Notes 3.1 Basic Concepts of Probability

I. Definitions:

- A _____ is an action through which specific results (counts, measurements, or responses) are obtained.

- The _____ of a single trial in a probability experiment is an _____.

- The set of all possible outcomes is the _____.

- An _____ consists of one or more outcomes and is a _____ of the sample space.

Example 1:
A probability experiment consists of tossing a coin and rolling a six-sided die.
a. Draw a tree diagram to represent the sample space.

b. How many outcomes are in the sample space?

c. List the sample space.

Try It Yourself 1:
A probability experiment consists of recording a response to the survey statement (agree, disagree, no opinion) and gender of the respondent.
a. Draw a tree diagram to represent the sample space.

b. Find the number of outcomes in the sample space.

c. List the sample space.

II. A **simple event** is an event that _____.

Try It Yourself 2:

You ask for a student's age at his or her last birthday. Listed below are two different events:

    Event C: The student's age is between 18 and 23, inclusive

    Event D: The student's age is 20.

For each event, decide how many outcomes are in the event and whether the event is *simple* or not.

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III. The Fundamental Counting Principal

Example 3:
You are purchasing a new car. The possible manufacturers, car sizes, and colors are listed:
      Manufacturer:
      Car size:
      Color:
How many different ways can you select a car?

Try It Yourself 3:
Your choices now include a Toyota, a van, or a tan or gray car. Now, how many different ways can you select a car?

Example 4:
The PIN (personal identification number) for an ATM withdrawal consists of four digits.
Each digit can be 0 through 9.

How many access codes are possible if
    a.   each digit can be used only once?

    b.   each digit can be repeated?

    c.   each digit can be repeated but thei first digit cannot be 0 or 1?

Try It Yourself 4:
How many license plates can you make if a license plate consists of
    a.   six alphabetical letters each of which can be repeated?

    b.   six alphabetical letters each of which can be repeated, but the first letter cannot be A, B, C, or D?

    c.   three alphabetical letters each of which can be repeated, and three digits each of which can be repeated?

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IV. Theoretical (or classical) probability formula:

Example 5:

You roll a six-sided die. What is the sample space? _____

    Find the probability of the following events:

    1. Event A: rolling a 5

    2. Event B: rolling an 8

    3. Event C: rolling a number greater than 1

Try It Yourself 5:

You select a card from a standard deck. How many are in the sample space? _____

    Find the probability of each of the following:

    1. P(seven of diamonds)

    2. P(a diamond)

    3. P(a diamond, heart, club, or spade)

    4. P(not a ten)

IV. Empirical (or _____) Probability is based on _____ from

probability experiments. List the formula for finding empirical probability.

Example 6:

A company is conducting an online survey of randomly selected individuals to determine if traffic congestion is a problem in their community. The results are listed below. What is the probability that the next person that responds to the survey says that traffic congestions is a serious problem in their community?

Response	Number of times
It is not a problem.	82
It is a moderate problem.	115
It is a serious problem.	123

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V. **Law of Large Numbers**

VI. **Summary of probability:**

A probability cannot be _____ or _____.

So the probability of an event E is between _____.

That is, _____.

VII. **Complement of Event E**

You survey a sample of 1000 employees at a company and record the age of each. The results are shown in the frequency distribution. If you randomly select an employee, what is the probability they are not between 25 and 34 years old?

Employees Age	15 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 and over
Frequency	54	366	233	180	125	42

Assignment:

In New Textbook:
Pgs 142 – 147/ 1, 2, 7, 9 – 10, 13 – 15, 35 – 36, 46 – 47, 49 – 50, 53, 59, 64 – 67

In Old Textbook:
Pgs 111 – 113/ 1, 2, 5, 7 – 8,   18 – 19,   21, 29, 31 – 34