

Question # 2 (6 Points)

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	1	2	3	4	5	6
X^2	1	4	9	16	25	36
$p(x)$.15	.15	.30	.20	.15	.05
$\sum p(x)$	0,15	0,3	0,9	0,8	0,75	0,3
$X - \mu$	-2,2	-1,2	-0,2	2,08	1,8	2,8
$(X - \mu)^2$	4,84	1,44	0,04	0,64	3,24	7,84
$p(x)(X - \mu)^2$	0,726	0,216	0,012	0,128	0,486	0,392

$\mu = 3,2$

(I) The random variable X is

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

(II) The expected value.

- a) 2.05 b. 2.45 c. 3.20 d. 5.05

(III) The variance is.

- (a) 1.96 b. 2.05 c. 1.65 d. 4.05

(IV) The standard deviation of X is

- a) 1.05 b. 1.15 c. 1.40 d. 2.20

(V) Probability that X is equal to 1 is:

- a. 0.1 b. 0.15 c. 0.2 d. 1.2

(VI) Probability that X is at most to 1 is:

- a. 0.05 b. 0.15 c. 0.30 d. 2.20

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Question # 3 (5 Points)

The true unemployment rate in West Bank is 30% (0.30) (Palestinian Central Bureau of Statistics-2008). Assume that 10 employable people are selected randomly from West Bank. Use Binomial probabilities to answer:

- I) What is the expected number of unemployed persons in the sample?
 - a) 2
 - b) 3**
 - c) 5
 - d) 7
- II) What is the standard deviation of the number who are unemployed in the sample?
 - a) 0.45
 - b) 1.45
 - c) 2.45
 - d) 2.10**

$var(x) = np(1-p)$
 $\frac{3(0.70)}{2.1}$

- III) What is the probability that exactly 4 are unemployed?
 - a) 0.15
 - b) 0.20**
 - c) 0.25
 - d) 0.35

$\binom{10}{4} (0.30)^4 (0.70)^6$
 $= 210 \times 8.1 \times 10^{-3} \times 0.117649$
 $= 0.20$

- IV) What is the probability that At least 2 are unemployed?
 - a) 0.15
 - b) 0.22
 - c) 0.85
 - d) 0.95**
 - e) 0.63

- V) What is the probability that At least 9 are employed?
 - a) 0.15
 - b) 0.22
 - c) 0.25
 - d) 0.05
 - e) 0.999**

$\binom{10}{9} (0.30)^9 (0.70)^1 = 0.266$
 $\binom{10}{8} (0.30)^8 (0.70)^2 = 0.12$
 $\binom{10}{2} (0.30)^2 (0.70)^8 = 0.23$

$= 0.28 + 0.12 + 0.23$
 $= 0.63$

~~$\binom{10}{9} (0.30)^9 (0.70)^1 = 1.37 \times 10^{-4} \times 0.70 = 9.59 \times 10^{-5}$~~
 ~~$\binom{10}{8} (0.30)^8 (0.70)^2 = 1.44 \times 10^{-3}$~~
 ~~$\binom{10}{7} (0.30)^7 (0.70)^3 = 2.1 \times 10^{-3}$~~
 ~~$\binom{10}{6} (0.30)^6 (0.70)^4 = 1.37 \times 10^{-3}$~~
 ~~$\binom{10}{5} (0.30)^5 (0.70)^5 = 1.37 \times 10^{-3}$~~

~~$1 - \binom{10}{0} (0.30)^0 (0.70)^{10} = 1 - 0.0282475 = 0.9717525$~~
 ~~$1 - \binom{10}{1} (0.30)^1 (0.70)^9 = 1 - 0.1200721 = 0.8799279$~~
 $1 - \binom{10}{0} (0.30)^0 (0.70)^{10} - \binom{10}{1} (0.30)^1 (0.70)^9$
 $= 1 - 0.0282475 - 0.1200721 = 0.8516804$

Question # 4 (8 Points)

Multiple Choice questions:

For the following data observations: 10, 11, 12, 13, 14, 16, 17, 19, 20, 28

The mean is:

- a) 13 b) 14.4 c) 13.5 d) 16

The IQR is: $= Q_3 - Q_1$

- a) 5 b) 8 c) 10 d) 15

The standard deviation is:

- a) 1.586 b) 3.25 c) 5.38 d) 6.33

Are there any outliers in the data? Explain.

Upper fence = $Q_3 + 1.5 IQR$
~~19.5~~ ~~28~~

Lower fence = $Q_1 - 1.5 IQR$
 $11 - 15$
 $= -4$
 outliers = -4

Question # 5 (6 Points)

$n = 100$

Suppose an IQ test has a mean of 100 and a standard deviation of 15.

a) According to Chebyshev's theorem, at least what percentage of IQ-Scores are between 77.5 and 122.5?

$\frac{77.5 - 100}{15} = -1.5$ $1 - \frac{1}{(1.5)^2} = 0.55$ of data between
 $\frac{122.5 - 100}{15} = 1.5$ 77.5 & 122.5

b) In how many different ways can 4 people be seated on 5 chairs (Show work)

~~24~~
 $5 \times 4 \times 3 \times 2 = 120$

c) How many different committees of 3 persons be selected from a group of 5 (Show work)

$\binom{5}{3} = \frac{5!}{3!(5-3)!} = 10$

Questions (8 Points)

a) If $P(A_1) = .40$ and $P(A_2) = .60$, $P(A_1 \cap A_2) = 0$, $P(B|A_1) = .20$, and $P(B|A_2) = .25$

1. Are A_1 and A_2 mutually exclusive? Yes Why? $(A \cap B) = \emptyset$

$$P(B|A_1) = 0,20$$

$$P(B|A_2) = 0,20$$

2. Are A_1 and A_2 independent?

No Why?

$$P(A_1 \cap A_2) \neq P(A_1) \cdot P(A_2)$$

~~$$P(B|A_1) = P(A_1)$$~~

~~$$P(A_1 \cap B) = 0,40 \times 0,20$$~~

~~$$(0,40 \times 0,20) + (0,60 \times 0,25)$$~~

~~$$P(B) \neq \Rightarrow \frac{0,08}{0,93} \neq 0,26$$~~

3. Compute $P(A_1 \cap B)$

~~$$P(A_1) + P(B|A_1/B)$$~~

~~$$0,40 + 0,26 = 0,66$$~~

4. Compute $P(A_1 \cup A_2)$

~~$$= P(A_1) + P(A_2) - P(A_1 \cap A_2)$$~~

~~$$= 0,40 + 0,60 - 0 = 1$$~~

5.

Compute $P(A_1 | B)$

$$P(A_1 | B) = \frac{0,40 \times 0,20}{(0,40 \times 0,20) + (0,60 \times 0,25)}$$

$$= \frac{0,08}{0,93}$$

$$= 0,86$$

~~$$P(B|A_1) \cdot P(A_1)$$~~

~~$$P(B|A_2) \cdot P(A_2)$$~~

~~$$0,20 \times 0,60$$~~

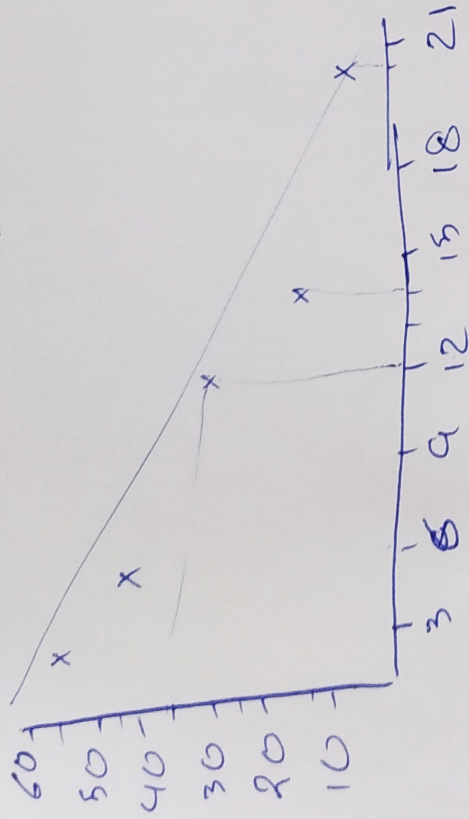
~~$$0,12$$~~

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Given are 5 observations for two variables, x and y.

x_i	y_i	$x - \bar{x}$	$(y - \bar{y})$	$\sum(x - \bar{x})(y - \bar{y})$	$(x - \bar{x})^2$
3	55	-2	21,6	-43,2	4
12	35	7	1,6	11,2	49
6	45	-1	11,6	-11,6	1
20	10	15	-23,4	-351	225
14	22	9	-11,4	-102,6	81
5	33,4			-497,2	360

a. Develop a scatter diagram for these data



b. What relationship is indicated by the scatter diagram between the two variables: -ve linear relationship

c. Develop the estimated regression equation by computing b_0 and b_1 (you may just use the calculator to do this)

$$b_1 = \frac{\sum(x - \bar{x})(y - \bar{y})}{\sum(x - \bar{x})^2} = \frac{-497,2}{360} = -1,38 \quad b_0 = \bar{y} - b_1 \bar{x} = 33,4 - (-1,38 \times 5)$$

$$= 40,3$$

$$\hat{y} = b_0 + b_1 x$$

$$= 40,3 - 1,38x$$

d. Use the estimated regression equation to predict the value of y when $x = 10$

$$\hat{y} = 40,3 - (1,38 \times 10)$$

$$= 26,5$$

f

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Question # 1 (11 Points)

Multiple Choice Questions

A study aims to find the relationship between « Gender » and « Number of Years of Education ». Answer the following questions :

- The variable « Gender » is :
 - Ordinal Scale
 - Nominal Scale
 - Ratio Scale
 - Interval Scale
- The variable « Gender » is :
 - Quantitative
 - Qualitative
 - Both
 - Neither
- To study the relationship between Age and Number of Years of Education, we use :
 - Histogram
 - Cross-tabulation
 - Scatter plot
 - Ogive
- The name (or shape) of the discrete random variables that expresses number of boys in a sample of 100 Bir Zeit students is :
 - Poisson
 - Binomial
 - Normal
 - Uniform
- A random variable that may assume either a finite number of values or an infinite sequence of values such as 0, 1, 2, ..., is :
 - Continuous
 - Ogive
 - Discrete
 - Uniform
- A numerical description of the outcome of an experiment is :
 - Event
 - Experiment
 - Random Variable
 - Outcome
- A numerical measure of the likelihood of an event is
 - Experiment
 - Experiment
 - Expected value
 - Probability
- A measure of the strength and direction of the linear relationship between two variables is :
 - Expected value
 - Covariance
 - Correlation Coefficient
 - variance
- A measure of variability (dispersion) that is not affected by outlier is :
 - Mean
 - Median
 - Variance
 - Coefficient of variation
- A measure of location that is not affected by outlier is :
 - IQR
 - Median
 - Variance
 - Coefficient of variation
- A measure of variability (dispersion) that does not depend on the unit of measurement :
 - IQR
 - Median
 - Variance
 - Coefficient of variation

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