Fall 2018 **October 10, 2018**
MATH-333 (Common Exam. #1) **NJIT**

Q. # 1	#2	#3	#4	#5	#6	Total
16	24	11	16	16	17	

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) ____________________________________ **Section #** ______
Last **First**

Instructors: Sirag Mahmood, Matthew Michal, Padma Natarajan, Jonathan Porus, Donivyn Schmidt

Problem 1) Ann, Jay, and Russell are three physicians at a wellness clinic. Dr. Ann consults with 40% of the patients, Dr. Jay consults with 25% of the patients, and Dr. Russell consults with 35% of the patients. Further, 10% of Dr. Ann's patients do not have medical insurance from his/her employer, while 15% of Dr. Jay's patients and 20% of Dr. Russell's patients do not have medical insurance from his/her employer.

i) What is the probability that a randomly selected patient at the wellness clinic does not have medical insurance from his/her employer? (**Round your answer to four decimal places) (8 points)**

ii) If a randomly selected patient at the wellness clinic has medical insurance from his/her employer, what is the probability that the patient consulted Dr. Russell? (**Round your answer to four decimal places) (8 points)**

Problem 2) This problem has two independent parts a) and b)

a) The following table summarizes the results of a medical diagnostic test for Lyme disease on 100 people at a hospital. Complete the table and answer the questions below:

	Test Results		
True disease status	**Lyme disease (Test Positive) (T)**	**No Lyme disease (Test Negative) (T')**	**Total**
Lyme disease (D)	6	4	
No Lyme disease (D')		82	
Total			

i) What is the probability that a randomly chosen person will test positive for Lyme disease? **(1+ 5 = 6 points)** **(Round your answer to two decimal places)**

ii) A randomly chosen person tests negative for Lyme disease. What is the probability that the person does not have the Lyme disease? **(6 points)** **(Round your answer to four decimal places)**

b) Suppose there are 50 students enrolled in the statistics course, 45 students enrolled in the humanities course, and 10 in both. If a student is randomly selected from this group of 100 students,

i) What is the probability that the student is enrolled in none of the two courses? (**6 points**) (**Round your answer to two decimal places)**

ii) What is the probability that the student is enrolled in at least one of the two courses? (**6 points**) (**Round your answer to two decimal places)**

Problem 3) The stem and leaf plot of a sample of 35 student scores on a statistics test is given below:

```
Stem-and-leaf of Scores  N  = 35
Leaf Unit = 1.0


 3     3 | 235
 7     4 | 2568
 13    5 | 234457
(11)   6 | 23456788999
 11    7 | 4679
 7     8 | 2499
 3     9 | 247
```

i) Find the median score **(5 points).**

ii) What would the interquartile range be if the leaf unit was 10 instead of 1? **(6 points)**

Problem 4) (This problem has three independent parts i, ii, and iii)

i) (5 points) Consider two mutually exclusive events, *G* and *H*. Assume that P(H) > 0. Then, we have *P(G|H)* = ______. (**circle only one option**)

a) *P(G)*

b) *P(G) / P(H)*

c) 0

d) *P(H)*

e) 1

ii) (5 points) 18% of all students in a school play baseball, 32% of all students play soccer. The probability that a student plays baseball given that the student plays soccer is 22%. The probability that a student plays either baseball or soccer is closest to. (**circle only one option**)

a) 0.10

b) 0.46

c) 0.43

d) 0.28

e) 0.50

iii) (6 points) In the population of young children eligible to participate in a study of whether their calcium intake is adequate, 54% are *5 to 10 years* of age and 46% are *11 to 13 years* of age. For those who are *5 to 10 years* of age, 19% have inadequate calcium intake. For those who are 11 to 13 *years* of age, 56% have inadequate calcium intake. Let A denote "*5 to 10 years old*" and A^c denote "*11 to 13 years old*". (these are the only two age groups under consideration). Let C denote "*adequate calcium intake*" and C^c denote "*inadequate calcium intake*". Obtain $P(C^c)$. (**Round your answer to four decimal places**)

Problem 5) (This problem has two independent parts i and ii)

i) The standard deviation of scores for a sample of 11 students on a statistics quiz was found to be 3.67. If the instructor added 10 points to all the scores, how does it change the sample standard deviation? **(4 points)**

a) The standard deviation will remain the same, i.e., 3.67

b) The standard deviation will become 13.67

c) The standard deviation will become 10

d) The standard deviation will become 0.367

e) None of the options given above

ii) The random variable X, denoting the number of relays closing properly has the cumulative distribution function F(x) given as:

$$F(x)=\begin{cases} 0 & x<0 \\ 0.04 & 0\le x<1 \\ 0.36 & 1\le x<2 \\ 1 & 2\le x \end{cases}$$

a) Obtain the probability mass function of X, f(x) **(3 points)**

b) Obtain $P(X < 1)$ **(4 points)** **(Round your answer to two decimal places)**

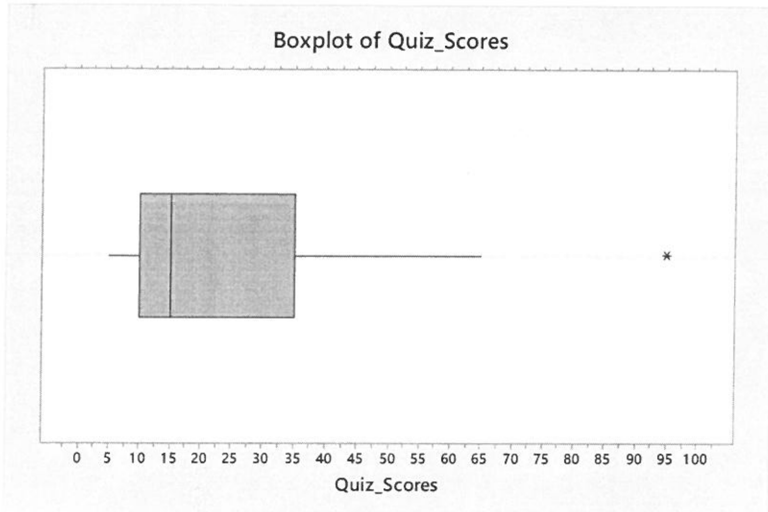
c) Obtain $P(1 \le x \le 2)$ **(5 points)** **(Round your answer to two decimal places)**

Problem 6) This problem has three independent parts a), b), and c)

a) A manufacturing lot of 1000 articles have 100 defectives and remaining good ones. If a sample of 10 articles are randomly selected without replacement from the lot, what is the probability that the sample will contain no defectives? **(6 points) (Round your answer to four decimal places)**

b) A pair of fair six-sided dice is rolled and a random variable X, the sum of points that turn up, is observed. Obtain the probability distribution of the random variable X. **(6 points)**

c) Use the box-and-whisker plot below to determine which statement is accurate



Which of the following statements are true? **(5 points)**

I. The interquartile range is 25
II. The median is 10
III. The distribution is skewed left

Circle the option that applies:

(A) I only (B) II only (C) III only (D) I and III (E) II and III (F) I and II

(G) None of the above options apply

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

Fall 2018 MATH 333 Formula Sheet Exam 1

1. $$s^2 = \frac{\sum_{i=1}^{n}\left(x_i - \bar{x}\right)^2}{n-1} \quad or \quad s^2 = \frac{\sum_{i=1}^{n} x_i^2 - \frac{(\sum_{i=1}^{n} x_i)^2}{n}}{n-1}$$

2. $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
   $P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(A \cap C) - P(B \cap C) + P(A \cap B \cap C)$

3. $P(A \cap B) = P(B|A)\,P(A) = P(A|B)\,P(B)$

4. $P(B \mid A) = \frac{P(A \cap B)}{P(A)}$ *for* $P(A) > 0$

5. For positive integers n and r, with $n \geq r$,
   a. $P_r^n = \frac{n!}{(n-r)!}$
   b. $C_r^n = \binom{n}{r} = \frac{n!}{r!(n-r)!}$

6. a) $P(B) = P(B \cap A) + P(B \cap A') = P(B \mid A)P(A) + P(B \mid A')P(A')$

   b) If $E_1, E_2, .., E_k$ are k mutually exclusive and exhaustive subsets, then
   $P(B) = P(B \cap E_1) + P(B \cap E_2) + ... + P(B \cap E_k) = P(B \mid E_1)P(E_1) + P(B \mid E_2)P(E_2) + ... + P(B \mid E_k)P(E_k)$

7. If $E_1, E_2, \ldots E_k$ are k mutually exclusive and exhaustive events and B is any event
   $$P(E_1 \mid B) = \frac{P(B \mid E_1)P(E_1)}{P(B \mid E_1)P(E_1) + P(B \mid E_2)P(E_2) + \ldots + P(B \mid E_k)P(E_k)} \quad \text{for } P(B) > 0$$

8. For a discrete random variable X, $F(x) = P(X \leq x) = \sum_{x_i \leq x} f(x_i)$

9. For a discrete random variable X, $\mu = E(X) = \sum_x x f(x)$

10. For a discrete random variable X,
    $$\sigma^2 = V(X) = E(X-\mu)^2 = \sum_x (x-\mu)^2 f(x) = \sum_x x^2 f(x) - \mu^2 \qquad \sigma = \sqrt{\sigma^2}$$

11. For a discrete random variable X, $E[h(X)] = \sum_x h(x) f(x)$

12. Discrete Uniform Distribution on the consecutive set of integers a, a+1, a+2, ...,b for $a \leq b$:
    $$f(x) = \frac{1}{(b-a+1)}, \qquad \mu = E(X) = \frac{b+a}{2}, \qquad \sigma^2 = \frac{(b-a+1)^2 - 1}{12}$$