Math 3339
Test 1 Review

1. A highway engineer knows that his crew can lay 5 miles of highway on a clear day, 2 miles on a rainy day, and only 1 mile on a snowy day. Suppose the probabilities are as follows: A clear day: .6, a rainy day: .3, a snowy day: .1. What are the mean and variance?

2. The following is a stem-plot of the birth weights of male babies born to the smoking group. The stems are in units of kg.

Stems	Leaves
2	3,4,6,7,7,8,8,8,9
3	2,2,3,4,6,7,8,9
4	1,2,2,3,4,5,6
5	3,5,5,6

   Find the median birth weight.

3. The heights in centimeters of 5 students are:
   165, 175, 176, 159, 172
   Find the sample median, sample mean and sample variance.

4. Newsweek in 1989 reported that 60% of young children have blood lead levels that could impair their neurological development. Assuming a random sample from the population of all school children at risk, find the probability that at least 5 children out of 10 in a sample taken from a school may have a blood level that may impair development.

5. The test grades for a certain class were entered into a Minitab worksheet, and then Descriptive Statistics were requested. The results were:

   MTB> Describe 'Grades'.

	N	MEAN	MEDIAN	TRMEAN	STDEV	SEMEAN
Grades	28	74.71	76.00	75.50	12.61	2.38

	MIN	MAX	Q1	Q3
Grades	35.00	94.00	68.00	84.00

   You happened to see, on a scrap of paper, that the lowest grades were 35, 57, 59, 60, … but you don't know what the other individual grades are. Nevertheless, a knowledgeable user of statistics can tell a lot about the data set simply by studying the set of descriptive statistics above.

   a. Write a brief description of what the results in the box tell you about the distribution of grades. Be sure to address:

         i.   The general shape of the distribution
        ii.   Unusual features, including possible outliers
      iii.   The middle 50% of the data
      iv.   Any significance in the difference between the mean and the median

    b. Construct a boxplot for the test grades.

6. Suppose the probability that a company will be awarded a certain contract is .25, the probability that it will be awarded a second contract is .21 and the probability that it will get both contracts is .13. What is the probability that the company will win at least one of the two contracts?

7. A psychologist interested in right-handedness versus left-handedness and in IQ scores collected the following data from a random sample of 2000 high school students.

	Right-handed	Left-handed	Total
High IQ	190	10	200
Normal IQ	1710	90	1800
Total	1900	100	2000

    a. What is the probability that a student from this group has a high IQ?
    b. What is the probability that a student has a high IQ given that she is left-handed?
    c. Are high IQ and left-handed independent? Why or why not?

8. A VCR manufacturer receives 70% of his parts from factory F1 and the rest from factory F2. Suppose that 3% of the output from F1 are defective while only 2% of the output from F2 are defective.
    a. What is the probability that a received part is defective?
    b. If a randomly chosen part is defective, what is the probability it came from factory F1?

9. A sports survey taken at THS shows that 48% of the respondents liked soccer, 66% liked basketball and 38% liked hockey. Also, 30% liked soccer and basketball, 22% liked basketball and hockey, and 28% liked soccer and hockey. Finally, 12% liked all three sports.
    a. Draw a Venn diagram to represent the given information.
    b. What is the probability that a randomly selected student likes basketball or hockey? Solve this by also using an appropriate formula.
    c. What is the probability that a randomly selected student does not like any of these sports?

10. Donald has ordered a computer and a desk from 2 different stores. Both items are to be delivered Tuesday. The probability that the computer will be delivered before noon is .6 and the probability that the desk will be delivered before noon is .8. If the probability

that either the computer or the desk will be delivered before noon is .9, what is the probability that both will be delivered before noon?

11. A distribution of grades in an introductory statistics class (where A = 4, B = 3, etc) is:

X	0	1	2	3	4
P(X)	.10	.15	.30	.30	?

    a. Find $P(X = 4)$
    b. Find $P(1 \leq X < 3)$
    c. Find the mean grade in this class.
    d. Find the standard deviation for the class grades.
    e. Find the lowest grade X_0 such that $P(X \geq X_0) < 0.5$

12. Suppose you have a distribution, X, with mean = 28 and **standard deviation** =2.1. Define a new random variable Y = 2X + 1.
    a. Find the mean of Y.
    b. Find the **variance** of Y.
    c. Find the standard deviation of Y.
    d. Let W = X + X for X in the above problem. Find the **variance** of W.

13. An appliance store is offering a special price on a complete set of kitchen appliances (refrigerator, oven, stove, dishwasher). A purchaser is offered a choice of manufacturer for each component:

        Refrigerator: Kenmore, GE, LG, Whirlpool
        Oven: KitchenAid, Samsung, Frigidaire, Kenmore
        Stove: Electrolux, Hotpoint, GE
        Dishwasher: Bosch, Silhouette, Premier, Whirlpool

    Use the product rules to answer the following questions:
    a. In how many ways can one appliance of each type be selected?
    b. In how many ways can appliances be selected if none is to be Kenmore?
    c. If someone randomly chooses their appliances, what is the probability that at least one Kenmore component is chosen?

14. Suppose that for events A and B, $P(A) = 0.4$, $P(B) = 0.3$, and $P(A \cup B) = 0.5$.
    a. Compute $P(A | B)$
    b. Are events A and B independent?

15. Inventory for a manufacturer are produced at three different plants, 45% from plant 1, 30% from plant 2, and 25% from plant 3. In addition, each plant produces at different levels of quality. Plant 1 produces 2% defectives, plant 2 produces 5% defectives, and plant 3 produces 8% defectives.
    a. What is the probability that an item is defective?
    b. If an item from the inventory is found to be defective, what is the probability that is was produced in plant 2?

16. An urn has 20 blue marbles and 15 red marbles in it. Determine the probability that if 5 marbles are selected, at least two will be blue.

17. Marie is getting married tomorrow, at an outdoor ceremony in the desert. In recent years, it has rained only 5 days each year. Unfortunately, the weatherman has predicted rain for tomorrow. When it actually rains, the weatherman correctly forecasts rain 90% of the time. When it doesn't rain, he incorrectly forecasts rain 10% of the time. What is the probability that it will rain on the day of Marie's wedding, given the weatherman forecasts rain?

18. The grades of from a random sample of 9 students on a midterm exam (x) and on the final exam (y) are as follows:

x	77	50	71	72	81	94	96	99	67
y	82	66	78	34	47	85	99	99	68

   a) Draw a scatterplot of the relationship between the midterm exam scores and the final exam scores.
   b) From the scatterplot, determine the strength, direction and form of the relationship.
   c) Give the correlation between the scores on the midterm and the scores on the final exam. Describe what this number means.
   d) Determine the least-squares regression line.
   e) Estimate the final exam grade of a student who received a grade of 85 on the midterm exam.
   f) Determine the coefficient of determination. Describe what this number means.

19. An electronics firm claims that the proportion of defective units of a certain process is 5%. A buyer has a standard procedure of inspecting 15 units selected randomly from a large lot. On a particular occasion, the bury found 5 items defective.
   a) What is the probability of this occurrence, given that the claim of 5% defective is correct?
   b) What would be your reaction if you were the buyer?
   c) Determine the expected number of defective items from 15 units selected, given that the claim of 5% defective is correct.