Mutually Inclusive Events

We earlier defined two events that share no common outcomes as being mutually exclusive. It follows, then, that two events that share common outcomes are not mutually exclusive but mutually inclusive.

Some examples of mutually inclusive events:

1. The experiment is rolling a die. The first event is rolling an even number. The second event is rolling a 4. Rolling a four is an outcome common to both events. Therefore, these events are mutually inclusive.

2. The experiment is drawing a card from a standard deck. The first event is drawing a spade. The second event is drawing a face card. Drawing the jack, queen, or king of spades are outcomes common to both events. Therefore, these events are mutually inclusive.

$$\frac{13}{52} + \frac{12}{52} - \frac{3}{52} = \frac{22}{52} = \boxed{\frac{11}{26}}$$

3. The experiment is playing a game of hockey. The first event is your team scoring a goal. The second event is winning the game. In a hockey game, a team must score at least one goal to win. Therefore, these events are mutually inclusive.

Classify the following events as either mutually exclusive or mutually inclusive.

A) The experiment is rolling a die. The first event is that the number is greater than 3 and the second event is that the number is even.

ANSWER: Inclusive

B) The experiment is answering a multiple-choice question. The first event is that the correct answer is chosen and the second event is that answer A is chosen.

ANSWER: Inclusive

To calculate the probability of <u>mutually inclusive events</u>, we use the following:

<u>Mutually Inclusive Events</u> **If Event A and Event B are dependent events, then the probability of Event A <u>or</u> Event B occurring(but not both) is found by:** **P(A or B) = P(A) + P(B) - P(A and B)**

This is called the <u>ADDITION PRINCIPLE</u>

Example 1:

Tom has a blue die and a green die in a bag. He chooses one die and rolls it. Find the probability that Tom will choose a blue die or a 6.

Solution: These events are dependent on each other.

P(blue die or 6) = P(blue) + P(6) - P(blue and 6)

$$= \frac{1}{2} + \frac{2}{12} - \frac{1}{12}$$

$$= \frac{6}{12} + \frac{2}{12} - \frac{1}{12}$$

$$= \frac{8}{12} - \frac{1}{12}$$

$$= \frac{7}{12}$$

Example 2:

A card is chosen from a deck of cards. Find the probability of getting either a 4 or a spade.

Solution: **These events are dependent on one another.**

P(4 or spade) = P(4) + P(spade) - P(4 and spade)

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

$$= \frac{17}{52} - \frac{1}{52}$$

$$= \frac{16}{52}$$

$$= \frac{4}{13}$$

① a) P(4 or diamond)

$= P(4) + P(\text{Diamond}) - P(4\diamondsuit)$

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

$= \frac{16}{52}$

$= \boxed{\frac{4}{13}}$