📘 Relative and Expected Frequencies

1️⃣ Relative Frequency

Definition:

Relative frequency is the **proportion of times an event occurs** out of the total number of trials. It can be used as an **estimate for probability**, especially when theoretical probability is unknown.

Formula:

$$\text{Relative Frequency} = \frac{\text{Number of times an event occurs}}{\text{Total number of trials}}$$

Example 1: Spinner Experiment

A spinner is spun 100 times. It lands on red 23 times.

Estimated probability of landing on red:

$$\frac{23}{100} = 0.23$$

So, the **relative frequency** of red is 0.23. This estimates the **probability** of red.

2️⃣ Expected Frequency

Definition:

Expected frequency is the number of times an event is likely to happen, based on its probability, in a given number of trials.

Formula:

$$\text{Expected Frequency} = \text{Probability} \times \text{Number of trials}$$

Example 2: Estimating Expected Frequency

If the probability of winning a game is 0.2 and you play 50 times:

$$\text{Expected wins} = 0.2 \times 50 = 10$$

🟢 Understanding Fair, Bias, and Random

- **Fair** – All outcomes have **equal probability**.
  Example: A fair dice has a $\frac{1}{6}$ chance for each number.

- **Bias** – Some outcomes are **more likely than others**.
  Example: A loaded dice might land on 6 more often than other numbers.

- **Random** – Outcomes occur **without a predictable pattern**, but each has a known probability.
  Example: Drawing a card from a well-shuffled deck is random.

3 Using Experiments to Estimate Probability

Example 3: Spinner Experiment Continued

Color	Frequency
Red	23
Blue	37
Green	40
Total	100

Estimated probabilities:

- Red: $\frac{23}{100} = 0.23$
- Blue: $\frac{37}{100} = 0.37$
- Green: $\frac{40}{100} = 0.40$

Use these to predict expected outcomes in future experiments.