Section Overview

Professional Development

Experimental and Theoretical Probability

Lesson 10-5, 10-6

Why? Probability can be used for quality control and helping people determine the likelihood of winning a contest.

Experimental probability = $\frac{\text{number of times the event occurs}}{\text{number of trials}}$

Example: A spinner landed on blue 5 times, red 3 times, and green 2 times. Find the experimental probability of the spinner landing on red.

Experimental probability =

$$\frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{3}{10} = 30\%$$

Theoretical probability = $\frac{\text{number of ways event can occur}}{\text{total number of equally likely outcomes}}$

Example: An experiment consists of rolling a number cube. Find the theoretical probability of rolling a number greater than 4.

Theoretical probability =

$$\frac{\text{number of ways event can occur}}{\text{total number of equally likely outcomes}} = \frac{2}{6} = \frac{1}{3} = 33\frac{1}{3}\%$$

Independent and Dependent Events

Lessons 10-7

Why? Knowledge of whether events are independent or dependent is necessary for choosing the correct probability formula.

Dependent Events
The occurrence of one event ***does*** affect the probability of the other.

Independent Events
The occurrence of one event ***does not*** affect the probability of the other.

Probability of Dependent Events

$$P(A \text{ and } B) = P(A) \cdot P(B \text{ after } A)$$

where $P(B \text{ after } A)$ is the probability of B given that A has occurred.

Probability of Independent Events

$$P(A \text{ and } B) = P(A) \cdot P(B)$$

Combinations and Permutations

Lesson 10-8

Why? Combinations and permutations are used to determine the number of possibilities for phone numbers, passwords, and codes.

The **factorial** of a number is the product of the natural numbers less than or equal to the number. 0! is defined as 1.

$$n! = n \cdot (n-1) \cdot (n-2) \cdot (n-3) \cdot \ldots \cdot 1$$

$$0! = 1$$

A **permutation** is a selection of a group of items in which **order is important.**

The number of permutations of n items taken r at a time:

$$_nP_r = \frac{n!}{(n-r)!}$$

A **combination** is a selection of a group of items in which **order does not matter.**

The number of combinations of n items taken r at a time:

$$_nC_r = \frac{n!}{r!(n-r)!}$$