Probability

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Probability

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Comprehensive study notes for

Probability

by

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(Math King of Katargam). Master every concept with clear explanations, solved examples, and practice problems.

Key Concepts

Introduction

Probability

measures the likelihood of an event occurring. It ranges from 0 (impossible) to 1 (certain).

Experiment:

A process with well-defined outcomes.

Random experiment:

Cannot predict the outcome with certainty.

Trial and Event

A

trial

is a single performance of an experiment. An

event

is a specific outcome or set of outcomes.

Empirical probability:

Based on actual experiments and observations.

Empirical Probability Formula

P(E) = (Number of times event E occurs) / (Total number of trials). For example, if a coin is tossed 100 times and heads appears 52 times, P(heads) = 52/100 = 0.52.

Key Properties

0 <= P(E) <= 1. P(E) + P(not E) = 1. If P(E) = 0, the event is impossible. If P(E) = 1, the event is certain. As the number of trials increases, the empirical probability approaches the theoretical probability.

Coin Toss

For a fair coin: P(Heads) = 1/2, P(Tails) = 1/2. For two coins: P(both heads) = 1/4, P(one head one tail) = 1/2, P(both tails) = 1/4.

Dice Roll

For a fair die: P(getting any number 1-6) = 1/6. P(even number) = 3/6 = 1/2. P(number > 4) = 2/6 = 1/3.

Cards

A standard deck has 52 cards: 4 suits (hearts, diamonds, clubs, spades), 13 cards each. Hearts & diamonds are red;

clubs & spades are black.

Face cards:

Jack, Queen, King (12 total).

Important Formulas

Empirical Probability

P(E) = (Favorable outcomes)/(Total trials)

Complement

P(not E) = 1 - P(E)

Coin Toss

P(H) = P(T) = 1/2

Single Die

P(any number) = 1/6

Cards (total)

52 cards, 4 suits, 13 per suit

Solved Examples

Example 1:

A coin is tossed 200 times and heads appear 108 times. Find P(heads) and P(tails).

Solution:

P(heads) = 108/200 = 0.54. P(tails) = (200-108)/200 = 92/200 =

0.46

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Example 2:

A die is rolled 300 times and 5 appears 48 times. Find P(getting 5).

Solution:

P(5) = 48/300 =

0.16

.

Example 3:

From a deck of 52 cards, what is the probability of drawing a heart?

Solution:

There are 13 hearts. P(heart) = 13/52 =

1/4

.

Practice Questions

A coin is tossed 150 times and heads come up 78 times. Find P(heads) and P(tails).

A die is rolled 250 times. The number 6 appears 42 times. Find P(6).

What is the probability of getting a sum of 7 when two dice are rolled?

A bag contains 5 red and 3 blue balls. Find P(red) and P(blue).

From a deck of 52 cards, find the probability of drawing a king or a queen.

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