

10.4 Independent and Dependent Events

Name: Key

Independent Probability Replacement / put back

If two events are independent, this means the probability that one event occurs in no way affects the probability of the other event occurring.

In other words...

Events A and B are independent events if and only if

$$P(A \text{ and } B) = P(A) \times P(B)$$

Otherwise, A and B are dependent events.

Dependent Probability Without Replacement / leave out

- The probability of a second event depends on the outcome of the first event.

- Usually the words "without replacement" are involved.

1. A bag contains 5 red, 3 green, 4 blue, and 8 yellow marbles. Find the probability of randomly selecting a green marble, and then a yellow marble if the first marble is replaced. put back

$$\frac{3}{20} \cdot \frac{8}{20} = \frac{24}{400} = \boxed{\frac{3}{50}}$$

2. A sock drawer contains 5 pairs of each color socks: white, green and blue. What is the probability of randomly selecting a pair of blue socks, replacing it, and then randomly selecting a pair of white socks?

$$\frac{5}{15} \cdot \frac{5}{15} = \frac{25}{225} = \boxed{\frac{1}{9}}$$

3. In a standard deck of cards, what is the probability of picking a diamond and then another diamond without replacement?

$$\frac{13}{52} \cdot \frac{12}{51} = \frac{156}{2652} = \boxed{\frac{1}{17}}$$

4. Randy has 4 pennies, 2 nickles, and 3 dimes in his pocket. If he randomly chooses 2 coins, what is the probability that they are both dimes if he doesn't replace the first one?

$$\frac{3}{9} \cdot \frac{2}{8} = \frac{6}{72} = \boxed{\frac{1}{12}}$$

5. Two students are chosen at random from a class of 30. What is the probability that both and your friend are chosen?

$$\frac{2}{30} \cdot \frac{1}{29} = \frac{2}{870} = \boxed{\frac{1}{435}}$$

6. A test includes several multiple choice questions, each with 5 choices. Suppose you don't know the answers for three of these questions, so you guess. What is the probability of getting all three correct?

$$\frac{1}{5} \cdot \frac{1}{5} \cdot \frac{1}{5} = \boxed{\frac{1}{125}}$$

7. Using the letters in the state ARKANSAS. Find the probability of picking an **S** and then an **A** without replacement.

$$\frac{2}{8} \cdot \frac{3}{7} = \frac{6}{56} = \boxed{\frac{3}{28}}$$

8. Using the letters in the state ARKANSAS. Find the probability of picking a **K** and then a **N** without replacement.

$$\frac{1}{8} \cdot \frac{1}{7} = \boxed{\frac{1}{56}}$$

9. Using the letters in the state ARKANSAS. Find the probability of picking a **R** and then a **S** without replacement.

$$\frac{1}{8} \cdot \frac{2}{7} = \frac{2}{56} = \boxed{\frac{1}{28}}$$

Determining if 2 Events are Independent ✓

Check the following events and determine if they are independent. $P(A \cap B) = P(A) \cdot P(B)$

10. $P(A) = 0.45$ $P(B) = 0.30$ $P(A \cap B) = 0.75$

$$.75 \square .45 \times .3$$

$$.75 \neq .135$$

Conclusion: Dependent

11. $P(A) = 0.12$ $P(B) = 0.56$ $P(A \cap B) = 0.0672$

$$.0672 \square .12 \times .56$$

$$.0672 = .0672$$

✓

Conclusion: Independent

12. $P(A) = \frac{4}{5}$ $P(B) = \frac{3}{8}$ $P(A \cap B) = \frac{7}{40}$

$$\frac{7}{40} \square \frac{4}{5} \times \frac{3}{8}$$

$$\frac{7}{40} \neq \frac{12}{40}$$

Conclusion: Dep.

13. $P(A) = \frac{7}{9}$ $P(B) = \frac{3}{4}$ $P(A \cap B) = \frac{7}{12}$

$$\frac{7}{12} \square \frac{7}{9} \cdot \frac{3}{4}$$

$$\frac{7}{12} = \frac{21}{36} \checkmark$$

Conclusion: Indep.