LESSON MAKER PRO

Chance Check

Compare expected chances with results from multiple samples.

GRADE 7 · 7.SP.6

7.SP.6 "Collect multiple samples to compare the relationship between theoretical and experimental probabilities for simple events."

NAME _____ DATE _____

EXPECTED AND OBSERVED

For equally likely outcomes, theoretical probability is favorable outcomes divided by all possible outcomes. Experimental probability is the number of times an event happens divided by the number of trials. To combine samples, add their event counts and add their trial counts before dividing.

WORKED EXAMPLE

A game has 9 equally likely tickets, and 2 are winners. After each pick, the ticket goes back. Compare the theoretical probability of winning with the combined experimental probability.

TICKET PICKS

Sample	Picks	Wins
A	18	5
B	36	9

1. Theoretical probability = 2/9.
2. Total wins = 5 + 9 = 14. Total picks = 18 + 36 = 54.
3. Combined experimental probability = 14/54 = 7/27.
4. Since 2/9 = 6/27, the experimental probability is greater by 1/27.

Answer: Theoretical: 2/9. Combined experimental: 7/27, which is greater by 1/27.

PRACTICE 6 problems

1 A fair coin was flipped in two samples. Find the theoretical probability of heads and the combined experimental probability of heads.

COIN FLIPS

Sample	Flips	Heads
A	8	3
B	16	9

ANSWER _____

2 A fair number cube has faces numbered 1 through 6. Which sample's experimental probability of rolling an even number is closer to the theoretical probability? Find both experimental probabilities.

NUMBER CUBE ROLLS

Sample	Rolls	Even rolls
A	8	5
B	24	11

ANSWER _____

3 A bag holds cards numbered 1 through 8. A card is drawn at random and replaced each time. Find the theoretical and combined experimental probabilities of drawing a 1 or 2. Which is greater?

CARD DRAWS

Sample	Draws	Draws of 1 or 2
A	16	5
B	24	7

ANSWER _____

4 A bag holds 3 red tiles and 1 blue tile. A tile is picked at random and replaced each time. How far is the combined experimental probability of blue from its theoretical probability?

TILE PICKS

Sample	Picks	Blue picks
A	8	2
B	24	7

ANSWER _____

5 A spinner has 3 equal sections labeled sun, moon, and star. Which sample's experimental probability of sun is closer to the theoretical probability? Explain with a fraction.

SPINNER RESULTS

Sample	Spins	Sun results
A	12	3
B	24	10

ANSWER _____

6 A spinner has 4 equal sections, one marked star. Each sample's experimental probability of star differs from the theoretical probability. Find the combined experimental probability. Does it match the theoretical probability?

STAR RESULTS

Sample	Spins	Star results
A	12	4
B	28	6

ANSWER _____

APPLY IT Show your work

1 A music app picks one of 6 tracks at random each time, and repeats are allowed. Two tracks are by the same artist. Using both listening samples, compare the experimental probability of hearing that artist with the theoretical probability. State the difference.

MUSIC APP PICKS

Sample	Picks	Artist's tracks
A	12	3
B	24	10

ANSWER _____

2 A game shop shows one of 8 equally likely avatars on each visit. Three are dragons, and the same avatar can appear again. Compare the combined experimental probability of seeing a dragon with the theoretical probability. Why might the first sample alone give a different impression?

AVATAR VISITS

Sample	Visits	Dragon avatars
A	16	4
B	32	14

ANSWER _____

CHALLENGE One step up

A spinner has 4 equal sections, one gold. A student finds each sample's experimental probability of gold, then averages those two fractions. Find that average. Next, pool the counts to find the experimental probability across all spins. Which result represents all the spins, and how does it compare with the theoretical probability? Explain.

GOLD SPINNER RESULTS

Sample	Spins	Gold results
A	8	4
B	24	3

WORK SPACE AND ANSWER

ANSWER KEY

Chance Check

GRADE 7 · 7.SP.6

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A fair coin was flipped in two samples. Find the theoretical probability of heads and the combined experimental probability of heads.	**Theoretical: 1/2. Combined experimental: 12/24 = 1/2.**
2	A fair number cube has faces numbered 1 through 6. Which sample's experimental probability of rolling an even number is closer to the theoretical probability? Find both experimental probabilities.	**A: 5/8. B: 11/24. Sample B is closer to the theoretical probability of 1/2.**
3	A bag holds cards numbered 1 through 8. A card is drawn at random and replaced each time. Find the theoretical and combined experimental probabilities of drawing a 1 or 2. Which is greater?	**Theoretical: 2/8 = 1/4. Combined experimental: 12/40 = 3/10. The experimental probability is greater.**
4	A bag holds 3 red tiles and 1 blue tile. A tile is picked at random and replaced each time. How far is the combined experimental probability of blue from its theoretical probability?	**1/32**
5	A spinner has 3 equal sections labeled sun, moon, and star. Which sample's experimental probability of sun is closer to the theoretical probability? Explain with a fraction.	**Neither is closer. A is 3/12 = 1/4 and B is 10/24 = 5/12; each is 1/12 from the theoretical probability of 1/3.**
6	A spinner has 4 equal sections, one marked star. Each sample's experimental probability of star differs from the theoretical probability. Find the combined experimental probability. Does it match the theoretical probability?	**Combined experimental: 10/40 = 1/4. Yes, it matches the theoretical probability of 1/4.**

PART 2 · APPLY IT

1. **The combined experimental probability is 13/36. The theoretical probability is 1/3 = 12/36, so the experimental probability is greater by 1/36.** Add the artist counts and the picks to get 13/36. Compare it with 2/6 = 1/3 = 12/36.
2. **Both probabilities are 3/8. The first sample gives 4/16 = 1/4, which is lower than 3/8, but the combined results match the theoretical probability.** The theoretical probability is 3/8, and the combined experimental probability is (4 + 14)/(16 + 32) = 18/48 = 3/8. The first sample alone has an experimental probability of 1/4.

CHALLENGE

The average of 4/8 and 3/24 is 5/16. Pooling gives (4 + 3)/(8 + 24) = 7/32, which represents all 32 spins because it counts every gold result and every spin. The theoretical probability is 1/4 = 8/32, so the pooled experimental probability is lower by 1/32.

Accept equivalent fractions and equivalent wording for comparisons. For combined experimental probabilities, students must add counts and trials, not average the sample probabilities.