Examples for Chapter 3– Probability
Math 1040-1

Section 3.1

1. Draw a tree diagram for each of the following situations. State the size of the sample space.

    (a) You flip a coin three times.

    (b) You draw two balls from an urn and track the colors. When you start, it contains three blue balls and one red ball.

    (c) When selecting your schedule for the fall, you need to decide whether or not to take each of the following classes: Math, Literature, and Psychology.

2. How many different ways are there to deal 5 cards from a standard deck (of 52 cards) if the order of the cards matters?

3. A website login requires that passwords have exactly 6 lowercase letters. How many different passwords are possible?

4. You flip a fair coin 3 times. What is the probability that you flip at least 2 heads? What is the probability that you flip all heads?

5. When drawing a card from a standard deck of cards, what is the probability that it is a diamond? What is the probability that it is between 5 and 10 (inclusive)?

6. After surveying 2000 people, you found that 1250 of them were in favor of a certain proposition, 500 were against it, and 250 were undecided. What is the probability that the next person you survey will be in favor of the proposition?

7. What is the probability that you guess a 6-character password on your first try (as we described earlier)?

8. You flip a fair coin 3 times. What is the complement of flipping at least 2 heads? What is the probability of this event? What is the complement of flipping all heads?

9. The probability that an employee is at least 40 is 0.426 at a certain company. What is the probability that an employee is under 40?

Section 3.2

1. Playing poker with a 5-card hand, you want to know the probability that you get a queen when you replace one card, knowing that you have a queen in your hand, and are trading in a card that is not a queen (which will not be redealt to you).

2. Using a fair coin, what is the probability of flipping 3 heads in a row, knowing that you have already flipped 2 heads?

3. Using the following data, what is the probability that a person you survey has a dog, given that they are male?

Pet Preference

Gender	Dog	Cat	Other Pet	No Pet	Total
Female	120	132	18	30	300
Male	135	70	20	25	250

4. Determine if each of the following pairs of events is independent or dependent.

   (a) Selecting an Ace from a deck of cards (Event A), not replacing it, then selecting a King (Event B).

   (b) Selecting an Ace from a deck of cards (Event A), replacing it, shuffling the deck, then selecting a King (Event B).

   (c) Going to college in Utah (Event A), and growing up in Utah (Event B).

   (d) Today's temperature (Event A), and tomorrow's temperature (Event B).

   (e) A person's gender and the choice of their pet, based on the following data:

   Pet Preference

Gender	Dog	Cat	Other Pet	No Pet	Total
Female	120	132	18	30	300
Male	135	70	20	25	250

5. Two cards are selected from a standard deck without replacement. What is the probability that an Ace is selected, then a King?

6. Calculate the probability that you flip a coin and get a tail, then roll a die and roll either a 2 or 4.

7. Calculate the probability that at least two people in this class (of 25 people) share the same birthday (ignoring leap years).

Section 3.3

1. Calculate each of the following probabilities, and state whether the events are mutually exclusive or not:

   (a) You roll a 5 or a 6 on a standard die.

   (b) You draw a 4 or a heart from a standard deck of cards.

   (c) You draw a spade or a club from a standard deck of cards.

2. The following table shows the Myers-Briggs personality preference and area of study for a random sample of 519 college students.

Myers-Briggs Preference	Arts and Science	Business	Allied Health
IN (introvert, intuitive)	64	15	17
EN (extrovert, intuitive)	82	42	30
IS (introvert, sensing)	68	35	12
ES (extrovert, sensing)	75	42	37

Find each of the following probabilities for a student chosen at random:

(a) The student is an intuitive extrovert.

(b) The student is either a sensing extroverted business major or an intuitive introverted allied health major.

Section 3.4

1. How many different ways are there to order 4 objects?

2. In how many ways can a standard deck of cards be shuffled?

3. In how many ways can you arrange 5 cards from a standard deck of cards?

4. Eight runners are racing in a heat for a sprint. In how many ways can they place in first, second, and third?

5. In how many ways can you draw 10 balls out of an urn, where 4 of the balls are red, and 6 of the balls are green.

6. A teacher who scales grades plans on assigning 3 A's, 4 B's, 4 C's, 3 D's, and 2 E's to her class of 16 students. How many different ways are there to assign grades?

7. An NBA team has 15 people on the roster. How many different starting lineups (of 5 people) are there?

8. Jayden needs to choose 7 of his 20 classmates to play on his soccer team. How many different ways are there to choose his team?

9. In how many ways can a 5-card hand in poker be dealt?

10. What is the probability of being dealt all hearts in a game of poker with a 5-card hand?

11. (Optional example) What is the probability of being dealt 4 of a kind in a 5-card hand in poker?