Mutually Exclusive Events – GCSE Maths

CONTENTS

1. Introduction

- Studying **Mutually exclusive events** are essential in probability because they help us analyze different types of real-world situations where outcomes interact in different ways.
- We learn mutually exclusive events in probability to understand situations where two events cannot happen at the same time.

2. What are Mutually exclusive Events?

- **Mutually exclusive events** are events that cannot happen at the same time.
- **For example:** When you roll an ordinary dice, you cannot get a 3 and an even number at the same time.
- Two events A and B are Mutually exclusive if,

$$P(A \cup B) = 0$$

This means there is no overlap between the two events.

- Mathematically,

$$P(A \cup B) = P(A) + P(B)$$

Or

$$P(A \text{ or } B) = P(A) + P(B)$$

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3. Steps to solve the Mutually exclusive events

- Here are the steps to solve Mutually Exclusive Events problems in probability:

Steps to solve the Mutually exclusive events:

Step#1: Identify Events

Step#2: Use Formula

Step#3: Calculate the Probability

Example: A fair six-sided die is rolled. What is the probability of rolling a 2 or a 5?

Solution:

Step#1: Identify Events

- **Event A:** Rolling a 2.
- **Event B:** Rolling a 5.

Step#2: Use Formula

$$P(A \cup B) = P(A) + P(B)$$

Step#3: Calculate the Probability

Probability of rolling a 2: $P(A) = \dfrac{1}{6}$

Probability of rolling a 5: $P(B) = \dfrac{1}{6}$

Put the Values in formula,

$$P(A \cup B) = \frac{1}{6} + \frac{1}{6} = \frac{2}{6} = \frac{1}{3}$$

The Probability of rolling a **2** or a **5** is $\dfrac{1}{3}$

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4. Solved Example

Problem1: A bag contains **3 red marbles**, **2 blue marbles**, and **5 green marbles**. If one marble is drawn at random, what is the probability that it is red or blue?

Solution:

Step#1: Identify Events

- **Event A:** Drawing a red marble
- **Event B:** Drawing a blue marble

Step#2: Use Formula

$$P(A \cup B) = P(A) + P(B)$$

Step#3: Calculate the Probability

Total marbles: 10 marbles

$$P(A) = \frac{3}{10}$$

$$P(B) = \frac{2}{10}$$

Put the Values in formula,

$$P(A \cup B) = \frac{3}{10} + \frac{2}{10}$$

$$P(A \cup B) = \frac{5}{10}$$

$$P(A \cup B) = \frac{1}{2}$$

The Probability of drawing a **Red** or **Blue** marble is $\frac{1}{2}$

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Problem2: A card is drawn from a standard deck of 52 cards. What is the probability that the card is either a **Heart** or a **Club**?

Solution:

Step#1: Identify Events

- **Event A:** Drawing a Heart: **13 Hearts**
- **Event B**: Drawing a Club: **13 Clubs**

Step#2: Use Formula

$$P(A \cup B) = P(A) + P(B)$$

Step#3: Calculate the Probability

Total cards: 52 cards

$$P(A) = \frac{13}{52}$$

$$P(B) = \frac{13}{52}$$

Put the Values in formula,

$$P(A \cup B) = \frac{13}{52} + \frac{13}{52}$$

$$P(A \cup B) = \frac{26}{52}$$

$$P(A \cup B) = \frac{1}{2}$$

The probability of drawing either a **Heart** or a **Club** from a deck is $\frac{1}{2}$

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Problem3: In a class of 30 students, each child likes different subjects, such as:

- 12 students like **Math(M)**
- 8 students like **Science(S)**
- 10 students like **History(H)**

If a student is selected at random, what is the probability that the student likes **math** or **science**?

Solution:

Step#1: Identify Events

- **Event A:** Student like Math: **12**
- **Event B**: Student like Science: **8**

Step#2: Use Formula

$$P(A \cup B) = P(A) + P(B)$$

Step#3: Calculate the Probability

Total Students: 30

$$P(A) = \frac{12}{30}$$

$$P(B) = \frac{8}{30}$$

Put the Values in formula,

$$P(A \cup B) = \frac{12}{30} + \frac{8}{30}$$

$$P(A \cup B) = \frac{20}{30} = \frac{2}{3}$$

The probability that a randomly chosen student likes either **math** or **science** is $\frac{2}{3}$

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Problem4: A pizza is cut into 8 equal slices:

- 3 slices have **cheese topping(C)**
- 2 slices have **pepperoni topping(P)**
- 3 slices have **veggie topping(V)**

If a person randomly picks one slice, what is the probability that it is **cheese** or **pepperoni**?

Solution:

Step#1: Identify Events

- **Event A:** Cheese slices: **3**
- **Event B**: Pepperoni: **2**

Step#2: Use Formula

$$P(A \cup B) = P(A) + P(B)$$

Step#3: Calculate the Probability

Total Slices: 8

$$P(A) = \frac{3}{8}$$

$$P(B) = \frac{2}{8}$$

Put the Values in formula,

$$P(A \cup B) = \frac{3}{8} + \frac{2}{8}$$

$$P(A \cup B) = \frac{5}{8}$$

The probability of picking a cheese or pepperoni slice is $\frac{5}{8}$