

# MATHCOUNTS<sup>®</sup> Problem of the Week Archive

## *A Salute to the Flag – November 6, 2023*

### **Problems & Solutions**

In honor of Veteran's Day, people around the country are flying American flags. For many people, finding flags to buy in stores has been next to impossible due to the great demand. Therefore, many of us are getting creative, and have started making our own handmade flags out of paper, pins, construction paper, fabric, etc. When flying horizontally, the overall width (top to bottom) and length (left to right) of the flag is in the ratio of 1:1.9. There are 13 stripes of equal width. The width (top to bottom) of the blue field containing the stars is  $\frac{7}{13}$  of the overall width of the flag; that is, from the top of the flag to the bottom of the 7<sup>th</sup> stripe. The length (left to right) of blue field is .76 of the overall width of the flag.

Ana wants to draw a US flag on a standard  $8\frac{1}{2}$  by 11-inch sheet of construction paper. What are the dimensions, in inches, of the largest flag she can draw if she approximates the ratio of the width:length as 1:2?

*The length is limited to 11 inches, so the width must be half of that, or 5.5 inches. Therefore, the largest dimensions for the flag will be **5.5 by 11 inches**.*

Antonio is making a US flag with 2-inch-wide stripes. If his flag has the correct ratios, what is the area of the entire rectangular blue field (including the stars)?

*If each stripe is 2 inches wide, the total width of the flag is  $2 \times 13 = 26$  inches. The length of the blue field is  $0.76 \times 26 = 19.76$  inches. The width of the blue field is  $7 \times 2 = 14$  inches. Therefore, the area of the blue field is  $19.76 \times 14 = \mathbf{276.64}$  in<sup>2</sup>.*

Our current flag has 50 stars, arranged in nine alternating rows of six and five stars. However, the original flag had 13 stars arranged in a circle, such that the outermost tip of each of the 13 stars was on the circumference of the circle. If the distance between the outermost tips of consecutive stars is 4 inches on the circumference of the circle, what is the radius of the circle, in inches? Express your answer in terms of pi.

*If the points of the 13 stars are 4 inches apart, the circumference of the circle measures  $13 \times 4 = 52$  inches. Since  $C = 2\pi r$ , we get  $52 = 2\pi r$ . Solving for  $r$ , by dividing both sides of the equation by  $2\pi$ , gives us a radius of  $\mathbf{26/\pi}$  inches.*

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