Section 8.3: Introduction to Probability

Terminology

Experiment – an activity or occurrence with an observable result

Trial – each repetition of an experiment

Outcomes – the possible results of each trial

Equally Likely Outcomes – each outcome is equally likely to occur

      Examples: tossing a coin, rolling a die

Sample Space – the set of all possible outcomes for an experiment

      Examples: Sample space for tossing a coin

                     Sample space for rolling a die

                     Sample space for tossing a coin and rolling a die

                     Sample space for a family with three children

Event – a subset of outcomes from a sample space

      Examples: Event of a family with 3 children having exactly 2 girls

                     Event of a family with 3 children having all the same sex

                     Event of a family with 3 children having all girls

Simple Event – an event with only one possible outcome

Certain Event – an event equals the sample space

Impossible Event – an event with no possible outcome

      Examples: Sample space for a die

                     Event of rolling a 4

                     Event of rolling a number less than 10

                     Event of rolling a 7

Mutually Exclusive Events – events that cannot occur at the same time

      Example: tossing a coin and getting a head and tail

Probability – the likelihood that a particular event will occur

$$P(E) = \frac{n(E)}{n(S)} = \frac{\text{number of times event could happen}}{\text{number of total outcomes in sample space}}$$

Examples: P(rolling an even number on a die)

P(rolling a number greater than 4)

P(rolling a number less than 10)

P(rolling an 8)

P(drawing an ace from a deck of cards)

P(drawing a face card)

P(drawing a spade)

P(drawing a spade or heart)

NOTE: $0 \le P(E) \le 1$

Section 8.4 (Part 1):   Properties of Probability

Union Rule for Probability

$$P(E \cup F) = P(E) + P(F) - P(E \cap F)$$
$$P(E \cup F) = P(E) + P(F) \quad \text{if } E \text{ and } F \text{ are mutually exclusive}$$

Examples: If a single card is drawn from a deck of cards, find the probability that it will be red or a face card.

If two dice are rolled, find the probability that the first die shows a 2 or the sum is 6 or 7.

If two dice are rolled, find the probability that the sum is 11 or the second die is 5.

Complement Rule for Probability

$$P(E') = 1 - P(E) \quad \text{or} \quad P(E) = 1 - P(E')$$

Examples: If a die is rolled, what is the probability that any number but 5 will come up?

If two fair dice are rolled, find the probability that the sum of the numbers showing is greater than 3.