Lesson 57: Probability Part 2

By the end of the lesson, you will be able to:

~ Find a probability of an event.
~ Find a probability of two or more events.
~ Determine if events are mutually exclusive or inclusive.

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Two events are **mutually exclusive** when they cannot occur at the same time.

Probability of Mutually Exclusive Events:

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

ex: Boy / Girl

Red MM | Yellow MM

Card ♡ / Black Card

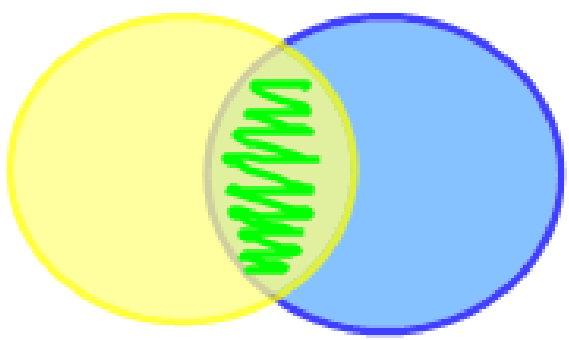
Two events are **inclusive** when the can occur at the same time. In this case, the probability is decreased.

Probability of Inclusive Events:

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

Black Ace
(2 cards)

A = Ace
B = Black



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Example 1: A card is selected at random from a standard deck of 52 cards. What is the probability of drawing a jack or a queen?

These events are mutually exclusive. Why? Add their probabilities.

$$P(J \text{ or } Q) = P(J) + P(Q)$$

$$= \frac{4}{52} + \frac{4}{52} = \frac{8}{52} = \frac{2}{13}$$

$$= \boxed{\frac{2}{13} = .1538 \quad 15.38\%}$$

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Example 2: Two cards are selected from a standard deck of 52 cards. What is the probability of selecting a jack or a black card?

Black Jack

Determine if this is inclusive or exclusive. Find the probability.

$$P(J \text{ or } Black) = P(J) + P(Black) - P(Black\,J)$$

$$\frac{4}{52} + \frac{26}{52} - \frac{2}{52} = \frac{28}{52}$$

$$= \boxed{\frac{7}{13} = .5385 \quad 53.85\%}$$

OR

$$\frac{C(4,1)}{C(52,1)} + \frac{C(26,1)}{C(52,1)} - \frac{C(2,1)}{C(52,1)}$$

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Example 3: Three cards are selected from a standard deck of 52 cards. What is the probability of selecting a king, a queen, or a red card? RQ or RK

Determine if this is inclusive or exclusive. Find the probability.

$$P(K \text{ or } Q \text{ or } Red) = P(K) + P(Q) + P(R) - \underbrace{\overset{2/52}{P(RQ)} - \overset{2/52}{P(RK)}}_{-P(R\ K \text{ or } Q)}$$

$$= \frac{4}{52} + \frac{4}{52} + \frac{26}{52} - \frac{4}{52} = \frac{30}{52}$$

$$= \boxed{\frac{15}{26} = .5769 \quad 57.69\%}$$

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Example 4: A bag contains 7 red and 4 white marbles. Three marbles are selected. What is the probability that at least one is white?

There are 3 ways to get at least 1 white marble: 1W 2W 3W

The probability of getting 1 white marble is: 84/165

The probability of getting 2 white marbles is: 42/165

The probability of getting 3 white marbles is: 4/165

$$P(at\ least\ 1\ white) = P(1\ white) + P(2\ white) + P(3\ white) =$$

$$\frac{C(4,1)\cdot C(7,2)}{C(11,3)} + \frac{C(4,2)\cdot C(7,1)}{C(11,3)} + \frac{C(4,3)C(7,0)}{C(11,3)}$$

$$= \frac{84}{165} + \frac{42}{165} + \frac{4}{165}$$

$$= \frac{130}{165}$$

$$= \boxed{\frac{26}{33} = .7879 \quad 78.79\%}$$

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Example 5: Elizabeth has 9 rings in her jewelry box. Five are gold and four are silver. If she randomly selects three rings to wear to a party, find each probability.

a.) P(exactly 2 gold) = P(2 gold and 1 Silver)

$$= \frac{C(5,2) \cdot C(4,1)}{C(9,3)}$$

$$= \frac{40}{84} = \boxed{\frac{10}{21} = .4762 \quad 47.62\%}$$

Example 5: Elizabeth has 9 rings in her jewelry box. Five are gold and four are silver. If she randomly selects three rings to wear to a party, find each probability.

b.) P(at least 2 silver) = P(2 silver & 1 gold OR 3 Silver)

$$= P(2\text{ silver \& 1 gold}) + P(3\text{ Silver})$$

$$= \frac{C(4,2)\cdot C(5,1)}{C(9,3)} + \frac{C(4,3)\cdot C(5,0)}{C(9,3)}$$

$$= \frac{30}{84} + \frac{4}{84} = \frac{34}{84} = \boxed{\frac{17}{42} = .4048 \quad 40.48\%}$$

Example 5: Elizabeth has 9 rings in her jewelry box. Five are gold and four are silver. If she randomly selects three rings to wear to a party, find each probability.

c.) P(all are silver or all are gold) = $P(3S) + P(3G)$

$$P(3S) + P(3G)$$

$$= \frac{C(4,3) \cdot C(5,0)}{C(9,3)} + \frac{C(5,3) \cdot C(4,0)}{C(9,3)}$$

$$= \frac{4}{84} + \frac{10}{84} = \frac{14}{84} = \boxed{\frac{1}{6} = .1667 \quad 16.67\%}$$

By the end of the lesson, you will be able to:

~ Find a probability of an event.
~ Find a probability of two or more events.
~ Determine if events are mutually exclusive or inclusive.

Can you?

Homework:

Journal 57

Assignment 57

Remember to give answers in Fraction form, Decimal form (4 places), and Percentage!!!