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Probability

Relative frequency

Probability gives us the theoretical measurement of how likely something is to happen. As we all know, though, life does not always run perfectly according to theories. Often, it seems like things are not doing what has been predicted should happen. Relative frequency is the measure of what *actually* happens, over a large number of trials and/or a long period of time.

Lesson Outcomes

By the end of this lesson, you should be able to:

- define relative frequency
- explain the difference between theoretical probability and relative frequency
- work out the relative frequency in an experiment

Curriculum Links

LO 4: Data Handling and Probability

- 10.4.2 (a) Use probability models for comparing the relative frequency of an outcome with the probability of an outcome.

Lesson Notes

Theoretical probability = $\frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$

For example, the theoretical probability of throwing a 6 on a dice is 1 out of 6.

$$P(\text{throwing a 6}) = \frac{1}{6}$$

However, if you actually throw a dice about 6 times, it's possible that you won't throw a 6 at all. The relative frequency of throwing a 6 in your experiment would be zero out of 6. If you threw a 3 three times, then the relative frequency of throwing a 3 would be 3 out of 6.

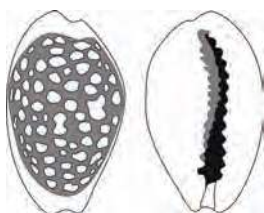
Relative frequency, also called **experimental probability**, is the probability we get when we test something out or record what's happening in a real situation. It is also written as a ratio or fraction, but now we record the actual numbers which we got from our experiment.

Relative frequency = $\frac{\text{Number of times an event happens}}{\text{Number of trials conducted}}$

With more and more trials, relative frequency gets closer to theoretical probability.

Suppose for example, after 600 throws, you get 111 sixes.

$$\text{Relative frequency (throwing a 6)} = \frac{111}{600} \approx \frac{1}{6}$$



This is close to the theoretical probability of throwing a six. So relative frequency is an *estimate* of theoretical probability.

Task

In the Nigerian game, *Igba-ita*:

1. What is the **theoretical probability** of getting a winning combination of shells?
[Tip: How many ways can a challenger get each of the winning combinations?]
2. Play the game
3. Record the **relative frequency** of getting a winning combination of shells.

Igba-ita ("pitch and toss"):

Two or more people can play. Each person starts with 12 cowrie shells. Players decide how many rounds to play. One person is the challenger. The others agree on the number 1, 2 or 3 and place this number of shells into a pot. The challenger throws 4 of his own cowries and counts how many land with the opening up and how many land with the opening down.

The challenger wins all the cowries in the pot if:

- they all land with the opening up or
- they all land with the opening down or
- 2 land opening up and 2 land opening down

Play starts again. If the shells land any other way, then the challenger has lost and must put 4 cowries into the pot. Another person becomes the challenger. A person who runs out of cowries is out of the game. The winner is the person with the most shells at the end.

Adapted from Claudia Zaslavsky: Math Games and Activities From Around the World. Chicago Review Press, Chicago: Illinois. 1998. pp 52 - 53.