MATHCOUNTS® Problem of the Week Archive

The Fourth of July – July 6, 2020

Problems & Solutions

When most of us think of the Fourth of July, we think of fireworks! Over the years, fireworks have become more and more elaborate. However, this is also the time of year when safety agencies are concerned about the improper use of fireworks and the possible injuries that can occur. Fireworks are safer now than they used to be but can still cause very serious injuries. In 1990, there were 17.8 injuries per 100,000 pounds of fireworks. In 1999, that number had fallen approximately 30.5%. What was the number of injuries per 100,000 pounds of fireworks in 1999?

The number of injuries per 100,000 pounds of fireworks in 1999 will be 100 – 30.5 = 69.5% of 17.8. Therefore, 0.695 × 17.8 = ***12.371*** *injuries per 100,000 pounds of fireworks.*

Fifty-six men signed the Declaration of Independence, though the signing was not actually on the Fourth of July. Being the President of the Congress, John Hancock, one of the five signers from Massachusetts, was the first to sign the Declaration. If the other men were to sign the document in random order, what is the probability that the next two signers would also be from Massachusetts? Express your answer as a common fraction.

There are 55 more men that signed the document after John Hancock and 4 of them are from Massachusetts. So, the probability that the next signer would be from Massachusetts is 4/55. The probability that the third signer would be from Massachusetts is now 3/54. So, the probability that the second and third signers are also from Massachusetts is (4/55) × (3/54) = 12/2970 = ***2/495****.*

Though most people are familiar with John Hancock's "slightly large" signature on the Declaration of Independence, it is not so well-known that Thomas Jefferson was the primary author of the document. Jefferson is one of the four men whose faces were permanently carved in stone at Mount Rushmore. In the carving, each of Jefferson's eyes is 11 feet across. How many square yards, to the nearest whole number, are covered by his two eyes?

If each eye is 11 feet across, that means that the radius of each eye is 5.5 feet across. The area of one eye is $\pi(5.5)^2 = 95.0332$ *square feet. If we double this (since we want the square yards covered by both eyes), we have 190.0664 square feet. Now, to turn this into square yards, we must remember that there are 9 square feet in every square yard. So, dividing 190.0664 by 9, we see that Thomas Jefferson's eyes cover* ***21*** *square yards, to the nearest whole number.*

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