

QuantQA: Quantitative Finance Interview Training

Q1: Dice Expected Value

You roll a fair six-sided die repeatedly until you get a 6.

What is the expected number of rolls?

Q2: Card Probability

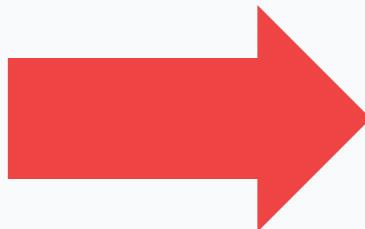
Two cards are drawn from a standard 52-card deck without replacement.

What is $P(\text{both aces})$?

Q3: Coin Sequences

Flip a fair coin repeatedly until you get two heads in a row (HH).

What is the expected number of flips?



We have a classic problem: find the expected number of trials until first success. Rolling a die until getting 6 follows a geometric distribution. Each roll is independent with probability $p = \frac{1}{6}$. The number of trials until first success follows a geometric distribution. We can formalize: let X be the number of rolls needed. The probability mass function is $P(X = k) = (1 - p)^{k-1}p$ for $k = 1, 2, 3, \dots$. For the expected value, we use the well-known formula for geometric distribution: $E[X] = \frac{1}{p}$. Substituting our probability: $E[X] = \frac{1}{1/6} = 6$. **Intuition:** On average, you need $\frac{1}{p}$ trials to get one success. Since each outcome has probability $\frac{1}{6}$, we expect to roll 6 times before seeing a 6. This can also be derived by solving the recurrence $E = 1 + \frac{5}{6}E$, which gives $E = 6$...

Answer: 6