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Probability

IGCSE Mathematics

The Panda Math Tutor

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1 Introduction

Note

Probability is one of the most widely applicable topics in IGCSE Mathematics. It deals with how likely events are to occur and is used in everyday contexts such as weather forecasting, games, insurance, medical testing, and risk assessment.
In this chapter, we will explore:

- The language and key definitions of probability
- The probability scale and basic probability
- Theoretical probability and experimental probability
- Expected frequency
- Mutually exclusive events and the Addition Rule
- Independent events and the Multiplication Rule
- Complementary events
- Sample space diagrams
- Tree diagrams
- Venn diagrams and set notation for probability
- Conditional probability (basic)

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2 Key Definitions

Definition

A **trial** (or **experiment**) is a single performance of a well-defined process whose outcome is uncertain. For example, rolling a die once, flipping a coin, or drawing a card from a deck.

Definition

An **outcome** is a single possible result of a trial. For example, when rolling a standard die, the possible outcomes are $1, 2, 3, 4, 5, 6$.

Definition

An **event** is a specific outcome or a **set of outcomes** that we are interested in. Events are usually denoted by capital letters such as A, B, C. For example, "rolling an even number" is the event $\{2, 4, 6\}$.

Definition

The **sample space** (denoted S or ξ) is the complete set of **all possible outcomes** of a trial. For a standard die: $S = \{1, 2, 3, 4, 5, 6\}$.

Definition

The **probability** of an event is a numerical measure of how likely that event is to occur. It is written as $P(A)$ and always satisfies:

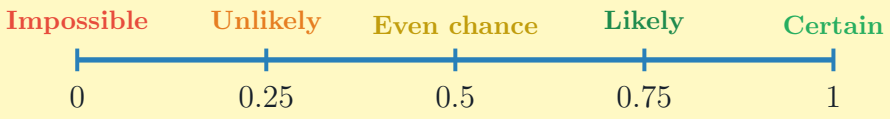
$$0 \leq P(A) \leq 1$$

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Note

Understanding the probability scale:

- $P(A) = 0$ means the event is **impossible** — it can never happen
- $P(A) = 1$ means the event is **certain** — it will definitely happen
- $P(A) = 0.5$ means the event is **equally likely** to happen or not happen
- The closer $P(A)$ is to 1, the more likely the event; the closer to 0, the less likely



Warning

Probabilities are always between 0 and 1 (inclusive).
A probability can be expressed as a **fraction**, a **decimal**, or a **percentage**. If your answer is negative or greater than 1, you have made an error.

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