EXTRA CREDIT (worth 5 exam points): Find and read an article from a newspaper or a magazine related to any topic that we have covered in this class (for example, it can involve a graph, chart, analysis, probability…). Type up at least one paragraph summary and turn it in along with the copy of your article (stapled together).
Due on or before October 8th (Friday) in class. Late work will NOT be accepted (and please do not ask me to accept it late).

3.1 Basic Concepts of Probability and Counting

1. You have a red and black six-sided dice.
   a) Develop the sample space that results from rolling these two dice.
   b) Find all possible outcomes of getting at least 5 with the black dice.
   c) Is "getting the sum of 4" a simple event?

2. How many pairs of letters from the English alphabet (with replacement) are possible? (Disregard the difference between uppercase and lower case letters.)
How will your answer change if replacements are not allowed? What if we make a difference between the uppercase and lowercase letters (without replacement)?

3. The phone numbers in U.S. consists of 10 digits (3 digits area code + 7 digits local number). How many different telephone numbers are possible within each area code, assuming that the local number can not begin with 0 or 1?

4. Restaurant menu has: 5 appetizers, 10 main dishes, 4 desserts, 5 drinks. If you would like to order all 4, how many different meals can you order?

5. Utah license plate contains 6 characters: 1 letter followed by 3 numbers, followed by 2 letters (letters and numbers can repeat). How many different license plates can the state of Utah issue? What happens if letters and numbers can not be repeated?

6. 2 coins (a dime and a nickel) are tossed. Find the probability that a) both coins land heads up, b) you get 1 head and 1 tail ?

7. A card is drawn from a standard deck of playing cards. Find the probability:
   a) the card drawn is an ace,
   b) the card drawn is a diamond,
   c) the card drawn is a diamond, a heart, or a club.

8. Two 6-sided dice (black and white) are tossed. What is the probability that the sum of the two dice is 8?

9. The surgeon tells you that for every 150 surgeries that he/she performs, 6 patients need to come back for the second surgery. If you are the next patient, find the probability that you would need to have the second surgery.

10. How long does it take you to get ready for work/school:

Response	frequency
0-20 min	25
20-40 min	75
40-60 min	37
more than 1hr	15

What is the probability that the next person that answers to the survey says that it takes him/her a) 40-60 min. to get ready? b) 20-40 min. or 40-60 min. to get ready?

11. 2 dice are tossed. Find the probability that their sum is not seven.

12. Assume that the probability of having a boy or a girl is 0.5. In a family of 5 children, what is the probability that:
a) all children are boys,
b) all the children are the same gender,
c) there is at least 1 girl.

13. A probability experiment consists of tossing a coin and rolling a die.
Draw a tree diagram.
Find the following probabilities:
a) tossing a tail and rolling an even number,
b) tossing a head or tail and rolling a number greater than 3,
c) tossing a head or rolling a number greater than 3.
Find the complement of this event (in c).

14. The probability that a manufactured part for the computer is working is 0.992. What is the probability that the part is not working?

15. The heights (in inches) of all males enrolled in history class:

6	5 5 6 6 6 8 9 9 9 9
7	0 0 1 2 2 2 3 4 4 5 5 6 6 7

If a male student is selected at random, find the probability that his height is:
a) at least 69 in.
b) between 70 in. and 73 in. (inclusive)
c) more than 75 in.
d) not 69 in.

3.2 Conditional Probability and the Multiplication Rule

1. Two cards are selected in sequence from a standard deck (52 cards). Find the probability that the second card is an ace, given that the first card is:
   a) a seven (assume that it is not replaced),
   b) an ace (assume that it is not replaced),
What would be the answer in a) and b) if the first card is replaced?

2. Study of the effect of coffee on gall stones:

	Gall stone disease	No disease
No coffee	385	14,068
Coffee	91	4,806

Find the probability that a patient:
a) has a gall stone disease, given that he/she did not consume coffee,
b) does not have a gall stone disease, given that he/she does consume coffee.

3. You are spinning the spinner with numbers 1 through 6. Assume that the spinner cannot stop on a line. You are spinning twice. Find the probability that:
a) the first spin stops on an odd number and the second spin stops on a multiple of 3,
b) the first spin shows a number less than 4 and the sum of 2 spins is equal to 5.

4. The probability that a student will pass organic chemistry class is 0.85.
   3 students are randomly selected. Find the probability that:
   a) all 3 will pass the class,
   b) none of 3 students will pass the class,
   c) at least 1 student will pass.

5. Three people are selected at random. Find the probability:
   a) all 3 are born on Tuesday
   b) all 3 are born on the same day of the week
   c) all 3 are born on a different day of the week

6. A 3 person jury must be selected at random (without replacement) from a pool of 12 people that has 7 men and 5 women. Find the probability of selecting an a) all-female jury, b) all-male jury.

7. You purchase 20 lottery tickets for which the probability of winning some prize on a single ticket is 1 in 10. What is the probability that you have at least 1 winning ticket among the 20 tickets?

8. Find the probability of drawing 3 diamonds in a row from a regular deck of cards
   a) the drawn card is returned to the deck each time
   b) the drawn card is not returned to the deck each time

9. Refer to problem #4. Find the probabilities if you are drawing 3 fives in a row.

10. Of campus professors 60% are male, and of these, 15% work for College of Humanities. Find the following probabilities:

a) randomly selected professor is a male and works for College of Humanities.
b) randomly selected professor is a male and does not work for College of Humanities.
c) randomly selected professor is a female and works for College of Humanities.

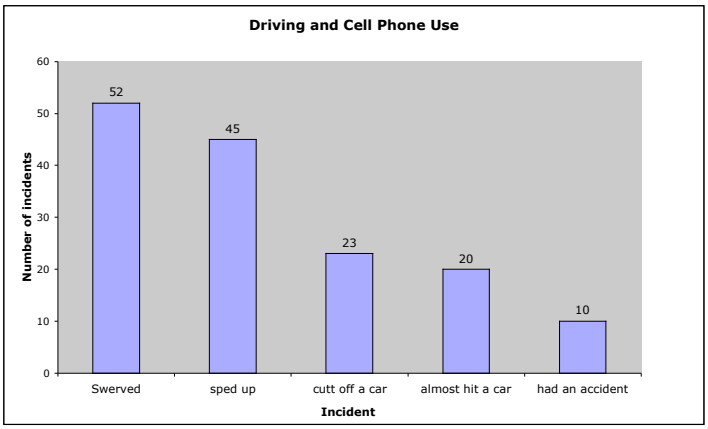
11.

Student ages	Frequency
17 – 26	149
27 – 36	85
37 – 46	46
47 – 56	15
57 and over	5

a) Find the probability that a student chosen at random is between 27 and 36 years old.
b) If 4 students are randomly selected (without replacement), find the probability that all four students are between 37 and 46 years old.
c) If four students are randomly selected (without replacement), what is the probability that at least 1 will be 57 years or older?
d) If four students are randomly selected (without replacement), what is the probability that none of these four students are between 17 and 26 years old?

12. The probability that a person in the U.S. has type A+ blood is 32.5%. Five unrelated people in the U.S. are selected at random. Find the probability that:
a) all five have type A+.
b) none of the five has type A+.
c) at least one of the five has type A+.

13. The following graph shows the types if incidents encountered with drivers using cell phones.



a) Find the probability that a randomly chosen incident involves cutting off a car.
b) Find the probability that two randomly chosen incidents (without replacement) both had an accident.
c) Find the probability that a randomly chosen incident did not involve cutting off a car.

14. The access code for a garage door consists of 5 digits. The first digit can not be 0. Find the probability that you guess the code from the first try?

15. Refer to the problem #15 from 3.1.
Find the probability that 2 randomly chosen male students are both between 69 in. and 73 in. tall.
Find the probability that at least 1 of 2 students is between 69 in. and 73 in. tall.

16. If you roll a 6 sided die 8 times, find the probability that you roll an odd number at least once.

3.3 The Addition Rule

1. Find the probability of rolling either a 2 or a 5 when you roll a single die.

2. Find the probability of drawing either a queen or a spade from a standard deck of cards.

3. You select one person at random from a room with 15 people: 5 blond men, 2 dark hair men, 4 blond women and 4 dark hair women. What is the probability that you will select either a women or a blond person?

4. If you roll a die, find the probability that you roll a number greater than 4 or an odd number?

5. A card is selected at random from a standard deck of cards. Find each probability:
a) Randomly selected card is a black suit or a king.
b) Randomly selected card is a four or a face card.
c) Randomly selected card is a 7 or a king.

6.

	Psychology major	Non-Psychology major
Males	150	9,750
Females	375	11,300

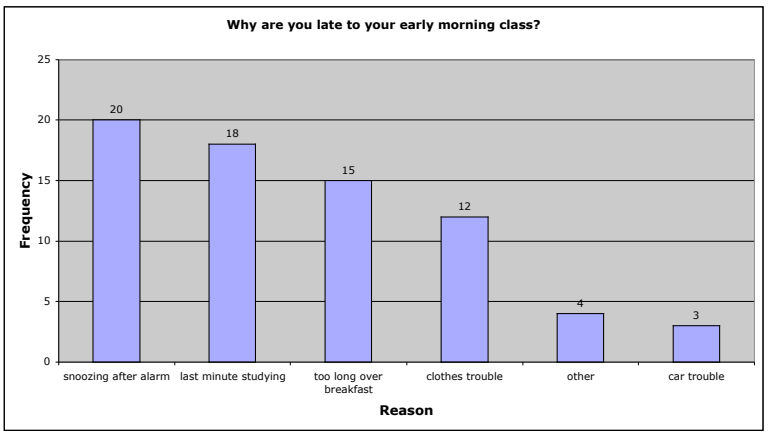
A student is selected at random. Find the following probabilities:
a) the student is a female or a psychology major
b) the student is a male or not psychology major
c) the student is a male and psychology major
d) Given that the student is a female, what is the probability that she is a psychology major?
e) If we select 3 students at random (without replacement), what is the probability that all 3 students are women and majoring in psychology?

7. Sam is playing a game with 2 dice (black and red) and on his next move he needs to throw a sum bigger than 9 in order to win. What is the probability that Sam will win?

8. If you roll a die, find the probability that you roll a number less than 5 or an even number.

9. If we have 3 sets A, B and C, find P (A or B or C).

10. From Section 2.2. we had this Pareto chart:



If you randomly selected a person from a sample, find each probability:

a) The person is late because of last minute studying or clothes trouble.
b) The person is not late because of last minute studying.

If you randomly selected 4 people from the study (without replacement), what is the probability that all 4 were late because of car trouble?

If you randomly selected 4 people from the study (without replacement), what is the probability that all 4 were late because of trouble with clothes?

3.4 Additional Topics in Probability and Counting

1. In how many different ways can we arrange letters A, B, C, D ?

2. We have 4 objects, A, B, C, and D, and we want to make ordered arrangements of 2 objects. How many would we have?

3. How many distinguishable permutations for MATHEMATICS?

4. Suppose you coach a team of 12 swimmers and you need to put together a 4-person relay team. In how many different ways can you do this?

5. Calculate:

$15!=$ $\quad {}_{25}P_3=$ $\quad \dfrac{{}_{10}C_3}{{}_{40}C_3}$

$12!=$ $\quad {}_{40}C_3=$ $\quad \dfrac{15!}{12!}=$

${}_{10}C_3=$ $\quad \dfrac{{}_{40}P_3}{{}_{35}P_7}=$ $\quad \dfrac{18!}{13!}=$

6. The scholarship committee is considering 25 applicants for 3 awards (1st award - \$3,500, 2nd award - \$3,000, 3rd award - \$2,000).
How many different ways are possible to award these scholarships?

7. There are 30 passengers that still need to check-in and get a boarding pass. The airline representative will upgrade 5 passengers to the first class, seats 1B, 1D, 3A, 3C, 4B. In how many different ways can the airline representative do this?

8. 20 runners enter the competition. In how many ways can they finish 1^{st}, 2^{nd}, and 3^{rd}?

9. How many ways can 3 Republicans, 2 Democrats, and 1 Independent be chosen from 10 Republicans, 8 Democrats, and 5 Independents to fill 6 positions on City Council?

10. A security code consists of 2 letters followed by 3 digits. The first letter can not be A, B, or C, and the last digit can not be a 0. What is the probability of guessing the security code in one trial? 2 trials?

11. A shipment of 40 fancy calculators contains 5 defective units. In how many ways can a college bookstore buy 20 of these units and receive:

a) no defective units

b) one defective unit

c) at least 17 good units

d) What is the probability of the bookstore receiving 2 defective units?

12. You are dealt a hand of four cards from a standard deck. Find the probability that:

a) the first three cards are of the same suit and one is of a different suit.
b) three cards are of the same suit and one is of a different suit