Math 140: Chapter 3 Probability

Consider a standard deck of cards.

2♡	3♡	4♡	5♡	6♡	7♡	8♡	9♡	10♡	J♡	Q♡	K♡	A♡
2♢	3♢	4♢	5♢	6♢	7♢	8♢	9♢	10♢	J♢	Q♢	K♢	A♢
2♣	3♣	4♣	5♣	6♣	7♣	8♣	9♣	10♣	J♣	Q♣	K♣	A♣
2♠	3♠	4♠	5♠	6♠	7♠	8♠	9♠	10♠	J♠	Q♠	K♠	A♠

3.2 Probability involving compound events

Often we deal with events that are described in terms of other events. These are called compound events and they involve the connectors *or*, *and* and *not*.

Probabilities involving NOT

Complement Rule:

Probabilities involving OR

Example 1. Consider the experiment of rolling a six sided die and flipping a coin.
Sample space: $S = \{1T, 1H, 2T, 2H, 3T, 3H, 4T, 4H, 5T, 5H, 6T, 6H\}$.
Let event A be the event of rolling an even number and event B be the event of getting Tail on the coin.
$A = \{$ $\}$

$B = \{$ $\}$
The event A OR B includes

Mutually exclusive events

Example 2. Are the following events mutually exclusive?

1. Let A be the event of "drawing a King" out of a deck of cards and B be the event of "drawing an Ace".

2. Let A be the event of "drawing a King" out of a deck of cards and B be the event of "drawing a Heart".

3. Let A be the event of "getting an A" and B the event of "getting a B" in this class.

Addition Rule for mutually exclusive events:

For two mutually exclusive events A and B, the probability that one **or** the other occurs is the sum of the probabilities of the two events.

The general additional rule

The Addition Rule doesn't work for events that aren't mutually exclusive. If the probability of owning a smartphone is 0.50 and the probability of owning a computer is 0.90, the probability of owning a smartphone **or** a computer may be pretty high, but it is not 1.40!

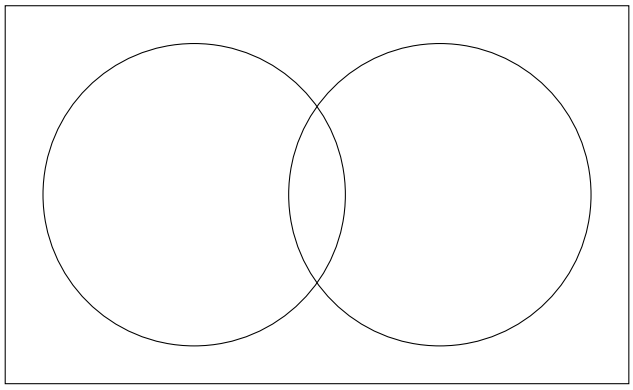
We'd like to generalize the Addition Rule to include events that aren't mutually exclusive.

General Addition Rule:

For any events A and B, the probability that A **or** B occurs is the sum of the probabilities of the two events minus the probability that both A and B occur.

Example 3. A survey of college students asked the questions: "Are you currently in a relationship?" and "Are you involved sports?" The survey found that 33% were currently in a relationship, and 25% were involved in sports. Eleven percent responded "yes" to both.

1. We can use a Venn Diagram to answer the following questions.



What is the probability that a randomly selected student:

(a) is in a relationship **or** is involved in sports?

(b) is not in a relationship and is not involved in sports?

(c) is in a relationship but not involved in sports?

(d) either is in a relationship or is involved in sports, but not both?