

Name: _____ Date: _____

Compound Probability: Mutually Exclusive vs. Overlapping

- ☆ Compound Event
 - Combines two or more events, using the word **and** or the word **or**.
- ☆ Mutually Exclusive
 - Events that **cannot** occur at the same time (have **no** common outcomes).
- ☆ Overlapping
 - Events having **at least one common outcome**.

Determine if the following events are mutually exclusive or overlapping.

- 0 1. has ridden a roller coaster; has ridden a Ferris wheel
- M.E. 2. rolling an odd number on a die, rolling an even number
- 0 3. a person has brown hair; has brown eyes
- 0 4. the correct answer is chosen; the answer A is chosen.
- M.E. 5. a student is a senior; is a junior

Overlapping Events

Probability that non-mutually exclusive events
A and B or both will occur expressed as:

$$\mathbf{P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)}$$

1. P(red or multiple of 3)

$$\frac{4}{8} + \frac{2}{8} - \frac{1}{8} = \frac{5}{8}$$

2. P(blue or odd)

$$\frac{2}{8} + \frac{4}{8} - \frac{0}{8} = \frac{6}{8} = \frac{3}{4}$$

3. P(green or orange)

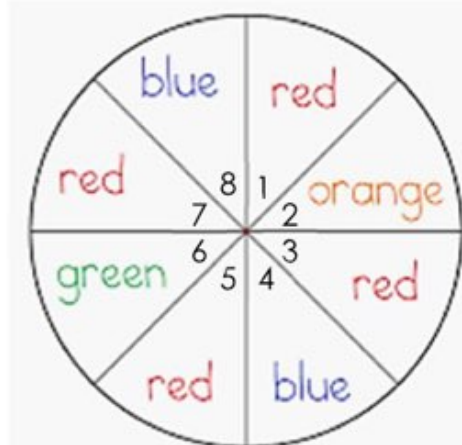
$$\frac{1}{8} + \frac{1}{8} - \frac{0}{8} = \frac{2}{8} = \frac{1}{4}$$

4. P(perfect square or prime)

$$\frac{2}{8} + \frac{4}{8} - \frac{0}{8} = \frac{6}{8} = \frac{3}{4}$$

5. P(perfect square or red)

$$\frac{2}{8} + \frac{4}{8} - \frac{1}{8} = \frac{5}{8}$$



* Perfect squares = 1, 4, 9, 16, 25, 36, 49, ... etc.

* Prime numbers = 2, 3, 5, 7, 11, 13, 17...

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

6. A fridge contains 13 bottles of sports drink: 5 lemon-lime, 4 orange, and 4 fruit-punch. You randomly grab a sports drink. What is the probability it is lemon-lime or orange?

$$\begin{aligned} P(\text{LL or O}) &= P(\text{LL}) + P(\text{O}) - P(\text{LL and O}) \\ &= \frac{5}{13} + \frac{4}{13} - \frac{0}{13} = \frac{9}{13} \end{aligned}$$

7. A jar contains 6 orange marbles numbered one to six. The jar also contains three green marbles numbered one to three. You randomly pick a marble. What is the probability it is green or has a number less than five?

$$\begin{aligned} P(\text{G or } <5) &= P(\text{G}) + P(<5) - P(\text{G and } <5) \\ \frac{3}{9} + \frac{6}{9} - \frac{3}{9} &= \frac{3}{9} = \frac{1}{3} \end{aligned}$$

8. A group of senior citizens have won free vacation packages. The vacation to Bermuda is chosen by 25% of them, 60% choose Alaska, and 15% choose Costa Rica. What is the probability that one randomly chosen senior citizen chooses to vacation in Bermuda or Costa Rica?

$$P(\text{B or C}) = P(\text{B}) + P(\text{C.R.}) - P(\text{B and C})$$

$$25\% + 15\% - 0\% = 40\% \text{ Bermuda or Costa Rica}$$

9. Suppose 80% of people can swim. Suppose 70% of people can whistle. Suppose 55% of people can do both. What percentage of people can swim or whistle?

$$\begin{aligned} P(\text{S or W}) &= P(\text{S}) + P(\text{W}) - P(\text{S and W}) \\ &= 80\% + 70\% - 55\% = 95\% \end{aligned}$$

10. At Hillgrove, 60% of the students carry a backpack or a wallet. 40% carry a backpack, and 30% carry a wallet. If a student is selected at random, find the probability that the student carries both a backpack and a wallet.

$$\begin{aligned} P(\text{B or W}) &= P(\text{B}) + P(\text{W}) - P(\text{B and W}) \\ 60\% &= 40\% + 30\% - P(\text{B and W}) \\ 60\% &= 70\% - P(\text{B and W}) \quad P(\text{B and W}) = 10\% \end{aligned}$$

11. Find the probability of picking a female or a person from Florida out of the committee members.

$$\begin{aligned} P(\text{Female or Florida}) &= \\ \frac{21}{31} + \frac{12}{31} - \frac{8}{31} &= \frac{25}{31} \end{aligned}$$

	Female	Male	
Florida	8	4	12
Alabama	6	3	9
Georgia	7	3	10
	21	10	31