

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

## Happy Holidays – December 20, 2021

### Problems & Solutions

This time of year, various religions and cultures celebrate a variety of holidays, and there are as many reasons for celebrating as there are religions and cultures. One theme runs through all holiday celebrations, though – there are symbols to commemorate the holiday. This week's problems focus on the symbols used in a few of the celebrations. And no matter what holidays you're celebrating, happy holidays!

One of the most recognizable symbols of Christmas is the tree. Most Christmas tree farmers plant 2000 trees per acre, and, on average, 1250 trees will survive. On average, what percent of the Christmas trees planted survive? Express your answer to the nearest tenth.

Since 2000 trees are planted per acre and only 1250 survive, on average,  $1250/2000 = 0.625 = \mathbf{62.5\%}$  of the trees planted survive.

Hanukkah is an eight-day Jewish celebration which is observed in November or December, as determined by the Hebrew calendar. One of the symbols of Hanukkah is the menorah, a candle holder which holds nine candles. According to the Code of Jewish Law, menorahs can be a maximum of 20 cubits high. A cubit is a traditional measurement equal to 18 inches. In feet, what is the maximum height of a menorah, according to the Code of Jewish Law?

Since a cubit equals 18 inches, and 18 inches is  $18/12 = 1.5$  feet, the maximum height of a menorah can be  $20 \times 1.5 = \mathbf{30}$  feet tall.

Kwanzaa is an African American holiday celebrated December 26th through January 1st. The colors of Kwanzaa are red, green and black, and the holiday has seven symbolic elements. Two of these elements are the Mishumaa Saba (the seven candles) and the Kinara (the candle holder). Traditionally, the Mishumaa Saba are arranged in the Kinara as shown, three identical red candles on the left, three identical green candles on the right and a black candle in the center. If, however, the candles could be arranged in any order, in how many different ways could the seven candles be arranged in the Kinara?



There are  $7! = 5040$  ways to arrange seven candles in a Kinara. But since the three red candles are identical, as are the three green candles, we need to divide by  $3! \times 3! = 6 \times 6 = 36$ . Doing so, we see that there are  $5040 \div 36 = \mathbf{140}$  different ways the seven candles can be arranged in the Kinara.

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