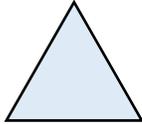
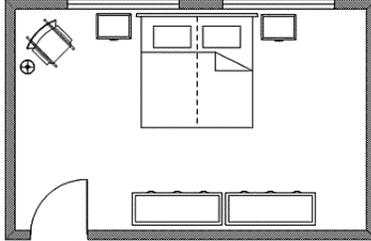
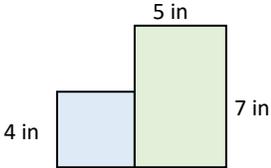


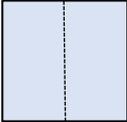
# Math Challenge #8

## Perimeter

**Kinder & First Grade: solve at least 3 problems.**  
**Second & Third Grade: solve at least 7 problems.**  
**Fourth Grade and above: solve at least 12 problems.**

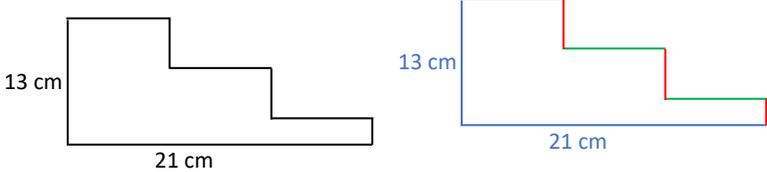
*Answer*

<p>1. An ant crawls around along the edge of this square plate once. If each side of the plate is 5 inches long. What is the distance does the ant crawl?  <math>5 + 5 + 5 + 5 = 20</math> inches</p>		<p>20 [inches]</p>
<p>2. The cookie cutter on the right is used to make lots of star cookies at Diana's home. What is the perimeter of a cookie?  <math>1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 = 10</math> inches</p>		<p>10 [inches]</p>
<p>3. An equilateral triangle is a triangle in which all three sides are equal. Lisa drew an equilateral triangle that measured 3 inches on each side. What was the perimeter of the triangle that she drew?  <math>3 + 3 + 3 = 9</math> inches</p>		<p>9 [inches]</p>
<p>4. Laura's bedroom shape is a square. The side's length is 11 feet long. What is the perimeter of her bedroom?  <math>11 + 11 + 11 + 11 = 44</math> feet</p>		<p>44 [ft]</p>
<p>5. A large rectangular bedroom is 18 feet long and 13 feet wide. What is the perimeter of the bedroom?  <math>18 + 13 + 18 + 13 = 62</math> feet</p>	 <p style="text-align: center;">Bedroom</p>	<p>62 [ft]</p>
<p>6. Tucker's room is in a shape of a regular pentagon (what a cool room!). The perimeter of his room is 60 feet, and each wall has the same length. Find the length of each side.  <math>60 \div 5 = 12</math> feet</p>		<p>12 [ft]</p>
<p>7. Vedah cut a piece of square with side length 4 inches. Joanna cut a piece of rectangular paper that is 7 inches long and 5 inches wide. They put together their papers to make a shape as the figure on the right. What is the perimeter of the figure?  <math>4 + 4 + 4 + 5 + 7 + 5 + (7 - 4) = 32</math> inches</p>		<p>32 [inches]</p>

8.  A piece of square paper with side length 15 cm was cut into half as in the picture. What is the perimeter of each new piece of paper?  
The new piece of paper: 15 cm by 7.5 cm. The perimeter is  $(15 + 7.5) \times 2 = 45$  cm.

45 [cm]

9. What is the perimeter of the figure below? All angles in the figure are right angles.  
Hint: do not estimate.



The total length of the red lines equals to 13.  
The total length of the green lines equals to 21.

Therefore, the perimeter of the figure is  $13 + 13 + 21 + 21 = 68$  cm

68 [cm]

10. Sandra is making a birthday card. She has a rectangle paper measuring 40 cm by 30 cm. She cuts out ten squares, each measuring 5 cm by 5 cm from the rectangle to make a birthday decoration. In each case, exactly one side of the square lies along a side of the rectangle, and none of the cut-out squares touch or overlap. What is the perimeter of the birthday card?



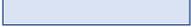
The original rectangle had a perimeter of  $2 \times 30$  cm +  $2 \times 40$  cm = 140 cm. Each of the new squares that is cut out removes one portion of length 5 cm and adds three sides of 5 cm. Thus, the overall cut outs increase the perimeter by 10 cm. Since there are 10 cut outs, the overall perimeter increases by  $10 \times 10$  cm = 100 cm. The final perimeter is 140 cm + 100 cm = 240 cm.

240 [cm]

11. The length of a rectangular family room is 6 feet longer than its width. If its perimeter is 64 feet. What is the length of the family room? Hint: Draw a model.

Half of the perimeter or length + width is 32 feet

Width:  32 ft.

Length: 

So 1 unit (width):  $(32 - 6) \div 2 = 13$  feet. Length of the room:  $13 + 6 = 19$  feet.

19 [ft]

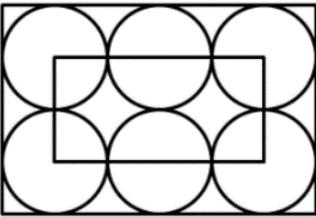
12. On a house plan diagram, 1 inch represents 4 feet. How long is the perimeter of a house that is  $24 \frac{1}{4}$  inches on the diagram?

1 inch  $\rightarrow$  4 feet  
 $\frac{1}{4}$  inch  $\rightarrow$  1 foot  
 So,  $24 \frac{1}{4}$  inches  $\rightarrow 24 \times 4 + 1 = 97$  ft.



97 [feet]

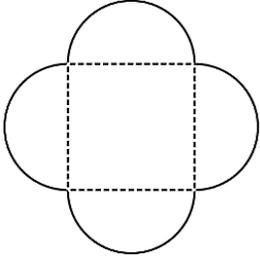
13. In the diagram on the right, six circles of equal size touch adjacent circles and the sides of the large rectangle. Each of the corners of the small rectangle is the center of one of the large circles. The perimeter of the small rectangle is 78 cm. What is the perimeter of the large rectangle?



The perimeter of the small rectangle is made of 12 radii of the circles. Thus, the radius of each circle is  $78 \div 12 = 6.5$  cm. If we look carefully, the large rectangle can be broken down into 20 of these radii. Therefore, the perimeter of the large rectangle is  $6.5 \times 20 = 130$  cm

*130 [cm]*

14. A square with perimeter 20 cm has a semicircle drawn onto each of its sides, as shown below.



What is the perimeter of the new shape? Give your answer in terms of  $\pi$ . Circumference of one circle is calculated by  $\pi d$ , where  $d$  is diameter of the circle.

If perimeter of the square is 20 cm, then the side of the square is 5 cm long. The sides of the square are the diameters of the semicircles, so the circumference of one full circle would be  $5 \times \pi = 5\pi$  cm. The 4 semicircles make up 2 full circles. So, the total perimeter of the new shape is  $5\pi + 5\pi = 10\pi$

*10 $\pi$  [cm]*

15. A large square paper was cut into half, then the results were cut again into half for a few more times. If at the end of cutting, there were 64 small squares, and each square has a side of 1.5 inches long, what is the perimeter of the large square paper?

Since there are 64 small squares, the original square was made of 8 by 8 small squares. The side of the original square must be:  $8 \times 1.5$  inches = 12 inches. Thus, the perimeter is  $12 \times 4 = 48$  inches.

*48 [inches]*

16. The length of a rectangular swimming pool is exactly three times as long as its width. If the pool has a perimeter of 296 m, find the width of the pool.

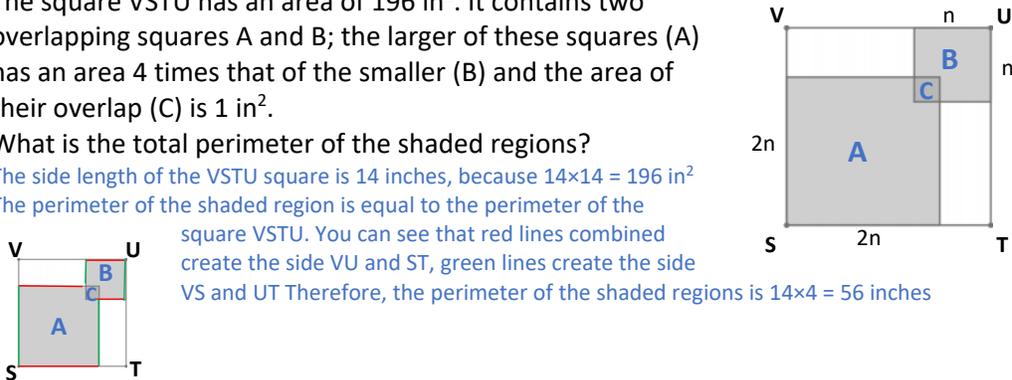


The perimeter is 8 x the width. The width must be  $296 \div 8 = 37$  meters

*37 [m]*

17. The square VSTU has an area of  $196 \text{ in}^2$ . It contains two overlapping squares A and B; the larger of these squares (A) has an area 4 times that of the smaller (B) and the area of their overlap (C) is  $1 \text{ in}^2$ . What is the total perimeter of the shaded regions?

The side length of the VSTU square is 14 inches, because  $14 \times 14 = 196 \text{ in}^2$ . The perimeter of the shaded region is equal to the perimeter of the square VSTU. You can see that red lines combined create the side VU and ST, green lines create the side VS and UT. Therefore, the perimeter of the shaded regions is  $14 \times 4 = 56$  inches

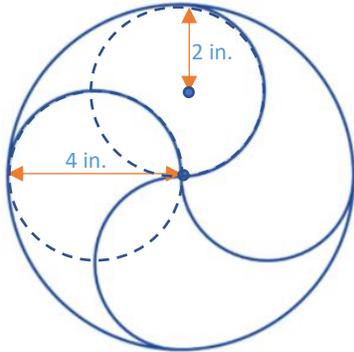


*56 [inches]*

18. The circle of radius 4 inches is divided into four congruent parts by arcs of radius 2 inches as shown. What is the length of the perimeter of one of the parts, in inches?

Circumference of one circle is calculated by  $\pi d$ , where  $d$  is diameter of the circle.

Each piece has a quarter of the big circle with radius 4 together with two semicircular arcs of radius 2.

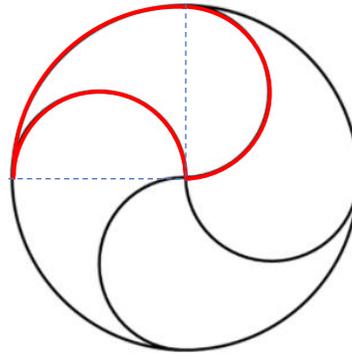


The perimeter of the quarter of the large circle is  $\frac{1}{4} \times 8 \times \pi = 2\pi$ .

The length of the two semicircular arcs will be equal to one circumference of the circle with the radius of 2 inches:

$$4 \times \pi = 4\pi.$$

Therefore, the overall perimeter is  $2\pi + 4\pi = 6\pi$ .



$6\pi$  [inches]

Solution is available on February 5th, 2021 at [www.mathinaction.org](http://www.mathinaction.org)