

INDEPENDENT EVENTS

Two events are **independent** if the occurrence of one of the events does not affect the probability of the occurrence of the other event. Events that are not independent are **dependent**.

Examples of independent events are:

- repeated tossing of a fair coin
- selecting a card from a deck, replacing the card, and then selecting another
- tossing a coin, and then rolling a six-sided die

Examples of dependent events are:

- selecting a card from a deck, not replacing the card, and then selecting another
- selecting the digits for a PIN if repeating a digit is not allowed
- taking a sample exam before taking the actual exam

If events A and B are independent, then the probability of them occurring in sequence is the product of their probabilities. $P(A \text{ and } B) = P(A) \cdot P(B)$

MUTUALLY EXCLUSIVE EVENTS

Two events are **mutually exclusive** if they cannot occur at the same time. If both events can occur at the same time, these events are **not mutually exclusive**.

Examples of mutually exclusive events are:

- rolling a 3 and rolling a 4 on a single roll of a die
- a single card selected from a deck is an 8 and a single card selected from a deck is a face card
- selecting a person with type O blood and selecting a person with type A blood

Examples of events that are not mutually exclusive are:

- rolling a sum of 10 with two dice and rolling a sum larger than 7 with two dice
- a single card selected from a deck is a king and a single card selected from a deck is a face card
- selecting a person with type O blood and selecting a male

If events A and B are mutually exclusive, then the probability that at least one will occur is the sum of their probabilities. $P(A \text{ or } B) = P(A) + P(B)$

Independent Events and Mutually Exclusive Events

Are the following pairs of events independent?

1. a. Flipping a coin and getting heads.
b. Flipping a coin a second time and getting heads.
2. a. Speeding while driving to class.
b. Getting a traffic ticket while driving to class.
3. a. Finding that your car will not start.
b. Finding that your kitchen light will not work.
4. a. Finding that your kitchen light is not working.
b. Finding that your refrigerator is not working.
5. a. Drinking until your driving ability is impaired.
b. Being involved in a car crash.
6. a. Testing positive for a virus infection.
b. Being left-handed.

Are the following pairs of events mutually exclusive?

7. a. Selecting a voter who is under the age of 30.
b. Selecting a voter whose principal news source is MTV.
8. a. Selecting someone treated with an experimental drug.
b. Selecting someone who experiences improved symptoms.
9. a. Getting an odd number when a roulette wheel is spun.
b. Getting an even number when a roulette wheel is spun.
10. a. Selecting an ace from a deck of cards.
b. Selecting a card that is a spade.
11. a. Selecting a survey subject who is a registered Democrat.
b. Selecting a survey subject who is not a registered voter.
12. a. Selecting a survey subject who is watching CNN.
b. Selecting a survey subject who is not watching television.

ANSWERS:

- | | | | | | |
|--------|-------|--------|--------|---------|---------|
| 1. Yes | 2. No | 3. Yes | 4. No | 5. No | 6. Yes |
| 7. No | 8. No | 9. Yes | 10. No | 11. Yes | 12. Yes |