MATHEMATICS · GRADES 10-12

Independent and dependent events

Difficulty level: Advanced

Mathematics: Grades 10-12

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Overview of the concept

This is how you tell whether one event changes the odds of another, like drawing cards without putting the first one back versus flipping a coin twice. If the first event changes what is left, the odds for the second event change too, and ignoring that gives you the wrong answer. You need it to work out card game odds, the chance of two things happening in a row at work or in sport, and any situation where the first result changes the chances of the next.



Rule

Two events are independent when the first does not change the chance of the second.

If the first event changes what is left, like drawing without putting the card back, the events are dependent.

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Worked examples

EXAMPLE 1

Q Are two coin tosses independent?

SOLUTION

The first toss does not change the coin or the second toss.

The chance of heads stays $\frac{1}{2}$ either way.

Yes, independent

EXAMPLE 2

Q Are two draws from a bag without replacement independent?

SOLUTION

The first draw removes a ball, changing what is left.

So the chances for the second draw change.

No, dependent

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Practice questions

1 Are two dice rolls independent?

A Yes

B No

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2 Are draws from a bag with replacement independent?

A Yes

B No

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3 Are two raffle tickets drawn without replacement independent?

- **A** Yes
- **B** No

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4 Two cards are drawn without replacement. The first card drawn is an ace. What happens to the chance of drawing an ace on the second draw?

- **A** It goes down
- **B** It stays the same
- **C** It goes up
- **D** It becomes zero

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Are two picks from a bag of marbles without replacement independent?

A Yes

B No

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Are two spins of a spinner independent?

A Yes

B No

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7 A card is drawn, replaced, and the deck is shuffled. Does the first draw change the chance of drawing a king on the second draw?

- **A** No, it stays the same
- **B** Yes, it goes up
- **C** Yes, it goes down
- **D** Yes, it becomes zero

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8 A fair coin lands on heads three times in a row. What is the chance of heads on the next flip?

- **A** Still 1/2
- **B** Less than 1/2
- **C** More than 1/2
- **D** Zero

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9

Twenty names are in a hat. One name is drawn and not put back. How many names are left in the hat for the second draw?

- A 20
- B 19
- C 21
- D 0

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Are successive lottery draws independent?

- A Yes
- B No

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ANSWER KEY

1. Yes

2. Yes

3. No

4. It goes down

5. No

6. Yes

7. No, it stays the same

8. Still 1/2

9. 19

10. Yes

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