

9.7 Probability of Multiple Events

Dependent Events – When the outcome of the first event affects the outcome of the second.

- Taking a marble out of a bag and NOT REPLACING it

Independent Events – When one event does not affect the outcome of the second.

- Rolling Dice
- Taking a marble out of a bag and REPLACING it
- Athletic games

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Classify each pair of events as dependent or independent. Explain.

A marble is selected from a bag of marbles. The marble is replaced and another marble is selected.

independent

Spin a spinner. Then, select a marble from a bag that contains marbles of different marbles.

independent

Select a marble from a bag that contains marbles of two colors. Put the marble aside, and select a second marble from the bag.

dependent

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Probability of A and B : If A and B are independent events, then $P(A \text{ and } B) = P(A) \cdot P(B)$

Suppose your favorite radio station is running a promotional campaign. Every hour five callers chosen at random get to select two songs each. You call the station once after 7am and again after 3pm. What is the probability of being one of the five callers after 7am? After 3pm? Find the probability of being one of the five callers both times you call.

$$P(7) = \frac{5}{125} = \frac{1}{25} = 4\%$$

$$P(3) = \frac{5}{200} = \frac{1}{40} = 2.5\%$$

$$\frac{1}{40} \cdot \frac{1}{25} = \frac{1}{1000} = .1\%$$

Radio Statistics	
Hour	Calls Received
7 am	125
3 pm	200

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A box contains 20 red marbles and 30 blue marbles. A second box contains 10 white marbles and 47 black marbles. If you choose one marble from each box without looking, what is the probability that you get a blue marble and a black marble?

$$P(\text{blue \& black}) = \frac{30}{50} \cdot \frac{47}{57} = \frac{47}{95} = 49\%$$

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Mutually exclusive events – two events that cannot happen at the same time.

Are the following events mutually exclusive? Explain.

Rolling an even number and rolling a prime number on a number cube.

not mutually exclusive $\frac{2}{6}$ is even & prime

Rolling an even number and rolling a number less than 2 on a number cube.

$\underbrace{2, 4, 6}$ $\underbrace{1}$ mutually exclusive

Rolling an even number and rolling a number greater than 5 on a number cube.

not mutually exclusive
6 is both at the same time

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Probability of A or B :

If A and B are mutually exclusive events, then $P(A \text{ or } B) = P(A) + P(B)$

If A and B are not mutually exclusive events, then $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

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About 53% of U.S. college students are under 25 years old. About 21% of U.S. college students are over 34 years old. What is the probability that a U.S. college student chosen at random is

A) Under 25 or over 34. $53\% + 21\% = 74\%$

B) Between 25–34 $100\% - 74\% = 26\%$

C) Between 25–34 or over 34 $26\% + 21\% = 47\%$

D) Under 34 $100\% - 21\% = 79\%$

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At a restaurant, customers get to choose one of four vegetables with any main course. About 33% choose green beans, and about 28% choose spinach. What is the probability that a customer will choose beans or spinach?

$$33\% + 28\% = 61\%$$

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A spinner has twenty equal size selections numbered from 1 to 20. If you spin the spinner, what is the probability that the number you spin will be a multiple of 2 or a multiple of 3?

$$\text{probability (even)} \frac{1}{2} = 50\%$$

$$P(x3) = \frac{6}{20} = \frac{3}{10} = 30\%$$

$$\frac{6}{18} \quad P(x6) = \frac{3}{20}$$

$$\frac{1}{2} + \frac{3}{10} - \frac{3}{20} = \frac{13}{20}$$

$$\frac{10}{20} + \frac{6}{20} - \frac{3}{20}$$

$$50 + 30 - 15 = 65\%$$

homework:

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