

Chance Changes

Test whether one outcome affects the next.

GRADE 8 • 8.PS.1.a

8.PS.1.a "Determine whether two events are independent or dependent and explain how replacement impacts the probability."

NAME _____

DATE _____

THE BIG IDEA

Independent events do not change each other's probabilities. Replacement usually makes draws independent because the total and the choices stay the same.

WORKED EXAMPLE

A jar has 3 orange and 8 green counters. Draw an orange counter, replace it, then draw an orange counter. Find the probability.

1. Total counters: $3 + 8 = 11$.
2. $P(\text{orange first}) = 3/11$.
3. After replacement, $P(\text{orange second}) = 3/11$.
4. Multiply: $3/11 \times 3/11 = 9/121$.

Answer: 9/121; the draws are independent.

PRACTICE 5 problems

- 1** A fair coin is tossed twice. Are the tosses independent or dependent? Explain.

ANSWER _____

- 2** A music app selects 1 song from 12 songs, removes it, then selects again. Independent or dependent?

ANSWER _____

- 3** A box has 2 blue and 5 red tokens. Draw a blue token, replace it, then draw a blue token. Find the probability.

ANSWER _____

- 4** A bag has 1 gold and 6 silver tokens. Draw a gold token and do not replace it. What is $P(\text{gold, then gold})$?

ANSWER _____

- 5** Flip a fair coin, then spin a spinner with 5 equal sections, 1 blue. Find $P(\text{heads, then blue})$.

ANSWER _____

APPLY IT Show your work

- 1** At game night, a prize box has 4 game-pass cards and 16 regular cards. You pick a game-pass card, replace it, then pick again. What is $P(\text{two game-pass cards})$? Are the picks independent?

WORK SPACE

ANSWER _____

- 2** A school store has 5 glow keychains and 7 regular keychains. You buy one glow keychain, and it is not replaced before you buy another. What is $P(\text{two glow keychains})$? Are the picks dependent?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

A bag has 5 green and 4 black tiles. Find $P(\text{two green tiles})$ with replacement and without replacement. Explain why the probabilities differ.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	A fair coin is tossed twice. Are the tosses independent or dependent? Explain.	Independent. The first toss does not change the coin.
2	A music app selects 1 song from 12 songs, removes it, then selects again. Independent or dependent?	Dependent. Removing a song changes the choices.
3	A box has 2 blue and 5 red tokens. Draw a blue token, replace it, then draw a blue token. Find the probability.	4/49
4	A bag has 1 gold and 6 silver tokens. Draw a gold token and do not replace it. What is $P(\text{gold, then gold})$?	0; the events are dependent.
5	Flip a fair coin, then spin a spinner with 5 equal sections, 1 blue. Find $P(\text{heads, then blue})$.	1/10; the events are independent.

PART 2 • APPLY IT

- 1/25; independent.** There are 20 cards, so each game-pass probability is $4/20 = 1/5$. Replacement keeps the probability the same: $1/5 \times 1/5 = 1/25$.
- 5/33; dependent.** The probability is $5/12 \times 4/11 = 20/132 = 5/33$. The first purchase changes the keychains left.

CHALLENGE

With replacement: 25/81. Without replacement: 5/18. Without replacement, the first green tile leaves 4 green out of 8 tiles, so the second probability changes.

Accept equivalent unsimplified fractions where appropriate. For independence explanations, accept statements that the first event does or does not change the second probability.