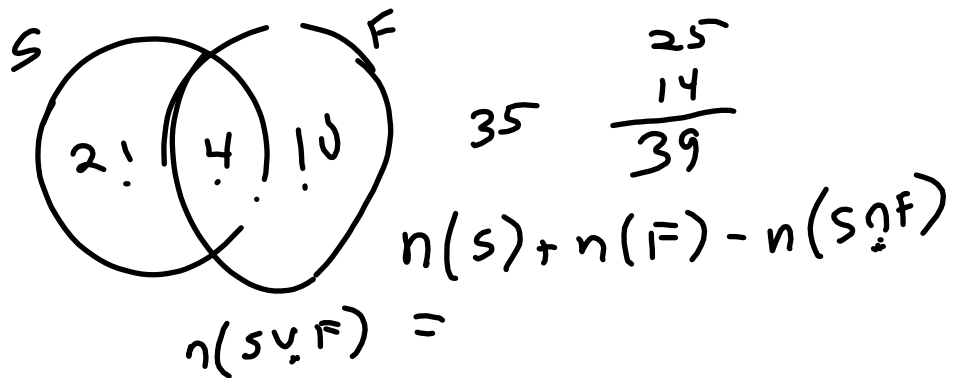


Section 12.6

The results of a survey of visitors at the Grand Canyon showed that 25 speak Spanish, 14 speak French, and 4 speak both Spanish and French. How many speak Spanish or French?



Section 12-6 Or / And Problems

Compound Probability - Find the probability of two or more events

Or Problems

Roll a die: P(even or greater than 4)

$$\begin{array}{c}
 2 \quad 4 \quad \textcircled{6} \quad 5 \quad \textcircled{6} \\
 \frac{3}{6} + \frac{2}{6} = \frac{5}{6} - \frac{1}{6} = \frac{4}{6}
 \end{array}$$

Or also know as the addition formula

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

Example 1:

The numbers 1 - 10 is written on separate pieces of paper and placed in a hat. One piece of paper is selected at random. Determine the probability is an even number or a number greater than 6.

$$\begin{array}{c}
 P(\text{even or } > 6) \\
 2 \quad 4 \quad \textcircled{6} \quad \textcircled{8} \quad \textcircled{10} \quad 7 \quad \textcircled{8} \quad 9 \quad \textcircled{10} \\
 \frac{5}{10} + \frac{4}{10} - \frac{2}{10} = \frac{7}{10}
 \end{array}$$

Example 2:

Consider the same sample space as the previous problem. Determine the probability that it contains a number less than 5 or a number greater than 8.

$$P(<5 \text{ or } >8)$$
$$\begin{array}{cccc} 1 & 2 & 3 & 4 \\ & & & 9 & 10 \end{array}$$
$$\frac{4}{10} + \frac{2}{10} = \frac{6}{10} = \frac{3}{5}$$

Two events A and B are mutually exclusive if it is impossible for both events to occur simultaneously.

Example 3:

One card is selected from a standard deck of cards. Determine whether the following pairs of events are mutually exclusive and find $P(A \text{ or } B)$

a) A = an ace, B = a jack $\frac{4}{52} + \frac{4}{52} = \frac{8}{52} = \frac{2}{13}$
 M.E.

b) A = an ace, B = a heart $\frac{4}{52} + \frac{13}{52} - \frac{1}{52} = \frac{16}{52} = \frac{4}{13}$
 NOT M.E.

c) A = a red card, B = a black card $\frac{26}{52} + \frac{26}{52} = 1$
 M.E.

d) A = a picture card, B = a red card $\frac{12}{52} + \frac{26}{52} - \frac{6}{52} = \frac{32}{52} = \frac{8}{13}$
 NOT M.E.

6 picture cards

PRACTICE THE SKILLS

In Exercises 11–14, determine the indicated probability.

11. If $P(A) = 0.6$, $P(B) = 0.4$, and $P(A \text{ and } B) = 0.3$, determine $P(A \text{ or } B)$.

$$.6 + .4 - .3 = .7$$

12. If $P(A \text{ or } B) = 0.9$, $P(A) = 0.7$, and $P(B) = 0.5$, determine $P(A \text{ and } B)$.

$$.9 = .7 + .5 - X$$

13. If $P(A \text{ or } B) = 0.7$, $P(A) = 0.6$, and $P(A \text{ and } B) = 0.3$, determine $P(B)$.

$$.7 = .6 + X - .3$$

14. If $P(A \text{ or } B) = 0.6$, $P(B) = 0.3$, and $P(A \text{ and } B) = 0.1$, determine $P(A)$.

15. **Exam Preparation** Professor Connell is in charge of a program to prepare students for a high school equivalency exam. Records show that the probability that a student in the program needs help in mathematics is 0.7, the probability that a student needs help in English is 0.6, and the probability that a student needs help in both mathematics and English is 0.55. Determine the probability that a student in the program needs help in mathematics or English.

$$.9 = .7 + .5 - X$$

$$X = .3$$