Probability of an Event

If an event E has $n(E)$ equally likely outcomes and its sample space S has $n(S)$ likely outcomes, then the *probability* of the event E is:

$$P(E) = \frac{n(E)}{n(S)} = \frac{\text{number of elements in } E}{\text{number of elements in } S}$$

Properties of Probability

1. A probability is a number between 0 and 1, inclusive.
   The closer the probability of an event to 1, the more likely the event is to happen and the closer the probability of an event to zero, the less likely it is to happen.

   $$0 \leq P(E) \leq 1$$
2. The probability of an event that cannot happen is 0.

   $$P(\varnothing) = 0$$
3. The probability of an event that must happen is 1.
4. The probability of the sample space S is 1.

   $$P(S) = 1$$
5. The probability of any two disjoint events E_1 and E_2 is the sum of the probabilities of each individual event

   $$P(E_1 \cup E_2) = P(E_1) + P(E_2)$$
6. The probability of any event which is not in E is the difference between 1 and the probability of event E.

   $$P(E') = 1 - P(E)$$

   E' signifies "not in E."

Practice Exercises

Do as indicated.

1. Three coins are tossed. What is the probability of getting:
   a. three heads
   b. at least two tails
   c. at most two tails
2. A pair of dice is rolled. What is the probability of getting:
   a. sum of seven
   b. sum is odd
   c. sum is less than 4
   d. a double
3. Given a regular deck of cards, a card is drawn at random. What is the probability of getting:
   a. a face card
   b. not a face card
   c. a black Jack
4. A letter is drawn at random from those in MATHEMATICS. Find the probability of each event.
   a. It is a vowel.
   b. It comes from the last 5 letters of the alphabet.
   c. It is a consonant.

Problem Set

Do as indicated.

1. Three coins are tossed. What is the probability of getting:
   a. two heads
   b. at least two heads
   c. no tail
2. A pair of dice is rolled. What is the probability of getting:
   a. sum of five
   b. sum is prime
   c. sum greater than 9
   d. not a double
3. Given a regular deck of cards, a card is drawn at random. What is the probability of getting:
   a. a red number card
   b. not a heart
   c. a black ace
4. A letter is drawn at random from those in MATHEMATICS. Find the probability of each event.
   a. It is the letter M.
   b. It comes from the first half of the alphabet.
   c. It is the letter C.

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