This worksheet is designed to help you understand how experimental probability is interpreted as relative frequency through your own investigations. You will answer questions to calculate, interpret and critically evaluate relative frequency from a range of experimental data.

Easy Questions

1. Define relative frequency in the context of an experiment. Write your answer in a clear sentence.

2. In an experiment with 10 trials, an event occurred 3 times. Compute the relative frequency of the event.

3. An event was observed 2 times in 5 trials. Determine its relative frequency.

4. An investigation found that an event occurred 7 times out of 20 trials. What is the relative frequency of the event?

5. Choose a simple real-life experiment (for example, tossing a coin twice). Record a set of outcomes and calculate the relative frequency of obtaining heads.

Intermediate Questions

6. Explain why the relative frequency of an event approaches the true probability as the number of trials increases.

7. The following data represents the outcome of an investigation: Outcome A occurred 12 times, Outcome B occurred 8 times, and Outcome C occurred 10 times in 30 trials. Calculate the relative frequency for each outcome.

8. A spinner was spun 50 times and landed on Region A 18 times. Find the relative frequency for Region A.

9. Based on the relative frequency of an event computed from previous trials, discuss how you might predict the outcome of the next trial. Provide a short explanation.

10. In a lab test, the relative frequency for drawing a red ball was found to be 0.28 over 100 trials. How many times was the red ball drawn?

11. If the relative frequency of an event is 0.45 over 200 trials, compute the number of times the event was observed.

12. Given the following data from an experiment: Outcome 1 occurred 5 times, Outcome 2 occurred 8 times, and Outcome 3 occurred 7 times in a total of 20 trials, plot a bar graph of the relative frequencies. (Sketch on pen and paper)

13. In an investigation measuring evaporation, a sensor recorded a high evaporation rate 15 times out of 60 trials. Calculate the relative frequency of high evaporation.

14. Write a brief explanation of how increasing the number of trials in an experiment can affect the relative frequency computed for an event.

15. A spinner divided equally into 4 regions was spun 80 times, and Region A occurred 30 times. Determine its relative frequency.

16. In a survey of 100 people, 40 responded positively to a question. Calculate the relative frequency of a positive response.

17. A six-sided die was tossed 60 times, and an even number appeared 30 times. What is the relative frequency of rolling an even number?

18. Discuss how inaccuracies in data collection might affect the relative frequency obtained in an experiment.

19. An investigation over 30 days recorded the following frequencies: Sunny days 12, Rainy days 8, and Cloudy days 10. Calculate the relative frequency for each weather type.

20. If an experiment is conducted over different numbers of trials, discuss in a short paragraph how increasing the number of trials affects the reliability of the relative frequency as an estimate of the true probability.

Hard Questions

21. In an experiment conducted over 150 trials on drawing a marble, the following counts were recorded: Blue 45, Red 60, Green 30, and Yellow 15. Calculate the relative frequency for each marble colour and state which colour is most common.

22. Design an experiment to determine the relative frequency of obtaining heads when flipping a coin. List the steps you would follow and, if you conducted 200 flips, state the expected number of heads if the coin is fair.

23. In three separate runs of an experiment, the following data was collected for event A: Set 1: 5 successes out of 20 trials, Set 2: 14 successes out of 40 trials, and Set 3: 9 successes out of 30 trials. Compute the overall relative frequency (by combining all trials) and compare it to each individual set's relative frequency.

24. In several investigations, relative frequency values for the same event differed between groups. Discuss possible reasons for such variation, including experimental errors and differences in sample size.

25. In a laboratory investigation, the following relative frequencies were recorded for a specific outcome over sequential groups: First 10 trials 0.2, next 20 trials 0.25, next 30 trials 0.3, and final 40 trials 0.35. Calculate the cumulative relative frequency after each group and comment on the trend observed.

26. An investigation over 35 days recorded the following frequencies: Sunny 18, Cloudy 10, and Rainy 7. Compute the relative frequency for each type of day, expressing your answers as decimals.

27. An experiment was repeated 5 times yielding the following relative frequencies for an event: 0.32, 0.28, 0.30, 0.35, and 0.33. Compute the mean relative frequency and the sample standard deviation. (Recall: standard deviation is computed as $\sqrt{\dfrac{\sum(x_i - \bar{x})^2}{n-1}}$.)

28. Write a detailed paragraph explaining how a low number of trials in an experiment might lead to misleading relative frequencies. Include an example to support your explanation.

29. Using the concept of relative frequency, determine the expected number of successes in an experiment if the relative frequency is 0.4 and the experiment is repeated 250 times.

30. In three separate experiments, event B was recorded over 100, 200, and 300 trials respectively, and in each case the relative frequency was approximately 0.22. Compute the total number of times event B occurred across all experiments and discuss the significance of your result in the context of large sample sizes.