LESSON MAKER PRO

Probability in Play

Use simulation results to make and compare predictions.

GRADE 7 · 7.DSP.C.15

7.DSP.C.15 "Approximate the probability of an event using data generated by a simulation (experimental probability) and compare it to the theoretical probability. a. Observe the relative frequency of an event over the long run..."

NAME _____ DATE _____

TWO WAYS TO FIND PROBABILITY

Experimental probability is the number of times an event happens divided by the total number of trials. Theoretical probability is the number of favorable outcomes divided by the number of equally likely outcomes. To predict a future count, multiply a probability by the number of future trials.

WORKED EXAMPLE

A box holds 25 tickets, and 7 are green. A simulation draws a ticket, replaces it, and repeats 50 times. It draws green 13 times. Find both probabilities and compare them.

1. Experimental probability = 13/50.
2. Theoretical probability = 7/25 = 14/50.
3. Compare: 13/50 is less than 14/50 by 1/50.

Answer: The experimental probability is 13/50, which is 1/50 lower than the theoretical probability of 7/25.

PRACTICE 6 problems

1 A fair coin lands on heads 10 times in 24 simulated flips. Find the experimental and theoretical probabilities of heads. Which is greater?

ANSWER _____

2 A fair six-sided number cube lands on 6 in 8 of 36 simulated rolls. Find the experimental and theoretical probabilities of rolling a 6. Which is greater?

ANSWER _____

3 A bag holds 3 red tiles and 9 blue tiles. A simulation draws a tile, replaces it, and repeats 40 times. It draws red 12 times. Find the experimental and theoretical probabilities of red. Which is greater?

ANSWER _____

4 The table shows cumulative results from a fair coin simulation. Use the rate after 96 flips to predict the number of heads in 192 more flips. How many heads would the theoretical probability predict?

CUMULATIVE COIN FLIP RESULTS

Total flips	Heads
12	8
24	11
48	23
96	47

ANSWER _____

5 A fair six-sided number cube lands on an even number in 30 of 72 simulated rolls. Find the experimental and theoretical probabilities of an even number. Which is greater?

ANSWER _____

6 A spinner has three equal sections labeled A, B, and C. The table shows cumulative simulation results. Which run has a rate of A closest to the theoretical probability? Use that run's rate to predict the number of A results in 270 more spins.

CUMULATIVE SPINNER RESULTS

Total spins	A results
30	6
90	27
180	58

ANSWER _____

APPLY IT Show your work

1 In a game, 3 of 12 equally likely avatar icons are rare. In 80 simulated icon picks, a rare icon appears 18 times. Find the experimental and theoretical probabilities of a rare icon. Which is greater?

WORK SPACE

ANSWER _____

2 A playlist has 8 songs, including 2 featured songs. Each shuffle makes every song equally likely to play first. In 120 simulated shuffles, a featured song plays first 33 times. Predict how many times a featured song will play first in 240 more shuffles using the experimental rate. How does this compare with the theoretical prediction?

WORK SPACE

ANSWER _____

CHALLENGE One step up

A fair six-sided number cube is simulated in three runs. The table shows the cumulative number of rolls that land on 6. Which run's rate is closest to the theoretical probability? Use that rate to predict the number of sixes in 288 more rolls, then explain why the prediction differs from the theoretical prediction.

CUMULATIVE NUMBER CUBE RESULTS

Total rolls	Sixes
36	9
72	15
144	26

WORK SPACE AND ANSWER

ANSWER KEY

Probability in Play

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A fair coin lands on heads 10 times in 24 simulated flips. Find the experimental and theoretical probabilities of heads. Which is greater?	**Experimental: 10/24 = 5/12. Theoretical: 1/2. The theoretical probability is greater.**
2	A fair six-sided number cube lands on 6 in 8 of 36 simulated rolls. Find the experimental and theoretical probabilities of rolling a 6. Which is greater?	**Experimental: 8/36 = 2/9. Theoretical: 1/6. The experimental probability is greater.**
3	A bag holds 3 red tiles and 9 blue tiles. A simulation draws a tile, replaces it, and repeats 40 times. It draws red 12 times. Find the experimental and theoretical probabilities of red. Which is greater?	**Experimental: 12/40 = 3/10. Theoretical: 3/12 = 1/4. The experimental probability is greater.**
4	The table shows cumulative results from a fair coin simulation. Use the rate after 96 flips to predict the number of heads in 192 more flips. How many heads would the theoretical probability predict?	**Experimental-rate prediction: 47/96 × 192 = 94 heads. Theoretical prediction: 1/2 × 192 = 96 heads.**
5	A fair six-sided number cube lands on an even number in 30 of 72 simulated rolls. Find the experimental and theoretical probabilities of an even number. Which is greater?	**Experimental: 30/72 = 5/12. Theoretical: 1/2. The theoretical probability is greater.**
6	A spinner has three equal sections labeled A, B, and C. The table shows cumulative simulation results. Which run has a rate of A closest to the theoretical probability? Use that run's rate to predict the number of A results in 270 more spins.	**The 180-spin run is closest to the theoretical probability of 1/3. Its rate predicts 58/180 × 270 = 87 A results.**

PART 2 · APPLY IT

1. **Experimental: 18/80 = 9/40. Theoretical: 3/12 = 1/4. The theoretical probability is greater.** Divide 18 by 80 for the simulated rate and 3 by 12 for the theoretical rate. Compare 9/40 with 10/40.
2. **The experimental rate predicts 66 times. The theoretical probability predicts 60 times, which is 6 fewer.** Multiply 33/120 by 240 to get 66. Multiply 2/8 by 240 to get 60.

CHALLENGE

The 144-roll run is closest to 1/6. Its rate predicts 26/144 × 288 = 52 sixes, while the theoretical probability predicts 1/6 × 288 = 48. The predictions differ because the simulated rate, 26/144, is slightly greater than 1/6.

Accept equivalent fractions and clear comparisons in words or symbols. Predictions are based on the specified simulation rate, not a different run's rate.