MATHEMATICAL
RESEARCH ACADEMY

AMC 10A 2019 Problem 20

The numbers $1, 2, \ldots, 9$ are randomly placed into the 9 squares of a 3×3 grid. Each square gets one number, and each of the numbers is used once. What is the probability that the sum of the numbers in each row and each column is odd?

$\textbf{(A)}\ \frac{1}{21} \qquad \textbf{(B)}\ \frac{1}{14} \qquad \textbf{(C)}\ \frac{5}{63} \qquad \textbf{(D)}\ \frac{2}{21} \qquad \textbf{(E)}\ \frac{1}{7}$

AMC 10A 2019 Problem 22

Real numbers between 0 and 1, inclusive, are chosen in the following manner. A fair coin is flipped. If it lands heads, then it is flipped again and the chosen number is 0 if the second flip is heads and 1 if the second flip is tails. On the other hand, if the first coin flip is tails, then the number is chosen uniformly at random from the closed interval $[0, 1]$. Two random numbers x and y are chosen independently in this manner. What is the probability that $|x - y| > \frac{1}{2}$?

$\textbf{(A)}\ \frac{1}{3} \qquad \textbf{(B)}\ \frac{7}{16} \qquad \textbf{(C)}\ \frac{1}{2} \qquad \textbf{(D)}\ \frac{9}{16} \qquad \textbf{(E)}\ \frac{2}{3}$

AMC 10A 2018 Problem 11

When 7 fair standard 6-sided dice are thrown, the probability that the sum of the numbers on the top faces is 10 can be written as $\frac{n}{6^7}$, where n is a positive integer. What is n?

$\textbf{(A)}\ 42 \qquad \textbf{(B)}\ 49 \qquad \textbf{(C)}\ 56 \qquad \textbf{(D)}\ 63 \qquad \textbf{(E)}\ 84$

AMC 10A 2018 Problem 19

A number m is randomly selected from the set $11, 13, 15, 17, 19$, and a number n is randomly selected from $1999, 2000, 2001, \ldots, 2018$. What is the probability that m^n has a units digit of 1?

$\textbf{(A)}\ \frac{1}{5} \qquad \textbf{(B)}\ \frac{1}{4} \qquad \textbf{(C)}\ \frac{3}{10} \qquad \textbf{(D)}\ \frac{7}{20} \qquad \textbf{(E)}\ \frac{2}{5}$

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AMC 10A 2020 Problem 11

What is the median of the following list of 4040 numbers?

$$1, 2, 3, ..., 2020, 1^2, 2^2, 3^2, ..., 2020^2$$

$\textbf{(A)}\ 1974.5 \qquad \textbf{(B)}\ 1975.5 \qquad \textbf{(C)}\ 1976.5 \qquad \textbf{(D)}\ 1977.5 \qquad \textbf{(E)}\ 1978.5$

AMC 10A 2020 Problem 2

The numbers $3, 5, 7, a$, and b have an average (arithmetic mean) of 15. What is the average of a and b?

$\textbf{(A)}\ 0 \qquad \textbf{(B)}\ 15 \qquad \textbf{(C)}\ 30 \qquad \textbf{(D)}\ 45 \qquad \textbf{(E)}\ 60$

AMC 10A 2020 Problem 13

A frog sitting at the point $(1, 2)$ begins a sequence of jumps, where each jump is parallel to one of the coordinate axes and has length 1, and the direction of each jump (up, down, right, or left) is chosen independently at random. The sequence ends when the frog reaches a side of the square with vertices $(0, 0)$, $(0, 4)$, $(4, 4)$, and $(4, 0)$. What is the probability that the sequence of jumps ends on a vertical side of the square?

$\textbf{(A)}\ \frac{1}{2} \qquad \textbf{(B)}\ \frac{5}{8} \qquad \textbf{(C)}\ \frac{2}{3} \qquad \textbf{(D)}\ \frac{3}{4} \qquad \textbf{(E)}\ \frac{7}{8}$

AMC 10A 2020 Problem 14

A positive integer divisor of 2020^2 is chosen at random. The probability that the divisor chosen is a perfect square can be expressed as $\frac{m}{n}$, where m and n are relatively prime positive integers. What is $m + n$?

$\textbf{(A)}\ 3 \qquad \textbf{(B)}\ 5 \qquad \textbf{(C)}\ 12 \qquad \textbf{(D)}\ 19 \qquad \textbf{(E)}\ 20$