

BRONX COMMUNITY COLLEGE
of the City University of New York

DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

MATH 23
Fall 2017 (J.P.)

Fourth Exam
Due Date: 12/06/2017

Directions: The exam totals 100 points. You *must* show all your work for full credit. Use the tables and formula sheets provided

Print Name: _____

1. (10 points) For the sample data $X = \{17, 15, 25, 12, 33\}$
 - (a) Find the median.
 - (b) Find the sample mean \bar{x} .
 - (c) Find the sample standard deviation s .
2. (10 points) The following data relates pension contribution (x) in thousands of dollars to the percent of taxable income (y).

| | | | | | |
|---|-----|-----|-----|-----|-----|
| x | 9 | 12 | 3.3 | 15 | 6.2 |
| y | 7.2 | 5.5 | 9.1 | 5.2 | 8 |

- (a) Plot the scatter diagram of the set of data.
 - (b) Based on the scatter diagram, would you estimate the correlation coefficient to be positive, negative or close to zero? Explain your answer.
3. (10 points) A baseball player hits the ball 35% of the time.
 - (a) In 10 opportunities, what is the probability of connecting more than 2 hits?
 - (b) What is the expected value of the number of hits in 10 chances?
 - (c) What is the standard deviation?
4. (10 points) In a sample of 340 individuals under the age of 40, each person was classified according to age and gender. We obtained the following table:

| | | | | | |
|--------|--------------|---------------|---------------|---------------|-------|
| | 0 - 10 years | 10 - 20 years | 20 - 30 years | 30 - 40 years | Total |
| Female | 45 | 82 | 18 | 50 | 195 |
| Male | 37 | 46 | 46 | 16 | 145 |
| Total | 82 | 128 | 64 | 66 | 340 |

Find the probability that a randomly selected individual from that sample is:

- (a) A male.
- (b) In the range of age from 10 - 20 years.

- (c) A female with age between 10 and 20 years.
 - (d) A female or in the group of age from 10 to 20.
 - (e) A male, given that the age is between 30 and 40.
 - (f) Of age between 30 and 40, given male.
 - (g) Determine if the events, selecting a male (M) and selecting an individual between 30 and 40 (T) are independent. Explain your answer.
 - (h) Determine if the events, selecting a male (M) and selecting an individual between 30 and 40 (T) are mutually exclusive. Explain your answer.
 - (i) Give an example of two mutually exclusive events when selecting a random individual from this sample.
5. (10 points) Let x be a random variable that represents the level of glucose in the blood (milligrams per deciliter of blood) after a 12 hour fast. The random variable x has a distribution that is approximately normal with $\mu = 85$ and $\sigma = 20$.
- (a) What is the probability that x is more than 60?
 - (b) Suppose that a doctor uses the average \bar{x} for a sample of $n = 4$ tests, taken a week apart. What type of distribution does \bar{x} have? What are the values of $\mu_{\bar{x}}$ and $\sigma_{\bar{x}}$?
 - (c) What is the probability that $75 < \bar{x} < 100$?
6. (5 points) A company is looking to hire more sales staff. The human resources department accepts only the 45% of the submitted resumes that meet the hiring criteria. Of all resumes received only 4% go to an interview, on the other hand of the resumes accepted by HR 20% come in for an interview. What is the probability that an applicant selected at random will have her resume accepted by HR and be granted an interview?
7. (5 points) In one high school, the athletic director found that 5% of the varsity athletes had concussions while playing at the school and 19% had severe sprains and 2% had experienced both. What is the probability that a randomly selected varsity athlete has either a concussion or a severe sprain?
8. (10 points) Computer Depot is a large store that sells and repairs computers. A random sample of 100 computer repair jobs took technicians an average of $\bar{x} = 93.2$ minutes per computer. Assume that σ is known to be 16.9 minutes. Find a 95% confidence interval for the population mean time μ for computer repairs.
9. (10 points) Let X be a random variable representing the mileage of a new model of car. To study X , a random sample of 36 cars was tested. A sample mean $\bar{x} = 33.7$ mpg was found. The sample standard deviation is known to be $s = 1.6$ mpg. Find a 90% confidence interval for the average mileage of this model.
10. (10 points) A researcher reports that the average salary of assistant professors is more than 42,000. A sample of 30 assistant professors has a mean salary of 43,260. The standard deviation of the population is 5230. At $\alpha = 0.05$, test the claim that assistant professors earn **more** than 42,000.00 a year.
- (a) State the null and alternate hypothesis.
 - (b) What is the value of the sample test statistic ?

- (c) Find the P-value of the test statistic or show the critical region on a graph.
 - (d) Based on your answers in parts (a), (b) and (c), will you reject or fail to reject the null hypothesis? Explain your answer.
11. (10 points) The average annual salary of employees at a retail store was \$28,000 last year. This year the company opened another store. Suppose a random sample of 16 employees had an average annual salary of $\bar{x} = \$26,000$ with sample standard deviation of $s = \$3730$. Use a level of significance $\alpha = 5\%$ to test the claim that the average annual salary for all employees is **different** from last years average salary. Assume salaries are normally distributed.
- (a) State the null and alternate hypothesis.
 - (b) What is the value of the sample test statistic ?
 - (c) Find the P-value of the test statistic or show the critical region on a graph.
 - (d) Based on your answers in parts (a), (b) and (c), will you reject or fail to reject the null hypothesis? Explain your answer.