24/25 Excellent!!

BIRZEIT UNIVERSITY

MATH DEPARTMENT

Stat 2371 TEST # 2 Fall Semester 2021

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Section #	Day - Time	Instructor
(1)	M, W 10:00—11:15	Hassan
2	T, R 14:15—15:30	Ayah
3	T, R 11:25—12:40	Ayah

Formulas:

Random Variable	F(x)	E(X) = μ_x	Var(X)
Discrete	-	$\sum x.f(x)$	$\sum(x-\mu_x)^2.f(x)$ Or $(\sum x^2.f(x)) - \mu^2$
Binomial	$\binom{n}{x}p^x(1-p)^{n-x}$	np	np(1-p)
Normal		μ	σ^2

Question # 1 Choose the correct answer

I) The name (or shape) of the continuous random variables that expresses the height of a student in a sample of 100 Birzeit students is: 1) Binomial (2) Normal 3. Uniform 4. Exponential.

II) The name (or shape) of the discrete random variables that expresses number of boys in a sample of 100 Birzeit students is: (1) Binomial 2. Normal 3. Uniform 4. Exponential.

III) A random variable that may assume either a finite number of values or an infinite sequence of values such as 0, 1, 2,.... Is (1) Discrete 2) Continuous

IV) A numerical description of the outcomes of an experiment:
1) Random Variable 2) Experiment (3) Binomial 4) Normal

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stion # 2 If Z has a standard normal probability distribution, find the following:

I) P(Z < 1.53) = ...0.9370.....

II) P(Z< 0.5) = ...0.6915.....

III) P(Z > 1.65) = ...1 - P(Z < 1.65) = 1 - 0.9505 = 0.0495

IV) P(Z > -1.53) = ...P(Z < 1.53) = 0.9370.....

V) The value of **Z** the area to the left of which is 0.9906 is :.....2.35.....

Question # 3

A local ambulance service handles 0 to 5 service calls on any given day. The probability distribution for the number of service calls is shown in the following **Table : Use the table to answer questions(I to IV).**

X # calls	X^2	f(x)	$\Sigma(x \cdot f(x))$	$\Sigma(x^2 \cdot f(x))$
0	0	0.1	0	0
1	1	0.2	0.2	0.2
2	4	0.3	0.6	1.2
3	9	0.1	0.3	0.9
4	16	0.3	1.2	4.8
Sum	30	1.00	2.3	7.1

m

(I) The random variable X is

(a) Discrete b) Continuous c) Both d)neither

$m = \Sigma(x \cdot f(x))$

(II) The probability that the ambulance receives **exactly 3** calls in a certain day is

a) 0.05 (b) 0.1 c) 0.2 d) 0.3

(III) The probability that the ambulance receives **at least 3** calls in a certain day is

a) 0.1 b) 0.2 c) 0.3 (d) 0.4

(IV) The expected value of X is.

a) 2.05 (b) 2.3 c) 4.05 d) 5.05

$V(X) = \Sigma(x^2 \cdot f(x)) - m^2$

$7.1 - 5.29$

$= 1.81$

(V) The variance is of X is.

a) 1.5 (b) 1.81 c) 1.99 d) 4.05

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$$P(x) = \binom{n}{x} \cdot p^x \cdot (1-p)^{n-x}$$

Question # 4

Assume that 90% of Birzeit university students have received the vaccination against the Corona virus. Let a sample of 16 students are taken, let the variable ***X*** **represent the number of students in the sample that are vaccinated.**

(I) The name of the variable ***X*** is

a) Binomial b) Poisson c) Hypergeometric d) Normal

(II) What is the probability that **exactly 16** of the selected students are vaccinated?

a) 0.215 b) 0.275 c) 0.185 d) 0.405

(III) What is the probability that **at most *15*** students out of the 16 that were received the vaccination?

a) 0.014 b) 0.154 c) 0.504 d) 0.814

(IV) What is the expected number of vaccinated students in the sample?

a) 9 b) 18 c) 14 d)20

(V) What is the variance of the number of vaccinated students in the sample?

a) 0.9 b) 1.0 c) 1.44 d)2.4

$$P(16) = \binom{16}{16} \cdot 0.90 \cdot (1-0.90)^{16-16}$$

$$= 1 \cdot 0.90 \cdot 1$$

$$= 0.90$$

$$P(16) = \binom{16}{16} \cdot 0.90^{16} \cdot (1-0.90)^{16-16}$$

$$= 1 \cdot 0.1853 \cdot 1$$

$$= 0.1853$$

$$(P \leq 15) = 1 - (P > 15) = 1 - P(16)$$

$$= 1 - 0.1853$$

$$P(15) = \binom{16}{15} \cdot 0.90^{15} \cdot (1-0.90)^{16-15}$$

$$16 \cdot 0.205 \cdot 0.1$$

$$= 0.328$$

$$ex = n \cdot p$$

$$V = n \cdot p \cdot (1-p)$$

$$14.4 \cdot 0.1$$

$$= 1.44$$

Question # 5

The mean cost for employee alcohol rehabilitation programs involving hospitalization is $2000 (*USA Today*, September 12, 1991). Assume the rehabilitation program cost has a normal probability distribution with a standard deviation of $600. Answer the following questions.

a. What is the probability that a rehabilitation program will cost at least $1,700?

$P(X > 1700)$

$Z = \frac{X - M}{6} = \frac{1700 - 2000}{600}$

$= \frac{-300}{600}$ $Z = -0.5$

$P(Z > -0.5)$

$= P(Z < 0.5)$

$= 0.6915$

b. What is the cost above which is the most expensive 10% of the rehabilitation programs?

$10\% - 100\% = 90\%$

$Z = 0.90$ $Z = 1.28$

$Z = \frac{X - M}{6}$

$1.28 = \frac{X - 2000}{600}$

$1.28 \times 600 + 2000$

$X = 2768$