

# Math Challenge #14



## SOLUTIONS

### Lengths and Areas

In this Math Challenge, students solve math puzzles that can strengthen their logical and creative thinking. Topics covered in this math challenge include Lengths and Areas.

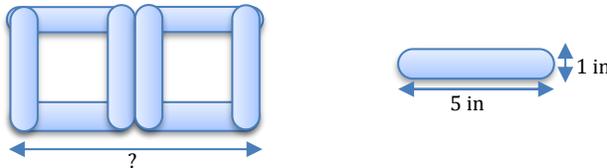
**Kinder & First Grade: solve at least 3 problems.**  
**Second & Third Grade: solve at least 6 problems.**  
**Fourth Grade and above: solve at least 12 problems.**

#### Problems

#### Answer

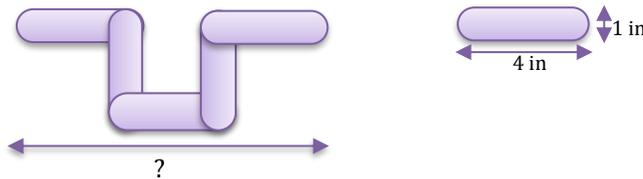
1. Eliza made the figure below using a number of popsicle sticks. Each of the popsicle sticks is **5 inches long, and 1 inch wide**. What is the length of the figure?

10 [inches]



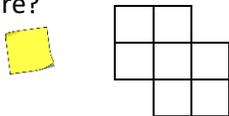
2. Five popsicle sticks that are **4 inches long** are connected as shown in the picture below. What is the length of the figure?

10 [inches]



3. Each sticky note will cover 1 square of the figure. How many sticky notes will cover the whole figure?

7



4. Tom has two sticks that are 6 inches long and 10 inches long respectively. He tied the two sticks together to make one long stick as follows:

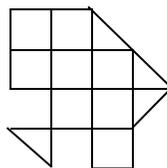
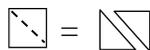
14 [inches]



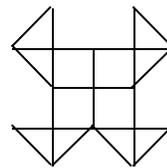
How long is the new stick?

5. If two triangles make up one square as shown, find how many squares make up each of these shapes?

A = 10 [squares]  
B = 8 [squares]

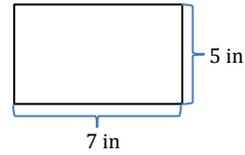


SHAPE A



SHAPE B

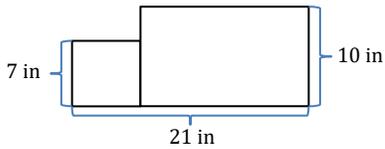
6. To find the area of a rectangle, multiply the length times the width. For example, to find the area of a rectangle with length of 7 feet and width of 5 feet, you can multiply 7 feet x 5 feet = 35 square feet. What is the area of this rectangle if we double its length and its width?



140 ft<sup>2</sup>

The new dimension would be 14 feet by 10 feet, therefore, the area is 14 x 10 = 140 square feet.

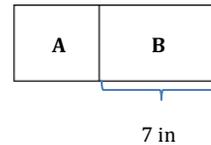
7. Find the area of the figure below which is made up of a square and a rectangle.



Length of the rectangle:  $21 - 7 = 14$  inches  
Area:  $(7 \times 7) + (14 \times 10) = 49 + 140 = 189$  in<sup>2</sup>

189 in<sup>2</sup>

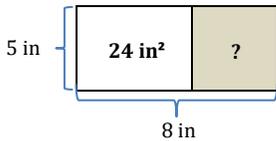
8. The figure on the right is made up of a square A and a rectangle B. The distance around the square A is 20 inches. Find the area of the whole figure.



Since A is a square, the side must be 20 inches  $\div 4 = 5$  inches. The length of the figure is 7 inches + 5 inches = 12 inches, and the width is 5 inches. Therefore, the area is  $12 \times 5 = 60$  in<sup>2</sup>

60 in<sup>2</sup>

9. Study the figure below:

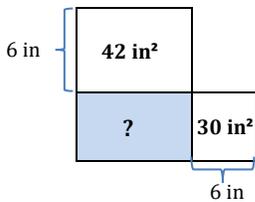


What is the area of the shaded figure?

One side of the rectangle is 5 in, the other is  $24/5$  in.  
Thus, one side of the shaded region is 5 in, the other  $8 - 24/5$ .  
Area will be  $5 \times (8 - 24/5) = 16$  square inches

16 in<sup>2</sup>

10. Study the figure below:

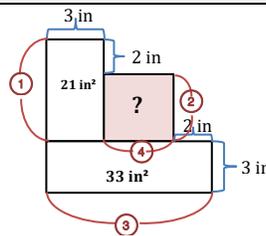
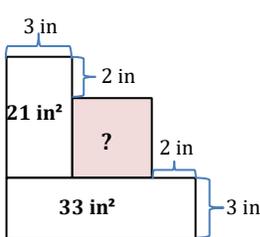


What is the area of the shaded figure?

The sides of the shaded rectangle are 7 inches and 5 inches.  
Thus, the area is  $7 \times 5 = 35$  square inches

35 in<sup>2</sup>

11. Study the figure below:

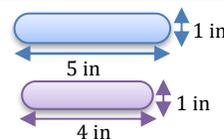


Find the length of ①  $21/3 = 7$  in.  
Find the length of ②  $7 - 2 = 5$  in.  
Find the length of ③  $33/3 = 11$  in.  
Find the length of ④  $11 - 3 - 2 = 6$  in.  
Area:  $6 \times 5 = 30$  in<sup>2</sup>.

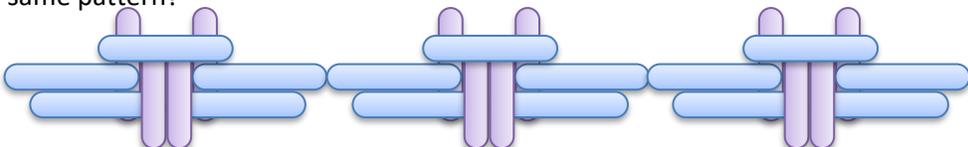
What is the area of the shaded figure?

30 in<sup>2</sup>

12. Tom has 2 different lengths of popsicle sticks. The longer ones are 5 inches long and the shorter ones are 4 inches long. He has 50 long ones and 30 short ones. He made a figure with this pattern. What is the longest possible figure he can make if he follows the same pattern?



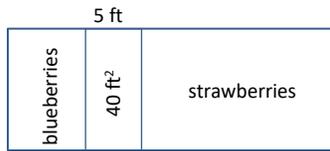
84 [inches]



Each figure uses 5 long popsicles and 4 short popsicles. Tom will be able to make a row of 7 figures like this. He will use for them  $7 \times 5 = 35$  long popsicles and  $7 \times 4 = 28$  short popsicle sticks. The width of each figure is  $5 + 5 + 2 = 12$  inches. Therefore, the length of the whole figure with 7 shapes attached as shown will be  $7 \times 12 = 84$  inches

13. Mrs. Rosenblum grows blueberries and strawberries. This season, she has changed the rectangular blueberry bed to a square by lengthening one of its sides by 5 feet. Because of this change, the area of the strawberry bed was reduced by 40 square feet. What was the area of the blueberry bed before the change?

24 ft<sup>2</sup>

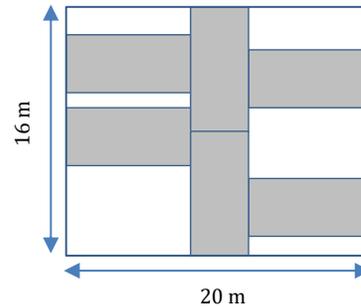


The sides of the small rectangle that is 40 ft<sup>2</sup> are 5 ft and 8 ft. The new side of the blueberry bed is 8 by 8 ft. Which means previously it was 8 ft by 3 ft. Thus, the area of the blueberry bed before change was 8×3 = 24 ft<sup>2</sup>

14. The sides of the large rectangle are 20 m and 16 m. All six shaded rectangles are the same shape and have the same area. What is the total area of all the shaded regions, in square meters?

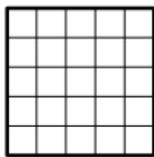
192 m<sup>2</sup>

Find the dimension of the small rectangle. The length:  $16/2 = 8$  m. The width:  $20 - 8 - 8 = 4$  m. The total area of all the shaded regions:  $6 \times (8 \times 4) = 192$  m<sup>2</sup>.

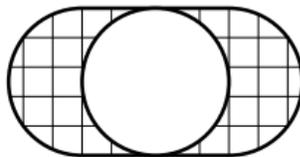


15. Shiven is coloring two shapes (shape A and shape B). He uses 1 teaspoon of acrylic paint to cover 1 single square. On which shape will he use more paint? Shape A or shape B?

same amount on both shapes

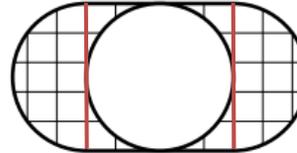


SHAPE A



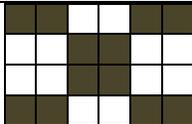
SHAPE B

Study the shapes. If you do two straight cuts of the ring shape and rearrange the pieces, you'll get the same 5 by 5 square shape. So, Shiven will use the same amount of acrylic paint for these shapes.



16. Allison has a chocolate bar made out of 12 squares of milk chocolate and 12 squares of white chocolate. She wants to get one piece, 2 by 2 square, in such a way to get the same volume of milk and white chocolate. In how many ways she can do it?

12 ways



In a square 2 by 2 she will get two pieces of milk and two pieces of white chocolate. She can do it in 12 ways

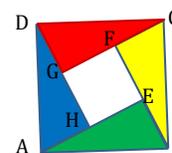
17. In a figure on the right, there are 4 identical right-angled triangles. They are arranged to form the shapes ABCD. In triangle ABE, AB=17 in and AE-BE=7 in. Find the area of ABCD. Find the area of EFGH.

Area of ABCD= 289 [in<sup>2</sup>]  
Area of EFGH = 49 [in<sup>2</sup>]

Area of ABCD is  $17 \times 17 = 289$  in<sup>2</sup>.

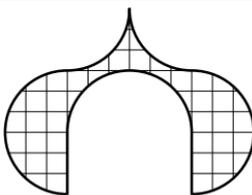
All 4 triangles are identical. If AE-BE=7 inches, then HE=AE-AH=7 in.

Area of EFGH =  $7 \times 7 = 49$  in<sup>2</sup>



18. Study the figure on the left. If the side of 1 square is  $\frac{1}{2}$  inch what is the area of this shape?

9 [in<sup>2</sup>]



If you'll cut this shape and rearrange the pieces, you can get a square with the side of  $6 \frac{1}{2}$  inch squares. Thus, the area is  $6 \times 6 \times \frac{1}{2} \times \frac{1}{2} = 9$  square inches

