# MATHCOUNTS® Problem of the Week Archive

## *Not Just Fireworks – July 4, 2022*

### *Problems & Solutions*

Everyone knows that on July 4, 1776, the thirteen colonies declared their independence from Britain. On July 8, the Declaration of Independence was read aloud in Philadelphia, marking the first celebration of Independence Day. The Declaration was written by Thomas Jefferson on a parchment that measured 24.25 inches by 29.75 inches. What was the number of square inches in the area of this document that changed the nation? Express your answer as a decimal to the nearest tenth.

*The area of a rectangle is length times width, so the area of the Declaration is 24.25 × 29.75 ≈* ***721.4*** *in*$^2$*.*

Of the 56 delegates to the Congress, a Committee of Five was appointed to write it. (Jefferson actually did most of the writing, with input from Benjamin Franklin and John Adams.) In how many different ways could a committee of 5 members be chosen from a group of 56?

*These are 56 ways to choose the first person, 55 ways to choose the second, and so on, for a total of 56 × 55 × 54 × 53 × 52 = 458,377,920. But because order doesn't matter, we need to divide by 5 × 4 × 3 × 2 × 1 = 120 (since any of the five could have been chosen first, any of the remaining four could have been chosen second, and so on). That gives the answer of 458,377,920 ÷ 120 =* ***3,819,816*** *ways to choose 5 members from 56.*

Independence Day is a day to celebrate our national history. A fun game you can play will teach you about national geography. From construction paper, cut out 100 red stars. On 50 of them, write the names of the states; on the other 50, write the names of the state capitals. Turn the stars face down, and arrange them in a 10 x 10 pattern. Pick two stars at random. If you make a match, go again. If not, it's the next player's turn. When all states and capitals have been matched, the player with the most stars wins. What's the probability that the first two stars chosen will result in a match between a specific capital and state?

*There are 100 ways to choose the first star and 99 ways to choose the second star, for a total of 99 × 100 = 9900 ways to choose two stars. These can be a match in two different ways: if the first star is a state and the second is its capital, or if the first star is a capital and the second is its state. The probability, then, is 2/9900 =* ***1/4950****.*

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