

**BRONX COMMUNITY COLLEGE**  
of the City University of New York

**DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE**

MATH 23  
Fall 2014

Third Exam  
Day (1.5 Hours)

1. (10 points) For the sample data  $X = \{2, 15, 25\}$ 
  - (a) Find the sample mean  $\bar{x}$ .
  - (b) Find the sample standard deviation  $s$ .
  - (c) Would you say that the data is consistent with the mean? Explain.
2. (10 points) The following data relates pension contribution (x) in thousands of dollars to the percent of taxable income (y).

x	5	11	3.5
y	2	1.5	4

- (a) Draw the scattered plot of the set of data.
  - (b) Using the graph would you estimate the correlation to positive, negative or zero? Explain your answer.
  - (c) Compute the coefficient of linear correlation to support your answer in part (b).
3. (10 points) The following probability distribution represents the claim sizes (x) for an auto insurance policy.

x	2	3	4
P(x)	.2	.35	.45

- (a) Sketch the graph of the distribution.
  - (b) Calculate the expected value of the distribution.
  - (c) Calculate the standard deviation.
4. (20 points) The following table represents the distribution of students at a local school:

	Male	Female
Junior	18	20
Sophomore	10	12
Senior	16	18

Find the probability that a randomly selected student is:

- (a) A male (M)?
- (b) A Sophomore(SP)?
- (c) not a Sophomore?

- (d) A junior (J)?
- (e) A junior and a senior (J and S)? How do you call this type of event?
- (f) A junior or a senior (M or F)? How do you call this type of event?
- (g) Junior and male (J and M)?
- (h) A junior or a male (J or M)?
- (i) Are the events “M=the selected student is a male” and “J=the selected student is a junior” mutually exclusive? Explain.
5. (10 points) An entrance exam requires two tests: Math and English. The probability of passing the English test is .45 and the probability of passing the Math test for student that already passed the English is .87.
- (a) What is the probability of passing both tests?
- (b) If the probability of passing the Mathematic test (without any conditions) is .55. What is the probability of passing English for students that already passed Math?
- (c) Are the events “E=passing the English exam” and “M=passing the Math Exam” independent? Explain your answer.
6. (10 points) Suppose that the probability of a hurricane in a calendar year is  $p = .05$ . Find the probability that, in a 10-year period, we have:
- (a) Exactly 3 hurricanes.
- (b) At least 3 hurricanes.
7. (10 points) Sketch a graph that represents the following probabilities, when  $z$  is distributed normal standard and find the actual probabilities
- (a)  $P(z < 1.75)$
- (b)  $P(z > 1.83)$
- (c)  $P(-0.41 < z < 1.32)$
8. (5 points) Let  $Z$  have a standard normal distribution. Given the following probability draw an appropriate diagram, shade the appropriate region and determine the value of  $Z_c$ .
- (a)  $P(0 < Z < Z_c) = .3830$
- (b)  $P(Z_c < Z < 0) = .2776$
9. (10 points) The average salary for first-year teacher is 28,340. If the distribution is approximately normal with  $\sigma = 3250$ , what is the probability that a randomly selected first-year teacher makes these salaries?
- (a) Less than 20,000 a year
- (b) Between 20,000 and 35,000 a year.
10. (5 points) Let  $X$  be a random variable representing the mileage of a new model of car. To study  $X$ , a random sample of 40 cars was tested. A sample mean  $\bar{x} = 34.1$  mpg was found. The standard deviation  $\sigma$  of the entire population is known to be  $\sigma = 1.6$  mpg.
- (a) What can you say about the  $\bar{X}$ -distribution? What would be the approximated values of the mean  $\mu_{\bar{X}}$  and the standard deviation  $\sigma_{\bar{X}}$ ?
- (b) Construct a 98% confidence interval for the actual mean  $\mu$  of the population of this model of automobile.