Math 3339
Test 1 Review

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1. A manager notes that there is a .125 probability that any employee will arrive late for work. What is the probability that exactly one person in a six-person department will arrive late?

2. A manufacturer has the following quality control check at the end of a production line: If at least 8 of 10 randomly picked articles meet all specifications, the whole shipment is approved. If, in reality, 85% of a particular shipment meet all specifications, what is the probability that the shipment will make it through the control check?

3. Joe Dimaggio had a career batting average of .325. What was the probability that he would get at least one hit in five official times at bat?

4. An insurance salesperson is able to sell policies to 15% of the people she contacts. Suppose she contacts 120 people during a 2-week period. What is the expected number of policies she sells?

5. 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?

6. Of the automobiles produced at a particular plant, 40% had a certain defect. Suppose a company purchases five of these cars. What is the expected value for the number of cars with defects? The variance?

7. 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.

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

9. 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.

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

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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
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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.

11. 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?

12. 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?

13. 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?

14. 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?

15. 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?

16. 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 $P(1 \le X < 3)$
    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 $P(X \ge X_0) < 0.5$

17. 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.

18. 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?

19. Suppose that for events A and B, $P(A)=0.4$, $P(B)=0.3$, and $P(A\cup B)=0.5$.

a. Compute $P(A\mid B)$
b. Are events A and B independent?

20. Suppose that $p(x,y)=\frac{3x+y}{39}$, x = 1, 2, y = 1,2,3 is the joint pmf of X and Y.

a. Create a contingency table for X and Y.
b. Fill in the marginal values for the table.
c. Find $E[X]$, $E[Y]$, and $E[XY]$
d. Find σ_X, σ_Y, and cov(X,Y)
e. Determine if X and Y are independent.

21. 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?

22. Suppose the random variable X takes on possible values x = 2,4,5,7 and has pmf given by $f(x)=\frac{x+1}{k}$, determine the value of k.

23. 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.

24. The average number of homes sold by the Happy Homes Realty company is 2 homes per day. What is the probability that exactly 3 homes will be sold tomorrow by this company?

25. Suppose that from a group of 9 men and 8 women, a committee of 5 people is to be chosen.
    a. What type of probability distribution is this?
    b. What is the probability that the committee has exactly 3 men and 2 women?

26. A restaurant serves three fixed-price dinners costing \$12, \$15, and \$20. For a randomly selected couple dining at this restaurant, let X = the cost of the man's dinner and Y = the cost of the woman's dinner. The joint pmf of X and Y is given in the following table:

			Y	
$P(x, y)$		12	15	20
	12	0.05	0.05	0.10
X	15	0.05	0.10	0.35
	20	0	0.20	0.10

    c. Compute the marginal pmf's of X and Y.

    d. What is the probability that the man's and the woman's dinner cost at most \$15 each?
    e. Are X and Y independent? Justify your answer.
    f. What is the expected value of the total cost of the dinner for the two people?
    g. Suppose the when a couple opens fortune cookies at the conclusion of the meal, they find the message "You will receive as a refund the difference between the cost of the more expensive and the less expensive meal that you have chosen." How much does the restaurant expect to refund?

27. The weight of a randomly selected bag of corn chips coming off an assembly line is a random variable with mean $\mu = 10$ oz. and standard deviation $\sigma = 0.2$ oz. Suppose we pick four bags at random assume that weight of each of the bags are independent.
    a. What is the mean of the combined weight of these four bags?
    b. What is the standard deviation of the combined weight of these four bags?

28. 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?