

DAWSON COLLEGE – DEPARTMENT OF MATHEMATICS

201-BZS-05  
PROBABILITY AND STATISTICS  
Final Exam

MAY 23rd, 2012  
M.MARCHANT, K. AMEUR

Name: \_\_\_\_\_

Student ID: \_\_\_\_\_

Grade: \_\_\_\_\_

- Please show all work and justify all answers.
- The test is printed on both sides of the sheets.
- Instructions: There are 12 questions. Round all probability and proportion final answers to 4 decimal places. Be sure to justify using z, t or chi-square distributions.

Question 1 (10 points)

Consider the following data set:

219	225	222	243	234	241	231	235	234
231	240	231	246	232	229	233	233	226
227	230	229	227	218	216	234	240	

For this data set find the:

- Median
- Mode
- 90<sup>th</sup> percentile
- 5 number summary , 1, , 3,

Question 2 (10 points)

Stride rate (number of steps per second) is important to the serious runner. Stride rate is closely related to speed, and a runner's goal is to achieve the optimum stride rate. As part of a study, researchers measured the stride rate at seven different speeds for 21 top female runners. The average stride rates for these women and the test speeds are listed in the table below.

- Find the coefficient of linear correlation and interpret this coefficient.
- Find the equation of the line of best fit.
- Using the result obtained in b, predict the average stride rate if the speed is 3.5 feet per second.
- Using the result obtained in b, predict the average stride rate if the speed is 0 feet per second. Interpret your result. Does the result make sense? Explain.

Average Stride Rate (steps/sec)	Speed (ft/sec)
3.05	15.86
3.12	16.88
3.17	17.5
3.25	18.62
3.36	19.97
3.46	21.06
3.55	22.11

The following sums may be useful:

$$\begin{array}{r} 22.96 \\ 75.512 \\ 435.4859 \end{array} \quad \begin{array}{r} 132 \\ 2520.6050 \end{array}$$

Note: Round final answers to 4 decimal places.

Question 3 (8 points)

A company has 10 identical machines that produce nails independently. The probability that a machine will break down on a given day is 0.1. Define a random variable  $X$  to be the number of machines that will break down in one day.

- a. What is the appropriate probability distribution for  $X$ ?
- b. Compute the probability that less than 4 machines will break down.
- c. What is the expected number of machines that will break down?
- d. What is the probability that more than the expected amount will break down?

Question 4 (8 points)

A pair of fair dice is rolled once.

Let  $E$  = the event of a sum of 8

Question 5 (8 points)

In a recent survey in a Statistics class, it was determined that only 60% of the students attend class on Monday morning. From past data it was noted that 95% of those who went to class on Monday mornings passed the course, while only 45% of those who did not go to class on Monday mornings passed the course.

- (a) What percentage of students is expected to pass the course?
- (b) Given that a person passes the course, what is the probability that he/she attended classes on Monday mornings?

Question 6 (5 points)

From a shipment of 20 new TV's, 3 are selected at random for testing. 2 TV's in the shipment are in fact defective. The shipment is only accepted if all 3 tests turn out OK. What is the probability that the shipment will be accepted?

Question 7 (6 points)

Consider the following function:

Question 8 (9 points)

The age in years of a randomly selected alcohol-impaired driver in a fatal crash is a random variable with probability density function given by:

$$f(x) = \frac{1}{36} - \frac{x}{18} \quad 0 \leq x \leq 36$$

0

- Find the value of  $k$  such that  $f$  is a probability distribution.
- Find the average age of an alcohol-impaired driver in a fatal crash.

Question 9 (8 points)

On the average, 6.7 cars drive by an intersection on a street every hour. Define the random variable  $X$  to be the number of cars that drive by the intersection in any hour.

- a. What is the appropriate probability distribution for  $X$ ?
- b. Compute the probability that exactly 5 cars will drive by in the next hour.
- c. Compute the probability that exactly 10 cars will drive by in the next two hours.

Question 10 (8 points)

A random sample of 192 emergency cases at a Montreal hospital included 56 serious ones requiring admittance.

- a) A report states that more than 35% of emergency cases are serious ones. Does the data support this report? Conduct a test of Hypothesis using  $\alpha = 0.05$ . Use the p-value approach.
- b) Construct a 95% confidence interval estimate of the true percentage of this hospital's emergency cases that are serious ones.

Question 11 (8 points)

A sample of 14 gas stations in Quebec were found to have a mean price for self-serve gasoline of \$1.36 per litre with  $s = \$0.04$ . A sample of 15 gas stations in Alberta were

