Section 13.2 Events Involving “Not” and “Or”

# Objective 1: Find the Probability That an Event Will Not Occur

If we know the probability of an event, , we can determine the probability that the event will not occur, denoted by . The event *not E* is called the complement of *E*. In any experiment, an event must occur or its complement must occur. Therefore, .

**Complement Rules of Probability**

* The probability that an event *E* will not occur is equal to 1 minus the probability that it will occur.



* The probability that an event E will occur is equal to 1 minus the probability that it will not occur.



Using set notation, if  is the complement of *E*, then  and .

a. You are dealt one card from a standard 52-card deck. Find the probability

 i. you are not dealt the ace of spades

 ii. you are not dealt a 2.

b. The table shows the annual income distribution of 95 million households, rounded to the nearest million.



If one household is randomly selected, find the probability that the household income is

 i. not in the $10,000 - $14,999 range.

 ii. less than $100,000.

# Objective 2: Find the Probability of One Event or a Second Event Occurring

If it is impossible for events *A* and *B* to occur simultaneously, the events are said to be **mutually exclusive**.

**“Or” Probabilities with Mutually Exclusive Events**

If *A* and *B* are mutually exclusive events, then .

Using set notation, .

**“Or” Probabilities with Events That are Not Mutually Exclusive**

If *A* and *B* are mutually exclusive events, then .

Using set notation, .

a. You are dealt one card from a standard 52-card deck. Find the probability

 i. the card is the ace of spades or the queen of hearts.

 ii. the card is a red 5 or a black 6.

 iii. the card is a nine or a black card.

 iv. the card is a heart or a face card.

b. The mathematics department of a certain college consists of the following:

 12 professors born in the United States

 14 professors born outside the United States

 13 teaching assistants born in the United States

 6 teaching assistants born outside the United States

If one person is selected at random from this group, find the probability the person is

 i. a professor

 ii. a teaching assistant or born outside of the United States