

## Section 4.4. Discrete Probability

**Note.** In this section we apply some of our counting results to probability.

**Definition.** An *experiment* is a procedure that yields one of a given set of possible outcomes. The *sample space* of the experiment is the set of possible outcomes. An *event* is a subset of the simple space.

**Definition 4.4.1.** The *probability* of an event  $E$ , which is a subset of a finite sample space  $S$  of equally likely outcomes, is  $p(E) = |E|/|S|$ .

**Example.** Page 261 Example 2.

**Example.** In a lottery, 6 numbers are chosen from a set of 43 numbers. What is the probability that you match all 6 numbers? 5? 4? 3? 2? 1? 0?

**Theorem 4.4.1.** Let  $E$  be an event in a simple space  $S$ . The probability of the event  $\bar{E} = S \setminus E$ , the complement of event  $E$ , is  $p(\bar{E}) = 1 - p(S)$ .

**Example.** In a room of 25 students chosen at random, what is the probability that at least two students share the same birthday?

**Theorem 4.4.2.** Let  $E_1$  and  $E_2$  be events in sample space  $S$ . Then

$$p(E_1 \cup E_2) = p(E_1) + p(E_2) - p(E_1 \cap E_2).$$

**Examples.** Page 266 Numbers 12 and 34.

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