

Probability Summary Page

The Probability of an Event

The probability of an event successfully occurring, $P(E)$, is equal to the number of possible (equally likely) success outcomes divided by the total number of possible (equally likely) outcomes.

$$P(E) = \frac{\text{number of successful outcomes}}{\text{number of total possible outcomes}}$$

Example: One card is drawn from a standard 52-card deck. Find the probability of getting a spade.

Solution: The probability is $\frac{13}{52}$ or **25%**.

Statistical Probability

The more you repeat an event, the closer the average outcome gets to the mean outcome.

Example: If we flip a coin n times, we expect that the number of heads will get closer to 50% for larger values of n .

Example: Since the probability of rolling a sum of a 9 with two dice is 11.1%, we expect that if we roll two dice a large number of times, then we will get a 9 about 11.1% of the time.

Two Independent Events

If A and B are independent events, the probability that both A and B will occur is the product of probabilities of each occurring separately.

$$P(A \text{ and } B) = P(A) \cdot P(B)$$

Example: If you roll a die and flip a coin, what is the probability of getting a 2 and a head?

Solution: $\frac{1}{6} \cdot \frac{1}{2} = \frac{1}{12}$

The Probability of a Complement

If A is the complement of B , then the sum of their probabilities is equal to one, or 100%.

Example: What is the probability of flipping three coins and getting at least one head?

Solution: The complement (or opposite) of this is getting no heads (which is all tails), which has a probability of $\frac{1}{8}$. Therefore, the probability of getting at least one head is $1 - \frac{1}{8} = \frac{7}{8}$.