

MATHCOUNTS[®] Problem of the Week Archive

Harvest Festival Poster – October 18, 2021

Problems & Solutions

Logan created a poster to advertise the Harvest Festival at his school. For the poster's border, he traced an elm leaf 20 times on an 8-inch by 10-inch sheet of construction paper. After all 20 of the identical leaves were cut from the sheet, only 19% of the original sheet remained. What was the area of each leaf? Express your answer as a decimal to the nearest hundredth.

Initially, the sheet of construction paper has dimensions 8 inches by 10 inches. Therefore, it has an area of $8 \times 10 = 80 \text{ in}^2$. We are told that all but 19% of the sheet was used for the leaves. It follows, then, that the 20 leaves accounted for $100 - 19 = 81\%$, or $0.81 \times 80 = 64.8 \text{ in}^2$, of the sheet of construction paper. Dividing, we see that each leaf had an area of $64.8 \div 20 = \mathbf{3.24 \text{ in}^2}$.

Logan glued those 20 leaves, with none overlapping, onto the front of the poster. If the leaves covered 7.5% of the front of the poster, what was the poster's area, in square inches?

From the previous problem, we know that the 20 leaves had a combined area of 64.8 in^2 . We are told that the leaves covered only 7.5% of the poster. So, the poster had an area of $64.8 \div 0.075 = \mathbf{864 \text{ in}^2}$.

The leaves, placed completely on the poster, along its perimeter, formed the poster's border. If the poster's width was $\frac{2}{3}$ its length, what was the perimeter of Logan's poster, in inches?

We are told that the width of the poster was $\frac{2}{3}$ the length, so $w = (\frac{2}{3}) \times l$. From the previous problem, we know that the poster has an area of 864 in^2 , and $w \times l = 864$. Substituting for w in the second equation, we get $(\frac{2}{3}) \times l \times l = 864$. Now we solve for l to determine the length of the poster. We get $(\frac{2}{3}) l^2 = 864 \rightarrow l^2 = 1296 \rightarrow l = 36 \text{ inches}$. It follows that $w = (\frac{2}{3}) \times 36 = 24 \text{ inches}$. Thus, the poster had a perimeter of $2 \times w + 2 \times l = 2 \times 36 + 2 \times 24 = 72 + 48 = \mathbf{120 \text{ inches}}$.

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