American University of Beirut
Math 204
Quiz II (Fall 2011)

Time 50 minutes.

Name: _____ **ID#:** _____

Instructor: N. Fuleihan

❖ **Circle your problem solving section number below:**

Section 13 8:00 Tu Section 14 9:30 Tu

Section 15 11:00 Tu

Solution

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7	/18
Total	/ 100

1- In how many ways can a supermarket manage display 5 brands of cereals in 3 spaces on a shelf?

(2 pts)

$$_5P_3$$

2- Out of 5 mathematicians and 7 engineers, a committee of 2 mathematicians and 3 engineers is to be formed. In how many ways can this be done if:

(7 pts)

a. Any mathematician and any engineer can be included?

2

$$_5C_2 \times {}_7C_3$$

b. One particular engineer must be in the committee?

3

$$_5C_2 \times {}_6C_2$$

c. Two particular mathematicians cannot be in the committee?

2

$$_5C_2 \times {}_7C_3$$

3- The probability of obtaining 0 defectives in a sample of 40 items is 0.34. The probability of obtaining 1 defective item in the sample is 0.46. What is the probability of

(5 pts)

a. Obtaining not more than 1 defective item in the sample?

2

$$0.34 + 0.46 = 0.8$$

b. Obtaining more than 1 defective item in the sample?

$$1 - 0.8$$

3

4-

(5 pts)

a. How many distinct ways can the letters of the word PEOPLE be arranged so that the two P's are together and the two E's are together/

3 $4!$

b. How many words can be formed with the letters of the word PEOPLE?

2 $\frac{6!}{2!2!}$

5- A bag contains 6 white marbles, 5 red marbles and 4 blue marbles. 3 marbles are selected without replacement. What is the probability that all the 3 marbles are of the same color?

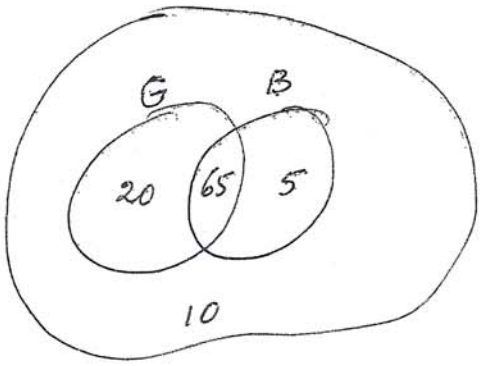
(4 pts) $\left(\frac{6}{15}\right)\left(\frac{5}{14}\right)\left(\frac{4}{13}\right) + \left(\frac{5}{15}\right)\left(\frac{4}{14}\right)\left(\frac{3}{13}\right) + \left(\frac{4}{15}\right)\left(\frac{3}{14}\right)\left(\frac{2}{13}\right)$

6- In New England, Out of 100 houses, 85 have a garage, 5 have backyard only and 65 have a garage and a backyard. What is the probability that a house

(9 pts)

a. has a backyard ?

2 $\frac{70}{100}$



b. has a backyard or a garage?

2 $\frac{90}{100}$

c. has neither garage nor a backyard?

2 $\frac{10}{100}$

d. has a backyard given that it has a garage?

3 $P(B|G) = \frac{P(B \cap G)}{P(G)} = \frac{65}{85}$

7- The names Salwa (S), Ghada (G). Rami (R) and Bassem (B) are written on slips of paper and placed in a box. Two names are to be drawn as representative of a club

(13 pts)

a. Determine a sample space for the experiment

$\{SG, SR, SB, GR, GB, RB\}$

3

b. What is the probability that the names drawn are Salwa and Bassem?

$\frac{1}{6}$

2

c. What is the probability that Ghada was one of the two?

$\frac{3}{6}$

2

d. What is the probability that both are male?

$\frac{1}{6}$

2

e. What is the probability that neither Salwa nor Rami were selected?

$\frac{1}{6}$

2

f. What is the probability that Salwa is selected given that one female is selected?

$\frac{S \cap \text{female}}{\text{female}} = \frac{\#3}{5}$

2

8- The students in Math 204 are classified according to their major and class.

(16 pts)

a. Find the missing numbers in the following table:

Major	Class				
	Freshman (F)	***Sophomore(S)***	***Junior (J)***	***Senior (S)***	**Total**
Economics(E)	6	4	3	7	20
Business(B)	8	3	7	6	24
Nutrition (N)	4	3	9	0	16
Total	18	10	19	13	60

3 Use the table to calculate the probability that one student is selected at random and is:

b. Junior and the major Nutrition

2 $\frac{9}{60}$

c. Senior or the major is Business

3 $\frac{13}{60} + \frac{24}{60} - \frac{6}{60}$

d. Freshman or Sophomore given that the major is Economics

2 $P((F \cup S) \cap E) = \frac{10}{20}$

$P(E)$

e. Sophomore or the major is not Nutrition.

3 $\frac{10}{60} + \frac{44}{60} - \frac{7}{60}$

f. The major is not Business given that he is Sophomore

3 $\frac{7}{10}$

9- What are the characteristics of a binomial distribution

(3 pts)

10- Five percent of all DVD players manufactured by a large electronics company are defective. A quality control inspector randomly selects five DVD players from the production line. (18 pts)

a. Find the probability that one to three DVD players in the sample are defective

3

$p=0.05$

$P(x=1) + P(x=2) + P(x=3)$

${}_5C_1 (0.05)(0.95)^4 + {}_5C_2 (0.05)^2(0.95)^3 + {}_5C_3 (0.05)^3(0.95)^2$

b. Find the probability that at most two DVD players in the sample are defective

$P(X=0) + P(x=1) + P(x \geq 2)$

3

c. Find the probability that at least three DVD players in the sample are defective

$P(x \geq 3) = 1 - P(x < 2)$

3

d. Find the probability that exactly 2 selected DVD players are **not** defective?

2

$p=0.95$

$P(x=2) = {}_5C_2 (0.95)^2 (0.05)^3$

e. Find the probability that no more than 4 are **not** defective?

3

$p=0.95$

$P(x \leq 4) = 1 - P(x > 4)$

f. Find the standard deviation of defective DVD players

2

$\sigma = \sqrt{npq}$

2 **g.** Find the standard deviation of **non** defective DVD players

$\sigma = \sqrt{npq}$

11- A radar unit is used to measure speeds of cars on a motorway. The speeds are normally distributed with a mean of 90 km/hr and a standard deviation of 10 km/hr. What is the probability that a car picked at random is travelling at a speed between 90km/hr and 100km/hr? (5 pts)

$\mu = 90 \quad \sigma = 10$

$P(90 < X < 100) = P(0 < Z < 1) = A(1)$

$= 0.3413$

$Z = \frac{X-\mu}{\sigma} = \frac{90-90}{10} = 0$

$Z = \frac{100-90}{10} = 1$

12- Let X be a continuous random variable that follows a normal distribution with a mean of 200 and a standard deviation of 25. 13 pts)

a. What data value from the distribution corresponds to $z = -1.43$

$\mu = 200 \quad \sigma = 25$

3

$Z = \frac{X-\mu}{\sigma} \qquad -1.43 = \frac{X-200}{25} \longrightarrow X = (-1.43)(25)+200$

$=$

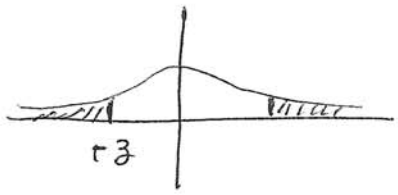
b. Find the value of X so that the area under the normal curve to the left of X is 0.1711.

5

$0.5 - A(-z) = 0.1711$

$A(-z) = 0.5 - 0.1711$

$= 0.3289$



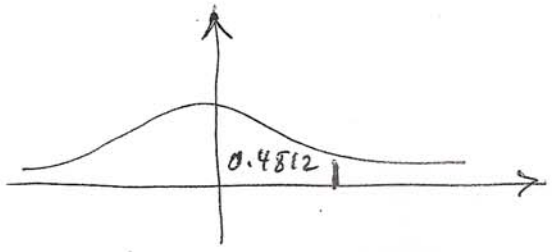
$-z = 0.95 \longrightarrow z = -0.95$ ~~$Z = \frac{X-\mu}{\sigma}$~~ $-0.95 = \frac{X-200}{25}$

$X = (-0.95)(25)+200$

$= 176.25$

c. Determine a so that $P(X < a) = 0.9812$

5



$0.5 + A(z) = 0.9812$

$A(z) = 0.4812 \Rightarrow z = 2.08$

7

$Z = \frac{X-\mu}{\sigma} \qquad 2.08 = \frac{X-200}{25}$

$X = 252$