

Probability Cheatsheet - Class 11 Mathematics

Prepared for Entry Test Preparation

1. Sample Space and Events

The **sample space** (S) is the set of all possible outcomes of an experiment. An **event** (E) is a subset of the sample space. The number of outcomes in the sample space is denoted $n(S)$, and the number of favorable outcomes for an event is $n(E)$.

Key Concepts

- **Sample Space Examples:** Coin tosses ($S = \{H, T\}$), dice rolls ($S = \{1, 2, 3, 4, 5, 6\}$), or selecting items from a set.
- **Event Examples:** Getting a head on a coin toss, drawing a red ball, or rolling a prime number.
- **Notation:** Events are denoted by letters (e.g., A, B), and their complements by \overline{E} .

2. Probability of an Event

The probability of an event E is:

$$P(E) = \frac{n(E)}{n(S)} = \frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$$

Since $n(E) \leq n(S)$, the probability satisfies:

$$0 \leq P(E) \leq 1$$

Key Concepts

- **Equally Likely Outcomes:** Assumes each outcome in S has the same chance of occurring.
- **Applications:** Used in experiments like coin tosses, dice rolls, drawing balls, or selecting slips.
- **Combinations:** Use $\binom{n}{r}$ when selecting items without order (e.g., multiple balls).

Examples

1. **Probability of drawing a green ball from 5 green, 3 red balls:**

$$n(S) = 8, n(A) = 5 \Rightarrow P(A) = \frac{5}{8}$$

2. Probability of rolling a 3 or 4 on a die:

$$n(S) = 6, n(A) = 2 \Rightarrow P(A) = \frac{2}{6} = \frac{1}{3}$$

3. Probability of two dice summing to 7:

$$n(S) = 36, n(B) = 6 \Rightarrow P(B) = \frac{6}{36} = \frac{1}{6}$$

3. Probability of an Event Not Occurring

The probability that an event E does not occur is:

$$P(\overline{E}) = 1 - P(E)$$

Key Concepts

- **Complement:** \overline{E} includes all outcomes in S not in E .
- **Applications:** Easier to compute for events like "at least one head" or "not green."

Examples**1. Probability of not drawing a green ball from 40 balls (5 green, 35 others):**

$$P(\text{green}) = \frac{5}{40} = \frac{1}{8} \Rightarrow P(\text{not green}) = 1 - \frac{1}{8} = \frac{7}{8}$$

2. Probability of at least one head in three coin tosses:

$$P(\text{no heads}) = \frac{1}{8} \Rightarrow P(\text{at least one head}) = 1 - \frac{1}{8} = \frac{7}{8}$$