Adding Probabilities Notes

1. **Simple Event:** Consists of one event

2. **Compound Event:** An event that consists of two or more simple events.

3. **Mutually Exclusive Events:** Events that cannot occur at the same time

4. **Probability of Mutually Exclusive Events:** If two events, A and B, are mutually exclusive, then the probability that A or B happens is the sum of their probabilities.

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

Ex: Mike has a stack of 8 baseball cards, 5 basketball cards, and 6 football cards. If he selects a card at random from the stack, what is the probability that it is a baseball or football card?

$$\frac{8}{19} + \frac{6}{19} = \frac{14}{19}$$

Ex: Sylvia has a stack of playing cards of 10 hearts, 8 spades, and 7 clubs. If she selects a card at random from this stack, what is the probability that it is a heart or a club?

$$\frac{10}{25} + \frac{7}{25} = \frac{17}{25}$$

Ex: There are 7 girls and 6 boys on the junior class homecoming committee. A subcommittee of 4 people is being chosen at random to decide the theme for the class float. What is the probability that the subcommittee will have at least 2 girls?

$$\frac{\underset{315}{{}_7C_2\,{}_6C_2} + \underset{210}{{}_7C_3\,{}_6C_1} + {}_7C_4\,{}_6C_0}{{}_{13}C_4} = \frac{560}{715} = \frac{112}{143}$$

Ex: The Film Club makes a list of 9 comedies and 5 adventure movies they want to see. They plan to select 5 titles at random to show this semester.

a. What is the probability that at least two of the films they select are comedies?

$$\frac{\underset{840}{{}_5C_2\,{}_9C_3} + \underset{360}{{}_5C_3\,{}_9C_2} + \underset{630}{{}_9C_4\,{}_5C_1} + \underset{126}{{}_9C_5}}{{}_{14}C_5} = \frac{1956}{2002} = \frac{978}{1001}$$

b. What is the probability that at least three of the films they select are adventures?

$$\frac{\underset{360}{{}_5C_3\,{}_9C_2} + \underset{45}{{}_5C_4\,{}_9C_1} + \underset{1}{{}_5C_5}}{{}_{14}C_5} = \frac{406}{2002} = \frac{29}{143}$$

c. What is the probability that at least five of the films they select are comedies?

$$\frac{{}_9C_5}{{}_{14}C_5} = \frac{126}{2002} = \frac{9}{143}$$

d. What is the probability that all of the movies selected will be comedies or all adventures?

$$\frac{{}_9C_5 + {}_5C_5}{{}_{14}C_5} = \frac{127}{2002}$$

5. Mutually Inclusive Events: Two events that whose outcomes may be the same (or have parts in common)

6. Probability of Inclusive Events: If two events, A and B, are inclusive, then the probability that A or B occurs is the sum of their probabilities decreased by the probability of both occurring.

overlap

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

Ex: What is the probability of drawing a queen or a diamond?

$$\frac{4}{52} + \frac{13}{52} - \frac{1}{52} = \frac{16}{52} = \frac{4}{13}$$

Ex: What is the probability of drawing a red card or a heart?

$$\frac{26}{52} + \frac{13}{52} - \frac{13}{52} = \frac{1}{2}$$

Ex: What is the probability of drawing a club or an ace?

$$\frac{13}{52} + \frac{4}{52} - \frac{1}{52} = \frac{16}{52} = \frac{4}{13}$$

Ex: The enrollment at Southburg High School is 1400. Suppose 550 students want to take French, 700 take Algebra, and 400 take both French and Algebra. What is the probability that a student at random takes French or Algebra?

$$\frac{550}{1400} + \frac{700}{1400} - \frac{400}{1400} = \frac{850}{1400}$$

Don't Double Count the middle. $= \frac{17}{28}$

Ex: There are 2400 subscribers to an Internet service provider. Of these, 1200 own Brand A computers, 500 own Brand B, and 100 own both A and B. What is the probability that a subscriber selected at random owns either Brand A or Brand B?

don't like this word.

$$\frac{1200}{2400} + \frac{500}{2400} - \frac{100}{2400} = \frac{1600}{2400} = \frac{2}{3}$$

Homework: Adding Probabilities Worksheet