LESSON MAKER PRO

Probability From Trials

Use simulation results to estimate chance.

HIGH SCHOOL · MM.D3D.C.18.a

MM.D3D.C.18.a "Estimate the probability of each value for a random variable based on empirical observations or simulations, using technology."

NAME _____ DATE _____

COUNT AND DIVIDE

A spreadsheet can run many trials and count how often each value of X occurs. To estimate the probability of a value, divide its count by the total number of trials.

WORKED EXAMPLE

A spreadsheet simulates 14 bus arrivals. X is the number of minutes late. Estimate the probability of each value.

SIMULATED BUS ARRIVALS

X	Count
0	5
2	9

1. Total trials: 5 + 9 = 14.
2. P(X = 0) ≈ 5/14.
3. P(X = 2) ≈ 9/14.

Answer: P(X = 0) ≈ 5/14; P(X = 2) ≈ 9/14.

PRACTICE 4 problems

1 A spreadsheet simulates 20 coin tosses. X is 1 for heads and 0 for tails. It records seven 1s and thirteen 0s. Estimate the probability of each value.

ANSWER _____

2 A spreadsheet simulates 30 bonus questions. X is the points earned, 0 or 1. It records eleven 0s and nineteen 1s. Estimate the probability of each value.

ANSWER _____

3 A spreadsheet simulates 40 wheel spins. X is the prize, 1 or 2 tickets. It records seventeen 1s and twenty-three 2s. Estimate the probability of each value.

ANSWER _____

4 A spreadsheet simulates 50 deliveries. X is 0 if on time and 1 if late. It records twenty-one 0s and twenty-nine 1s. Estimate the probability of each value.

ANSWER _____

APPLY IT Show your work

1 A spreadsheet simulates 60 two-match gaming sessions. X is the number of wins in a session. Estimate the probability of each value of X.

GAMING SIMULATION

Wins	Sessions
0	6
1	18
2	36

ANSWER _____

2 A spreadsheet simulates 80 attempts to upload a video. X is the number of retries, 0, 1, or 2. The counts are 8 for 0 retries, 32 for 1 retry, and 40 for 2 retries. Estimate the probability of each value.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Two spreadsheets simulate a random variable X. Use all the trials to estimate the probability of each value. Why might averaging the two batches' probabilities give a different answer?

TWO SIMULATION BATCHES

X	40 trials	60 trials
0	8	12
1	12	24
2	20	24

WORK SPACE AND ANSWER

ANSWER KEY

Probability From Trials

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A spreadsheet simulates 20 coin tosses. X is 1 for heads and 0 for tails. It records seven 1s and thirteen 0s. Estimate the probability of each value.	**P(X = 0) ≈ 13/20; P(X = 1) ≈ 7/20.**
2	A spreadsheet simulates 30 bonus questions. X is the points earned, 0 or 1. It records eleven 0s and nineteen 1s. Estimate the probability of each value.	**P(X = 0) ≈ 11/30; P(X = 1) ≈ 19/30.**
3	A spreadsheet simulates 40 wheel spins. X is the prize, 1 or 2 tickets. It records seventeen 1s and twenty-three 2s. Estimate the probability of each value.	**P(X = 1) ≈ 17/40; P(X = 2) ≈ 23/40.**
4	A spreadsheet simulates 50 deliveries. X is 0 if on time and 1 if late. It records twenty-one 0s and twenty-nine 1s. Estimate the probability of each value.	**P(X = 0) ≈ 21/50; P(X = 1) ≈ 29/50.**

PART 2 · APPLY IT

1. **P(X = 0) ≈ 1/10; P(X = 1) ≈ 3/10; P(X = 2) ≈ 3/5.** Divide each count by 60: 6/60, 18/60, and 36/60. Simplify each fraction.
2. **P(X = 0) ≈ 1/10; P(X = 1) ≈ 2/5; P(X = 2) ≈ 1/2.** Divide 8, 32, and 40 by 80, then simplify.

CHALLENGE

P(X = 0) ≈ 1/5; P(X = 1) ≈ 9/25; P(X = 2) ≈ 11/25. Averaging the batch probabilities gives both batches equal weight, even though one has more trials.

Accept equivalent fractions or decimals. Probabilities are estimates based on the simulated results.