**7.3 Using Counting Methods to Find Probabilities – Overview**

**Definitions / Key Ideas**

**Probability review**:

**Complement of an Event**: Consists of all outcomes in the sample space that are *not* in event E.

**Complement Rules of Probability**:

1) *P(E) + P(EC) = 1* 2) *P(E) = 1 – P(EC)* 3) *P(EC) = 1 – P(E)*

**Example 1**: Suppose we are randomly selecting a single card from a standard 52-card deck.

a) Find the probability of a diamond.

b) Find the probability of not a diamond.

**Example 2**: Suppose we collected data on majors of MATH 125 students and are randomly selecting a single student.

|  |  |
| --- | --- |
| **Major** | **Number of Students** |
| Math | 23 |
| Chemistry | 15 |
| Art | 18 |
| English | 20 |

a) Find the probability that the student is NOT an Art major.

b) Find the probability that the student is NOT an English nor Chemistry major.

**Calculating More Probabilities**

Two Approaches: 1) Direct way 2) Counting methods

**Example 1**: Liam and Michael are going to play video games this afternoon. Together, they have 41 video games. If they decide to randomly choose two video games, what is the probability that the two they choose will consist of each of their favorite video games? Assume they have different favorites.

\*\* Solve numerator and denominator separately

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Direct Counting Method

**Example 2**: A box of jerseys for a pick-up game of basketball contains 8 extra-large jerseys, 7 large jerseys, and 5 medium jerseys. If you are first to the box and grab 3 jerseys, what is the probability that you randomly grab 3 extra-large jerseys.

Direct Counting Method

**Example 3**: There are 11 balls numbered 1 through 11 placed in a bucket. What is the probability of reaching into the bucket and randomly drawing two balls numbered 1 and 4 without replacement, in that order?

**Example 4**: Julia sets up a passcode on her smart phone, which allows only six-digit codes. A spy sneaks a look at Julia's smart phone and sees her fingerprints on the screen over six numbers. What is the probability the spy is able to unlock the smart phone on his first try?