

Fall 2018  
MATH-333 (Common Exam. #2)

November 14, 2018  
NJIT

Q. # 1	#2	#3	#4	#5	#6	Total
19	12	13	21	19	16	

This exam is closed book and closed notes. Basic calculator is allowed.

Formula sheet is provided with the exam. You will need to show work to get full credit.

Use of advanced/programmable/graphing calculators and other electronic devices is not permitted during the exam.

Name (PRINT) _____ Last First	Section # _____
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**Problem 1) This problem has three independent parts a), b), and c)**

**a)** To qualify for a police academy, candidates must score in the top 10% on a general abilities test. The test has a mean of 200 and a standard deviation of 20. Find the lowest possible score to qualify. Assume the test scores are normally distributed. **(Round your answer to the nearest integer) The answer is closest to (7 points)**

- a)** 174    **b)** 26    **c)** 226    **d)** 200    **e)** none of the other options

**PLEASE SHOW WORK TO GET FULL CREDIT**

**b)** The wait time customers experience when calling into a computer help hotline is distributed uniformly between 0 and 15 minutes. Find the expected wait time a user will experience. **(Round your answer to one decimal place) (5 points)**

**c)** Assume that the heights of students at a high school are normally distributed, with mean 65 inches and standard deviation 2.5 inches. If 5 students are randomly selected, what is the probability that fewer than 2 are taller than 65 inches? **(Round your answer to four decimal places) (7 points)**

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**Problem 2)** The average time it takes a group of adults to complete a certain achievement test is 46.2 minutes. The standard deviation is 8 minutes. Assume that the variable is normally distributed.

i) Find the probability that a randomly selected adult will complete the test in less than 43 minutes. **(6 points)**  
**(Round your answer to four decimal places)**

ii) Find the probability that if 50 randomly selected adults take the test, the mean time it takes the group to complete the test will be less than 43 minutes. **(6 points)** **(Round your answer to four decimal places)**

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**Problem 3) This problem has two independent parts a) and b)**

**a) Of the total population of the United States, 20% live in the northeast. If 200 residents of the United States are selected at random, approximate the probability that at least 50 live in the northeast. (7 points) (Round your answer to four decimal places) *The answer is closest to***

- i) 0.0465    ii) 0.0386    iii) 0.0317    iv) 0.9535    v) 0.9614    vi) none of the other options

**b) Phone lines to a computer help desk are not occupied 60% of the time. Assume that calls to the help desk are independent. Suppose ten random calls are placed to the help desk. What is the probability that the lines are occupied for exactly three of these calls? (6 points) (Round your answer to three decimal places)**

**Problem 4) This problem has two independent parts a) and b)**

- a) The number of stork sightings on a certain route follows a Poisson distribution with a mean of 2 per year.  
i) What is the mean time between sightings? **(5 points)**

- ii) What is the probability that there are two sightings in three years? **(5 points) (Round your answer to four decimal places)**

b) The cumulative distribution function (cdf) of a random variable  $X$  is given below:

$$F(x) = \begin{cases} 0, & x < 0 \\ \frac{1}{8}x^3, & 0 \leq x < 2 \\ 1, & x \geq 2 \end{cases}$$

- i) Obtain the probability density function of  $X$ ,  $f(x)$  **(5 points)**

- ii) Find  $P(x > 1)$  **(6 points) (Round your answer to three decimal places)**

**Problem 5) This problem has two independent parts a) and b)**

**a) The time between calls to a research laboratory is exponentially distributed with a mean of 10 minutes.**

**i) What is the probability that there are no calls within 30 minutes? (6 points) (Round your answer to four decimal places)**

**ii) Determine  $x$  such that the probability that there are no calls within  $x$  minutes is 0.01. (7 points) (Round your answer to three decimal places)**

**b) The article on polygraph testing indicated that the probability of a false-positive (a trustworthy person who nonetheless fails the test) is 0.15. Let the random variable  $X$  denote the number of trustworthy people tested until someone fails the test. What is the probability that the first false-positive will occur when the third person is tested? (6 points) (Round your answer to four decimal places)**

**Problem 6) This problem has two independent parts a) and b)**

- a) The proportion of time  $X$  that an industrial robot is in operation during a 40-hour work week is a random variable with probability density function

$$f(x) = 2x \quad 0 \leq x \leq 1$$
$$= 0 \quad \text{elsewhere}$$

- i) Find the expected value of  $X$ ,  $\mu$  or  $E(X)$  (5 points) (Round your answer to three decimal places)

- ii) Find the variance of  $X$ ,  $\sigma^2$  or  $V(X)$  (6 points) (Round your answer to four decimal places)

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- b) Let the random variable  $X$  denote lifetime of devices manufactured by a company. The probability density function of  $X$  is given by

$$f(x) = \begin{cases} \frac{1}{2}e^{-x/2} & x > 0 \\ 0 & \text{elsewhere} \end{cases}$$

Obtain the cumulative distribution function of  $X$ ,  $F(X)$ . (5 points)



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Extra Space (ANY "Rough Work" must be crossed out)

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