

MATHCOUNTS[®] Problem of the Week Archive

Happy Surveyors Week! – March 18, 2024

Problems & Solutions

Happy Surveyors Week! Surveyors play an essential role in construction, land development, the creation of maps, and other land-based projects. They measure property boundaries, natural land features, and precise locations. This week, we celebrate all the surveyors out there who are dedicated to accuracy and ensure that building projects move forward safely.

Sponsors like the **National Council of Examiners for Engineering and Surveying** (NCEES), help us provide free math resources (like this Problem of the Week) and incredible program experiences for students!



In their day-to-day roles, surveyors use all kinds of math, including proportions and ratios, coordinate geometry, and measurement. To work your surveyor's brain, below are some practice problems on these math topics!

1. For St. Patrick's Day, Martin's family is having a barbecue. Martin is making the lemonade. If the directions call for 2 tablespoons of mix per quart of water, how many tablespoons of mix are needed to make 1.5 gallons of lemonade?

Since there are 4 quarts in a gallon, it follows that $4 \times 2 = 8$ tablespoons of mix are required per gallon of water, and half that amount, or $8/2 = 4$ tablespoons of mix are required per 0.5 gallon of water. Therefore, to make 1.5 gallons of lemonade, Martin needs to use $8 + 4 = 12$ tablespoons of mix.

2. On some graph paper, graph the following segments:

$$y = x, \text{ for } 0 \leq x \leq 2$$

$$y = 2x - 2, \text{ for } 2 \leq x \leq 3$$

$$x = 3, \text{ for } 4 \leq y \leq 6$$

$$y = -x + 9, \text{ for } 2 \leq x \leq 3$$

$$y = 7, \text{ for } 1 \leq x \leq 2$$

$$y = x + 6, \text{ for } 0 \leq x \leq 1$$

Now reflect each of the segments over the y-axis. What popular shape have you drawn?

*The first segment connects the points (0, 0) and (2, 2). The second segment connects the points (2, 2) and (3, 4). The third segment connects the points (3, 4) and (3, 6). The fourth segment connects the points (3, 6) and (2, 7). The fifth segment connects the points (2, 7) and (1, 7). Finally, the sixth segment connects the points (1, 7) and (0, 6). This should appear as half a heart. Once the reflection is done, you should have the shape of a **heart** with the y-axis running down the center.*

3. A particular construction crew places orange barrels on both sides of a road that is under construction such that the centers of adjacent barrels on the same side of the road are 15 feet apart. If the crew does this for a 1.5 mile stretch of roadway, how many barrels will be placed on the two sides of the road in total?

There are $1.5 \times 5280 = 7920$ feet on each side of the road. We start with one barrel at the "zero" mark and then add $7920 \div 15 = 528$ barrels on each side of the road, for a total of $528 + 1 = 529$ barrels per side. So for both sides there are a total of $2 \times 529 = \mathbf{1058}$ barrels.

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