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.

12 had annual income less than $10000.
8 had annual income from 10000 to 14999 dollars.
10 had annual income from 15000 to 24999 dollars.
19 had annual income from 25000 to 34999 dollars.
5 had annual income from 35000 to 49999 dollars.
18 had annual income from 50000 to 74999 dollars.
18 had annual income from 75000 to 99999 dollars.
5 had annual income above $100000.

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