11.6 Events Involving Not and Or; Odds

Either an event occurs or it does not occur. The event *not E* is called the **complement** of *E*. It is the set of all outcomes in a sample space, *S*, that are not outcomes in the event *E*. If the probability of *E* is known as *,* the probability that the event will not occur can be determined and is denoted by . In any experiment, either an event must occur or its complement must occur.

**COMPLEMENT RULES OF PROBABILITY**

The sum of the probability that an event will occur and the probability that the same event will not occur is 1.



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.



# Objective 1: Find the probability that an event will not occur

# Objective 2: Find the probability of one event or a second event occurring

Two events are **mutually exclusive** if it is impossible for them to both occur. A card chosen from a deck can be a spade or a diamond (or maybe neither), but not both, so the events *spade* and *diamond* are mutually exclusive. A card might be both a king and a spade, or neither, or both so the events *king* and *spade* are not mutually exclusive.

**PROBABILITIES USING *Or* WITH MUTUALLY EXCLUSIVE EVENTS**

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

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**PROBABILITIES USING *Or* WITH EVENTS THAT ARE NOT MUTUALLY EXCLUSIVE**

If *A* and *B* are not mutually exclusive events, then

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# Objective 3: Understand and use odds

Given the probability of an event *E*, the **odds in favor of** or the **odds against** the event occurring can be calculated. Odds are represented as a fraction in lowest terms or as a ratio of numbers separated by a colon (:) or sometimes by the word “to.”

**CALCULATING ODDS**

The **odds in favor of *E*** are found by taking the probability that *E* will occur and dividing by the probability that *E* will not occur.



The **odds against *E*** are found by taking the probability that *E* will not occur and dividing by the probability that *E* will occur.



Note that the odds against *E* is the reciprocal of the odds in favor of *E*.

**CALCULATING PROBABILITY FROM ODDS**

If the odds in favor of an event occurring are *,* then the probability of the event occurring is given by

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