30 mm and parallel sides of length 45 mm and 50 mm.

45. A circle with radius $\frac{3}{4}$ ft.

46. A circle with radius $12\frac{1}{5}$ mi.

Calculate the area of each figure. Use $\pi = 3.14$. See Examples 8 through 13.

47.



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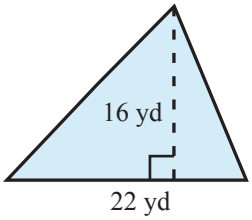

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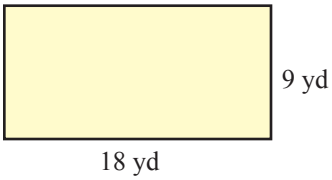

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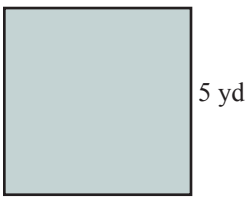

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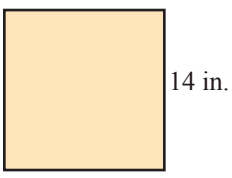

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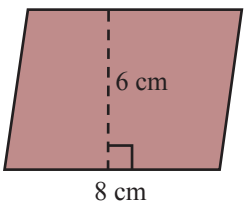

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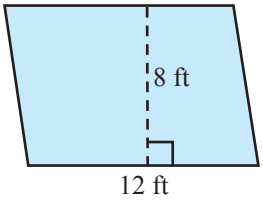

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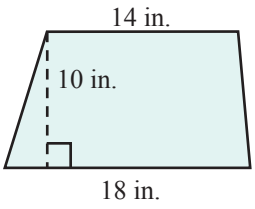

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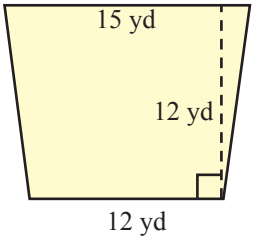

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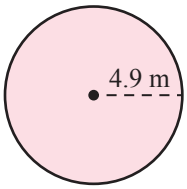

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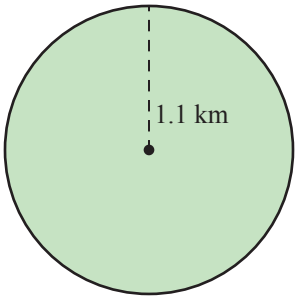

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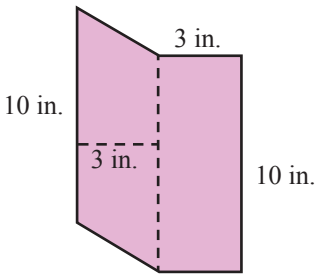

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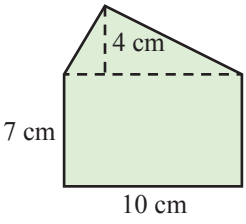

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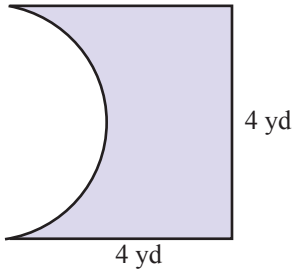

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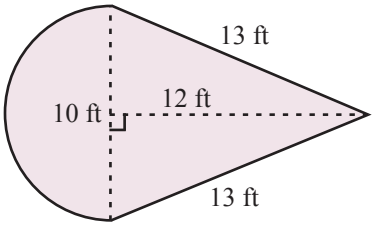

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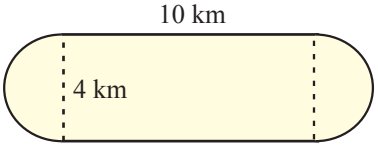

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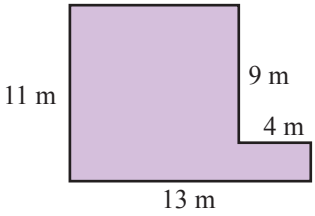

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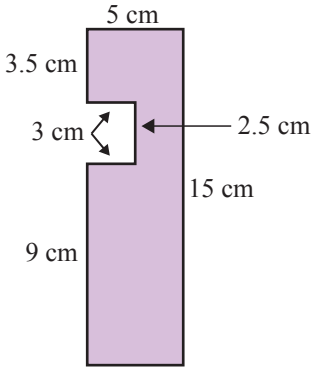

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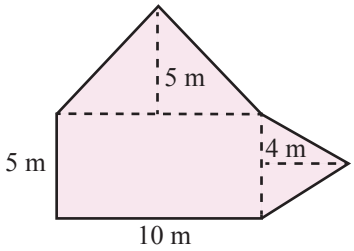

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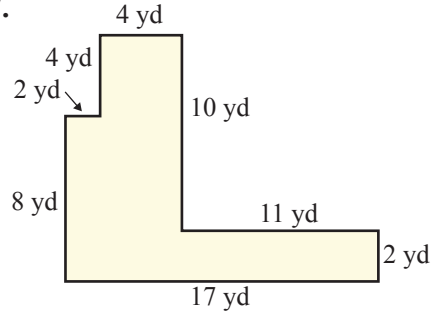
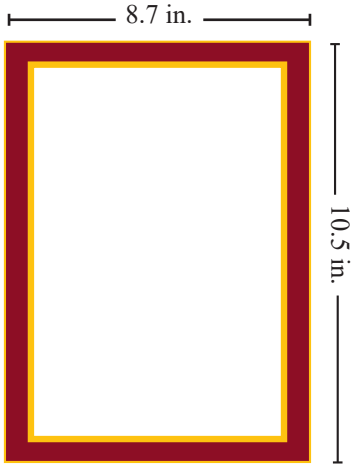


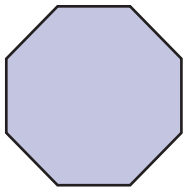
Applications

Solve. Use $\pi = 3.14$.

68. A rectangular picture frame is 10.5 inches high and 8.7 inches wide. How much picture framing material must be used to frame the picture? (**Hint:** This is the same as the perimeter of the outer edge.)



69. A regular octagon is an eight-sided figure with all eight sides equal and all eight angles equal. Find the perimeter of a regular octagon if one side measures 12 inches. (**Note:** Where do you see regular octagons an a regular basis?)

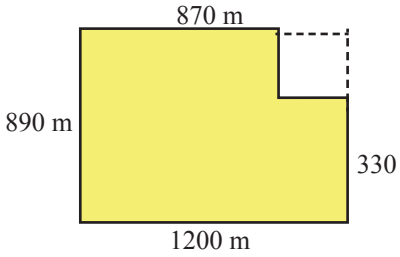


70. The Pentagon near Washington, D.C., is a five-sided building where each outside wall is 921 feet.

a. What is the perimeter of the building?

b. If it takes a person 0.00341 minutes to walk 1 foot, how long will it take the person to walk completely around the building? Round your answer to the nearest tenth of a minute.

71. For exercise, John will walk along the path which is indicated by the solid line in the drawing. Note that he cuts a corner where both sides are the same length.



a. How many meters did John walk?

b. How long would the walk have been if John didn't cut the corner, but rather walked the full rectangle, as indicated by the dotted line?

c. How do these two distances compare?

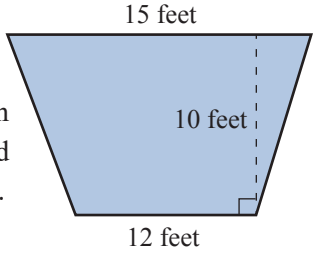
72. An engineer who is designing a new smartphone decides to add a soft neoprene edging to the phone. The phone itself is $4\frac{1}{2}$ inches tall and $2\frac{2}{5}$ inches wide. How much neoprene edging is needed to go along the outside edge of each smartphone?

73. Jessica wants to add a decorative fringe to a throw rug. The rug is a rectangle with length 8 feet and width 5 feet. If Jessica wants to buy 1 foot more than the perimeter of the rug, how many feet of fringe must she buy?

74. The boundaries of a certain small town form a parallelogram with a length of 4.5 miles and a height of 2.6 miles. What is the area within the town limits?

75. Vinyl tile is to be laid on the floor of a rectangular room which is 17 feet long and 12 feet wide. How many square feet of tile must be put down?

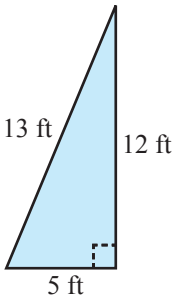
76. The main stage at a theater is in the shape of a trapezoid. The owner of the theater is planning to install a new specially designed flooring system on the stage. The stage is 12 feet wide in the front and 15 feet wide in the back. The stage is 10 feet deep. How much flooring will the manager need?



77. A sailboat has a triangular sail with the dimensions as shown in the drawing. (Note that the 12 foot measurement is the height of the triangle.)

a. What is the area of the sail?

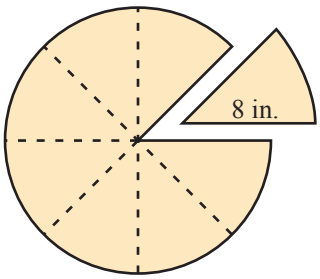
b. What is the perimeter of the sail?



78. A large 16 in. pizza is cut into eight pieces.

a. What is the perimeter of a single piece?

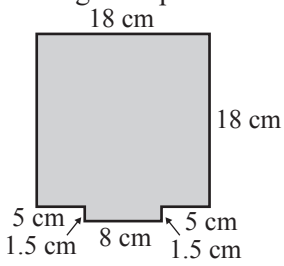
b. What is the area of this piece of pizza?



79. A square electronics circuit board is 18 centimeters on each side. On the center of one of the edges is a 8 by 1.5 centimeter rectangular lip for plugging in.

a. What is the total perimeter of the circuit board, including the lip?

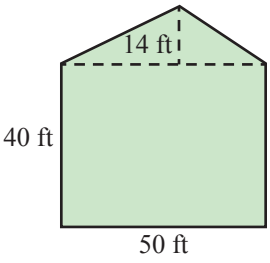
b. What is the area of the circuit board?



80. David is planting a five-sided lawn as shown in the figure below. The lawn consists of a 50 foot by 40 foot rectangle and an attached 14 foot high triangle.

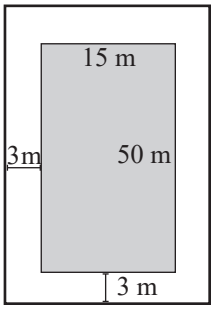
a. What is the area of the lawn to be planted?

b. If one pound of grass seed will cover 200 square feet, how many pounds will be necessary to cover the entire lawn? (**Hint:** Divide the area by the number of square feet that one pound of seed will cover.)



81. A 1-page magazine article must have 1-inch margins of blank space surrounding the content of the page. If the magazine pages are 11 inches by 14 inches, determine the largest amount of space that will contain print on this page.

82. A concrete patio is being poured to surround a rectangular swimming pool. The pool is 15 meters wide by 50 meters long. If the patio is to be a uniform 3 meters width all around the pool, find the area of the concrete patio.



83. A rectangular room is 25 ft by 20 ft with 10-ft high walls. How many gallons of paint will be needed to paint the four walls if each gallon covers 35 m2? Assume that that 1 square foot is approximately equal to 0.093 square meters.

Writing & Thinking

84. The perimeter of a standard sheet of paper ($8\frac{1}{2}$ in. by 11 in.) is $P = 2 \cdot 8\frac{1}{2} + 2 \cdot 11 = 17 + 22 = 39$ inches. Use a pair of scissors to cut a rectangle from one corner of a standard sheet of paper and measure the perimeter of the new figure. Repeat this process several times (in some cases, cut more than one rectangle from a different corner and measure the perimeter each time). Give a brief explanation of the results in each case.

85. Draw a rectangle and choose any point on one side of the rectangle. Draw line segments to the vertices on the opposite side (forming three triangles). Now cut out the two triangles on each end. Place these triangles inside the remaining triangle to show that the total of the two areas is equal to the area of the remaining triangle. Do this three different times choosing a different point each time. What fact does this illustrate about the area of a triangle?