

MTH302 Long Solved Questions

By

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If you toss a die and observe the number of dots that appears on top face then write the events that the even number occurs.

Solution:

Number of Possible outcomes = 6

Number of Events = 3

$P = \text{Number of events} / \text{Number of all Possible outcomes.}$

$P = 3/6$

Question No: 43 (Marks: 2)

Define Cumulative Poisson distribution.

Solution:

A cumulative Poisson distribution is used to calculate the probability of getting atleast n successes in a Poisson experiment. Here, n is the Poisson random variable which refers to the number of success.

Formula:

$$P(x \leq n) = P(x = 0) + P(x = 1) + \dots + P(x = n)$$

where, $P(x = 0)$ and $P(x = 1)$ is calculated using Poisson distribution formula.

Question No: 44 (Marks: 3)

friends take an IQ test. Their scores are 96, 100, 106, 114. Which of the following statements is true? Give reason.

Four

I. The mean is 103.

II. The mean is 104.

III. The median is 100.

IV. The median is 106.

(A) I only

(B) II only

(C) III only

(D) IV only

(E) None is true

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Solution:

The correct answer is (B). The mean score is computed from the equation:

$$\text{Mean score} = \Sigma x / n = (96 + 100 + 106 + 114) / 4 = 104$$

Since there are an even number of scores (4 scores), the median is the average of the two middle scores. Thus, the median is $(100 + 106) / 2 = 103$

Question No: 45 (Marks: 3)

What is the probability that a bag filled by the machine weighs less than 515 g?

$$z = (515 - 510) / 2.5 = 2.0$$

(Use the table given below)

| Z | 0.00 | 0.01 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 | 0.09 |
|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0.0 | 0.0000 | 0.0040 | 0.0080 | 0.0120 | 0.0160 | 0.0199 | 0.0239 | 0.0279 | 0.0319 | 0.0359 |
| 0.1 | .0398 | .0438 | .0478 | .0517 | .0557 | .0596 | .0636 | .0675 | .0714 | .0753 |
| 0.2 | .0793 | .0832 | .0871 | .0910 | .0948 | .0987 | .1026 | .1064 | .1103 | .1141 |
| 0.3 | .1179 | .1217 | .1255 | .1293 | .1331 | .1368 | .1406 | .1443 | .1480 | .1517 |
| 0.4 | .1554 | .1591 | .1628 | .1664 | .1700 | .1736 | .1772 | .1808 | .1844 | .1879 |
| 0.5 | .1915 | .1950 | .1985 | .2019 | .2054 | .2088 | .2123 | .2157 | .2190 | .2224 |
| 0.6 | .2257 | .2291 | .2324 | .2357 | .2389 | .2422 | .2454 | .2486 | .2517 | .2549 |
| 0.7 | .2580 | .2611 | .2642 | .2673 | .2704 | .2734 | .2764 | .2794 | .2823 | .2852 |
| 0.8 | .2881 | .2910 | .2939 | .2967 | .2995 | .3023 | .3051 | .3078 | .3106 | .3133 |
| 0.9 | .3159 | .3186 | .3212 | .3238 | .3264 | .3289 | .3315 | .3340 | .3365 | .3389 |
| 1.0 | .3413 | .3438 | .3461 | .3485 | .3508 | .3531 | .3554 | .3577 | .3599 | .3621 |
| 1.1 | .3643 | .3665 | .3686 | .3708 | .3729 | .3749 | .3770 | .3790 | .3810 | .3830 |
| 1.2 | .3849 | .3869 | .3888 | .3907 | .3925 | .3944 | .3962 | .3980 | .3997 | .4015 |
| 1.3 | .4032 | .4049 | .4066 | .4082 | .4099 | .4115 | .4131 | .4147 | .4162 | .4177 |
| 1.4 | .4192 | .4207 | .4222 | .4236 | .4251 | .4265 | .4279 | .4292 | .4306 | .4319 |
| 1.5 | .4332 | .4345 | .4357 | .4370 | .4382 | .4394 | .4406 | .4418 | .4429 | .4441 |
| 1.6 | .4452 | .4463 | .4474 | .4484 | .4495 | .4505 | .4515 | .4525 | .4535 | .4545 |
| 1.7 | .4554 | .4564 | .4573 | .4582 | .4591 | .4599 | .4608 | .4616 | .4625 | .4633 |
| 1.8 | .4641 | .4649 | .4656 | .4664 | .4671 | .4678 | .4686 | .4693 | .4699 | .4706 |
| 1.9 | .4713 | .4719 | .4726 | .4732 | .4738 | .4744 | .4750 | .4756 | .4761 | .4767 |
| 2.0 | .4772 | .4778 | .4783 | .4788 | .4793 | .4798 | .4803 | .4808 | .4812 | .4817 |
| 2.1 | .4821 | .4826 | .4830 | .4834 | .4838 | .4842 | .4846 | .4850 | .4854 | .4857 |
| 2.2 | .4861 | .4864 | .4868 | .4871 | .4875 | .4878 | .4881 | .4884 | .4887 | .4890 |
| 2.3 | .4893 | .4896 | .4898 | .4901 | .4904 | .4906 | .4909 | .4911 | .4913 | .4916 |
| 2.4 | .4918 | .4920 | .4922 | .4925 | .4927 | .4929 | .4931 | .4932 | .4934 | .4936 |

Solution:

Method is available in Lecture 40.....

$$=0.5+0.4772 = 0.9772$$

Question No: 46 (Marks: 3)

State three important properties of regression line

Solution:

There are three important properties of regression line are as follows.\

Slope

Intercept

Straight Line

Slope:

The slope is the vertical distance divided by the horizontal distance between any two points on the line, which is the rate of change along the regression line.

$$b = \frac{n \sum xy - (\sum x)(\sum y)}{(n \sum x^2 - (\sum x)^2)}$$

Intercept:

Use the INTERCEPT function when you want to determine the value of the dependent variable when the independent variable is 0 (zero).

Straight Line:

The simplest is the Simple Linear. Regression Model or a relationship between variables that can be represented by a straight line equation.

$$Y=a+bX$$

Question No: 47 (Marks: 5)

Calculate the mean, median and mode for the following set of data 5, 6, -5, 8, 19, 2, 1, 6, 25

Solution:

X
1
2
5
-5
6
6
8
19
25
67

Question No: 21 (Marks: 2)

Define the Null Hypothesis.

ANS: Null hypothesis is a scenario which explain a given set of data. It is tested to determine whether data provides sufficient reasons to pursue some alternative hypothesis.

It is a hypothesis that states there is no difference between 2 or more sets of data.

Question No: 22 (Marks: 2)

_____ A
coin can be tossed in 3 ways. A die can be thrown in 6 ways. A coin and a die together can be thrown in
...**3 X 6 = 18**.....ways.

Question No: 23 (Marks: 2)

_____ Find harmonic mean (HM) of 10,12,14,17.

ANS: Harmonic mean, $HM = n / (1/x_1 + 1/x_2 + 1/x_3 + 1/x_4 + \dots + 1/x_n)$

$$N = 4$$

$$X_1 = 10$$

$$X_2 = 12$$

$$X_3 = 14$$

$$X_4 = 17$$

$$1/x_1 + 1/x_2 + 1/x_3 + 1/x_4 = 1/10 + 1/12 + 1/14 + 1/17$$

$$1/10 = 0.1$$

$$1/12 = 0.08333$$

$$1/14 = 0.07142$$

$$1/17 = 0.05882$$

$$\text{Sum} = 0.31357$$

$$\text{Harmonic mean} = 4 / 0.31357 = 12.756$$

Question No: 24 (Marks: 3)

Find proportion of bags which have weight in excess of 505 g.

Mean = 500.

StDev = 2.5 g

(For $z=2.00$ probability is 0.4772)

Solution:

$$= .5 - 0.4772$$

$$= 0.0228$$

Question No: 25 (Marks: 3)

Given for a frequency distribution mode = 18, mean = 21. Calculate median . Using these values comment on skewness of distribution.

Solution:

We know that,

$$\text{Mean-mode} = 3(\text{mean} - \text{median})$$

Put the values in above equation:

$$21 - 18 = 3(21 - \text{Median})$$

$$3 = 63 - 3\text{median}$$

$$3\text{median} = 63 - 3$$

$$3\text{median} = 60$$

$$\text{Median} = 60/3$$

$$\text{Median} = 20$$

The distribution is moderately skewed and unimodal distribution.

Question No: 26 (Marks: 3)

_____ How many different ways can you select 2 letters from the set of letters: X, Y, and Z? (Hint: In this problem, order is NOT important; i.e., XY is considered the same selection as YX.)

Solution:

Total number of letters = 3

Letters taken at a time = 2

Number of ways in which 2 letters can be selected out of 3 = ${}^3C_2 = 3! / 2! (3-2)!$

$$= 3 * 2 * 1 / 2$$

$$= 3$$

Question No: 27 (Marks: 5)

_____ How many possible permutations can be formed from the word MATHEMATICS?

Solution:

Total number of alphabets in mathematics = 11

M = 2

A = 2

T = 2

H = 1

E = 1

I = 1

C = 1

S = 1

Permutations = $11! / 2! * 2! * 2! * 1! * 1! * 1 * 1! * 1!$

$$= 11! / 8 = 4,989,600$$

Question No: 28 (Marks: 5)

Find the standard deviation of 4, 9, 11, 12, 17, 5, 8, 12, 14

ANS: Standard deviation for sample = $\sqrt{\sum(X - \bar{X})^2 / (n-1)}$

$$\bar{X} = \text{mean} = (4+9+11+12+17+5+8+12+14)/9 = 92/9 = 10.22$$

$$n = 9$$

$$\text{so, } n-1 = 9-1 = 8$$

| X | $X - \bar{X}$ | $(X - \bar{X})^2$ |
|----|---------------|-------------------|
| 4 | -6.22 | 38.69 |
| 9 | -1.22 | 1.49 |
| 11 | 0.78 | 0.61 |
| 12 | 1.78 | 3.17 |
| 17 | 6.78 | 45.97 |
| 5 | -5.22 | 27.25 |
| 8 | -2.22 | 4.93 |
| 12 | 1.78 | 3.17 |
| 14 | 3.78 | 14.29 |

$$\sum(X - \bar{X})^2 = 139.57$$

$$\text{Standard deviation} = \sqrt{\frac{139.57}{8}} = 4.18$$

Question No: 29 (Marks: 5)

In a normal distribution $\mu = 30, \sigma = 5$ what proportion of cases will fall between 20 and 35?

Solution:

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\left(\frac{(x-\mu)^2}{2\sigma^2}\right)}$$

$$x = 35 - 20 = 15$$

$$\mu = 30$$

$$\sigma = 5$$

$$e = 2.71828$$

$$f(x) = \frac{1}{5\sqrt{2(22/7)}} 2.71828^{-\left(\frac{(15-30)^2}{2(5)^2}\right)}$$

$$f(x) = \frac{1}{5\sqrt{6.286}} 2.71828^{-\left(\frac{(-15)^2}{2(25)}\right)}$$

$$f(x) = \frac{1}{5(2.5072)} 2.71828^{-\left(\frac{225}{50}\right)}$$

$$f(x) = \frac{1}{12.536} 2.71828^{-(4.5)}$$

$$f(x) = 0.07978(0.011903)$$

$$f(x) = 0.000886278$$

Question No: 30 (Marks: 10)

Form a regression line from the data below.

| Departments | X | Y |
|-------------|----|----|
| 1 | 26 | 81 |
| 2 | 42 | 95 |
| 3 | 16 | 53 |
| 14 | 55 | 43 |
| 5 | 92 | 18 |
| 6 | 28 | 63 |
| 7 | 13 | 60 |

Solution:

| Departments | X | Y | X ² | X*Y |
|-------------|----|----|----------------|------|
| 1 | 26 | 81 | 676 | 2106 |
| 2 | 42 | 95 | 1764 | 3990 |
| 3 | 16 | 53 | 256 | 848 |
| 4 | 55 | 43 | 3025 | 2365 |
| 5 | 92 | 18 | 8464 | 1656 |
| 6 | 28 | 63 | 784 | 1764 |
| 7 | 13 | 60 | 169 | 780 |

sumX =272 sumY= 413 sumX²= 15138 sumX*Y = 13509

$Y = a + bx$ Straight Line

$$\sum y = na + b \sum x \text{(i)}$$

$$\sum xy = a \sum x + b \sum x^2 \text{(ii)}$$

Put the Values in Above Equation

$$413 = 7a + b272 \text{(iii)}$$

$$13509 = 272a + 15138b \text{(iv)}$$

Multiply Eq.(iii) with 272 & Eq.(iv) with 7

$$112336 = 1904a + 73984b \text{(v)}$$

$$94563 = 1904a + 105966b \text{(vi)}$$

$$112336 = 1904a + 73984b$$

$$\pm 94563 = \pm 1904a \pm 105966b$$

$$17773 = -31982b$$

$$\frac{17773}{-31982} = b$$

$$b = -0.55$$

put the value of b in eq.(v)

$$94563 = 1904a + 105966b$$

$$94563 = 1904a + 105966(-0.55)$$

$$94563 = 1904a - 58281.3$$

$$94563 + 58281.3 = 1904a$$

$$152844.3 = 1904a$$

$$a = \frac{152844.3}{1904}$$

$$a = 80.28$$

Put the Value of a and b in Straight Line equation

$$Y = a + bx$$

$$Y = 80.28 + (-0.55)x$$

$$Y = 80.28 - 0.55x$$

Question No: 31 (Marks: 10)

_____ The following data gives the height (in inches) of eleven 9-years old boys in a primary school.

57, 52, 51, 49, 55, 54, 50, 48, 53, 56, 47

- a) Find first, second and third quartiles.
b) Find interquartile range, Quartile deviation.

ANS:a) Data in arranged order: 47,48,49,50,51,52,53,54,55,56,57

number of data points, $n = 11$

position of $Q_i = i(n+1)/4$

Position of $Q_1 = (n+1)/4 = (11+1)/4 = 12/4 = 3$

So, $Q_1 = 3^{\text{rd}}$ value

= 49

Position of $Q_2 = 2(11+1)/4 = 24/4 = 6$

So, $Q_2 = 6^{\text{th}}$ value

= 52

Position of $Q_3 = 3(11+1)/4 = 36/4 = 9$

So, $Q_3 = 9^{\text{th}}$ value

55

b) Interquartile range = $Q_3 - Q_1$

= $55 - 49 = 6$

Quartile deviation = $(Q_3 - Q_1)/2$

= $(55 - 49)/2$

= $6/2 = 3$

Question No: 41 (Marks: 2)

student is chosen at random from a class of 16 girls and 14 boys. What is the probability that the student chosen is not a girl?

A

Solution:

Total boys + girls = 14+16 = 30
 $p(\text{student is boy}) = 14/30 = 7/15$

Question No: 42 (Marks: 2)

Write down the formula for Poisson distribution.(Not Excel formula)

Just as with the binomial distribution there is a formula for calculating probabilities

Solution

$f(x) = (\text{mean of number of successes in a given time period})^x \cdot e^{-\mu} / x!$

$e=2.71828$

Poisson Probability Distribution:

$$P(X=x) = \frac{\mu^x e^{-\mu}}{x!}$$

Question No: 43 (Marks: 2)

What will be the correlation coefficient r between variables X and Y if $\text{var}X=4, \text{var}Y=9$ and $\text{Cov}(X,Y)=3$?

Solution:

$$r = \frac{\text{cov}(X, Y)}{\sqrt{\text{var}(X) \text{var}(Y)}}$$

$$r = \frac{3}{\sqrt{4 \times 9}}$$

$$r = \frac{3}{\sqrt{36}}$$

$$r = \frac{3}{6}$$

$$r = 0.5$$

Question No: 44 (Marks: 3)

Suppose we draw a card from a deck of playing cards. What is the probability that we draw a spade?

Solution:

Total spade cards = 13

Total cards in deck = 52

P(card of spade) = $\frac{13}{52} = \frac{1}{4}$


Question No: 45 (Marks: 3)

Find the range and median of the following set of data 1,2,5,7,5,2,5,2,2,6,9,8,7,1,5.

Solution:

To get median sorting

1 1 2 2 2 2 5 5 5 5 6 7 7 8 9



Median = 5 and 2

Range = highest value – lowest value
= 9-1 = 8

Question No: 46 (Marks: 3)

_____ If a pollster might want to know whether or not, say, the sex, the ethnic background or salary range of a person is factor in his or her vote in election or for some type of legislation then justify which distribution is best fit for this scenario?(least two sentence description)

Solution:

We prefer Normal Distribution over others due to following

It is applied in situations where data is widely distributed. We use Normal distribution on sample data to get a better picture of large data which is not possible to collect in real life like population, scientific research data etc. because normal distributions are much easier to analyze.

The normal distribution can be used to describe, at least approximately, any variable that gathered near the mean In simple terms the Normal distribution is useful for study of real world distributions because in the real world a single distribution (like height of men) is a result of other random factors. In normal distribution we can calculate indefinite number of data.

Question No: 47 (Marks: 5)

_____ Find all the quartiles for the following data set:

77, 79, 80, 86, 87, 87, 94, 99

Solution:

| | | | | | | | |
|----|----|----|----|----|----|----|----|
| 77 | 79 | 80 | 86 | 87 | 87 | 94 | 99 |
|----|----|----|----|----|----|----|----|

$$Q_1 = \frac{(n+1)}{4}$$

$$Q_1 = \frac{(8+1)}{4}$$

$$Q_1 = \frac{9}{4}$$

$$Q_1 = 2.25$$

$$Q_1 = 79 + .25(80 - 79)$$

$$Q_1 = 79 + .25(1)$$

$$Q_1 = 79 + .25$$

$$Q_1 = 79.25$$

$$Q_2 = \frac{2(n+1)}{4}$$

$$Q_2 = \frac{2(8+1)}{4}$$

$$Q_2 = \frac{2(9)}{4}$$

$$Q_2 = \frac{18}{4}$$

$$Q_2 = 4.5$$

$$Q_2 = 86 + .5(87 - 86)$$

$$Q_2 = 86 + .5(1)$$

$$Q_2 = 86 + .5$$

$$Q_2 = 86.5$$

$$Q_3 = \frac{3(n+1)}{4}$$

$$Q_3 = \frac{3(8+1)}{4}$$

$$Q_3 = \frac{3(9)}{4}$$

$$Q_3 = \frac{27}{4}$$

$$Q_3 = 6.75$$

$$Q_3 = 87 + .75(94 - 87)$$

$$Q_3 = 87 + .75(7)$$

$$Q_3 = 87 + 5.25$$

$$Q_3 = 92.25$$

$$\text{InterQuartile Range} = Q_3 - Q_1$$

$$\text{InterQuartile Range} = 92.25 - 79.25$$

$$\text{InterQuartile Range} = 13$$

$$\text{Quartile Deviation} = \frac{Q_3 - Q_1}{2}$$

$$\text{Quartile Deviation} = \frac{92.25 - 79.25}{2}$$

$$\text{Quartile Deviation} = \frac{13}{2}$$

$$\text{Quartile Deviation} = 6.5$$

Question No: 48 (Marks: 5)

Calculate number of ways, a committee of 3 people comprising the President, Secretary and Treasurer to be chosen from 8 possible candidates.

Solution:

$$\text{Permutation} = \frac{n!}{(n-r)!}$$

$$\text{Permutation} = \frac{8!}{(8-3)!}$$

$$\text{Permutation} = \frac{8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1}{(5)!}$$

$$\text{Permutation} = \frac{8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1}{5 \times 4 \times 3 \times 2 \times 1}$$

$$\text{Permutation} = \frac{40320}{120}$$

$$\text{Permutation} = 336$$

Question No: 49 (Marks: 5)

_____ If X is a Poisson random variable with parameter $\lambda = 2$, find the probabilities for $x = 0, 1, 2, 3$ or more.

$$P(X = 2) = 2.1$$

Solution:

Don't understand this Question yet...

Question No: 50 (Marks: 10)

_____ If a committee of 3 people is to be selected from among 5 married couples so that the committee does not include two people who are married to each other, how many such committees are possible?

Solution:

Total number of ways of picking 3 from 5 married couples or 10 people = ${}^{10}C_3 = 120$

One set can have any five married couples = 5

- The third person can be any one of the remaining 8 one married couple is already part of the select set

Total Number of ways in which the set of three can have a married couple = $5 \times 8 = 40$


No. of combination which don't have any of married couples. = ${}^{10}C_3 - (5 \times 8) = 80$;

Question No: 27 (Marks: 5)

What will be the correlation coefficient r between variables X and Y if $\text{var}X=4$

$\text{Var}Y=9$, No. of observation $n=8$ and $\frac{\sum(X - \bar{X})(Y - \bar{Y})}{n} = 5$.

Solution:


$$\text{cov}(X, Y) = \frac{\sum (X - \bar{X})(Y - \bar{Y})}{n}$$

$$\text{cov}(X, Y) = \frac{5}{8}$$

$$\text{cov}(X, Y) = 0.625$$

$$r = \frac{\text{Cov}(X, Y)}{\sqrt{\text{var}(X) \text{var}(Y)}}$$

$$r = \frac{0.625}{\sqrt{4 \times 9}}$$

$$r = \frac{0.625}{\sqrt{36}}$$

$$r = \frac{0.625}{6}$$

$$r = 0.104$$

Question No: 28 (Marks: 5)

_____ On a final examination in mathematics the mean was 72 and the standard deviation was 15. Determine the standard scores of students receiving marks

(a) 60, (b) 93, (c) 72

Solution:

(a) 60

$$z = \frac{x - \mu}{\sigma}$$

$$z = \frac{60 - 72}{15}$$

$$z = \frac{-12}{15}$$

$$z = -0.8$$

(b) 93

$$z = \frac{x - \mu}{\sigma}$$

$$z = \frac{93 - 72}{15}$$

$$z = \frac{21}{15}$$

$$z = 1.4$$

(c) 72

$$z = \frac{x - \mu}{\sigma}$$

$$z = \frac{72 - 72}{15}$$

$$z = \frac{0}{15}$$

$$z = 0$$

Question No: 29 (Marks: 5)

a) Write all the combinations of $abcd$ taken 1 at a time.

Answer : $4!/1!(4-1)! = 4$

b) Write their combinations taken 2 at a time.

Answer : $4!/2!(4-2)! = 4.3.2/2.2 = 6$

c) Write their combinations taken 3 at a time.

Answer : $4!/3!(4-3)! = 4.3.2/3.2 = 6$

d) Write their combinations taken 4 at a time.

Answer : $4!/4!(4-4)! = 1$

Question No: 30 (Marks: 10)

Find the standard deviation and variance for 10 randomly selected data values :

44, 50, 38, 96, 42, 47, 40, 39, 46, 50 .

Solution:

| X | $(X - \bar{X})$ | $(X - \bar{X})^2$ |
|---------|-----------------|-------------------|
| 38 | -11.2 | 125.44 |
| 39 | 1-10.2 | 104.04 |
| 40 | -9.2 | 84.64 |
| 42 | -7.2 | 51.84 |
| 44 | -5.2 | 27.04 |
| 46 | -3.2 | 10.24 |
| 47 | -2.2 | 4.84 |
| 50 | 0.8 | 0.64 |
| 50 | 0.8 | 0.64 |
| 96 | 46.8 | 2190.24 |
| Sum=492 | | Sum=2600 |

$$\text{Mean} = \frac{\sum x}{n}$$

$$\text{Mean} = \frac{492}{10}$$

$$\text{Mean}(\bar{X}) = 49.2$$

$$\text{Variance} = \frac{\sum (X - \bar{X})^2}{n}$$

$$\text{Variance} = \frac{2600}{10}$$

$$\text{Variance} = 260$$

$$\text{Standard Deviation} = \sqrt{\frac{\sum (X - \bar{X})^2}{n}}$$

$$\text{Standard Deviation} = \sqrt{\frac{2600}{10}}$$

$$\text{Standard Deviation} = \sqrt{260}$$

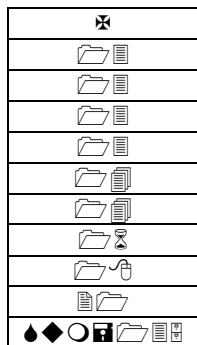
$$\text{Standard Deviation} = 16.12$$

Question No: 31 (Marks: 10)

Find the mean, median, mode, and range for the following list of values:

13, 18, 13, 14, 13, 16, 14, 21, 13

Solution:



$$\text{Mean} = \frac{\sum x}{n}$$

$$\text{Mean} = \frac{135}{9}$$

$$\text{Mean} = 15$$

$$\text{Median} = \frac{n+1}{2}$$

$$\text{Median} = \frac{9+1}{2}$$

$$\text{Median} = \frac{10}{2}$$

$$\text{Median} = 5^{\text{th}} \text{ Value}$$

$$\text{Median} = 14$$

Mode = Most Repeated Value

$$\text{Mode} = 13$$

Range = Largest Value – Smallest Value

$$\text{Range} = 21 - 13$$

$$\text{Range} = 8$$

Question No: 42 (Marks: 2)

For the marks obtained by 9 students ,given $Q_1 = 56$ marks , $Q_2 = 65$ marks , $Q_3 = 74$ marks
.Find Q.D .

Solution:

$$\text{Quartile Deviation} = \frac{Q_3 - Q_1}{2}$$

$$\text{Quartile Deviation} = \frac{74 - 56}{2}$$

$$\text{Quartile Deviation} = \frac{18}{2}$$

$$\text{Quartile Deviation} = 9$$

Question No: 43 (Marks: 2)

Describe the difference between Poisson distribution and Cumulative Poisson Distribution.

Solution:

Poisson Distribution

A Poisson random variable is the number of successes that result from a Poisson experiment. The probability distribution of a Poisson random variable is called a Poisson distribution.

Cumulative Poisson Probability

A cumulative Poisson probability refers to the probability that the Poisson random variable is greater than some specified lower limit and less than some specified upper limit.

Question No: 44 (Marks: 3)

Eleven subjects carried out the same task using a pocket calculator. The times (in seconds) taken were: 69, 75, 83, 58, 95, 72, 86, 88, 77, 79, 90. Find the range & median .

Solution:

| | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|
| 58 | 69 | 72 | 75 | 77 | 79 | 83 | 86 | 88 | 90 | 95 |
|----|----|----|----|----|----|----|----|----|----|----|

Range = Largest Value – Smallest Value

Range = 95 – 58

Range = 37

$$\text{Median} = \frac{n+1}{2}$$

$$\text{Median} = \frac{11+1}{2}$$

$$\text{Median} = \frac{12}{2}$$

$$\text{Median} = 6^{\text{th}} \text{ Value}$$

$$\text{Median} = 79$$

Question No: 45 (Marks: 3)

Find the trends in the data below:

| | A | B | C | D | E | F |
|----|---|------------|---------------|-------------|------------------------|--------------|
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | Day | Period | Data | Moving average. | Trend |
| 6 | | 1 | Morning | 170 | | |
| 7 | | | Afternoon | 140 | 180 | |
| 8 | | | Evening | 230 | 182 | |
| 9 | | 2 | Morning | 176 | 186 | |
| 10 | | | Afternoon | 152 | 187 | |
| 11 | | | Evening | 233 | 189 | |
| 12 | | 3 | Morning | 182 | 192 | |
| 13 | | | Afternoon | 161 | 195 | |
| 14 | | | Evening | 242 | | |
| 15 | | | | | | |

Solution:

Actual Data – Moving Average = trend

| Actual Data | Moving average | Trend |
|-------------|----------------|-------|
| 140 | 180 | -40 |
| 230 | 182 | 48 |
| 176 | 186 | -10 |

| | | |
|-----|-----|-----|
| 152 | 187 | -35 |
| 233 | 189 | 44 |
| 182 | 192 | 10 |
| 161 | 195 | -34 |

Question No: 46 (Marks: 3)

A random sample of size n is drawn from normal population with mean 6 and S.D

1.2; if $z = 4$, $\bar{x} = 8$ what is n?

Solution:

$$z = \frac{X - \bar{X}}{S.D}$$

$$4 = \frac{X - 8}{1.2}$$

$$4 \times 1.2 = X - 8$$

$$4.8 = X - 8$$

$$4.8 + 8 = X$$

$$X = 12.8$$

Put the Value of X in S.D

$$S.D = \frac{X - \bar{X}}{n}$$

$$1.2 = \frac{12.8 - 6}{n}$$

$$1.2n = 6.8$$

$$n = \frac{6.8}{1.2}$$

$$n = 5.67$$

$$n = 6$$

Question No: 47 (Marks: 5)

Use the given data to find the equation of the regression line. Round the final values to three significant digits, if necessary.

x y

1 143
 3 116
 5 100
 7 98
 9 90

Solution:

| X | Y | XY | X ² | Y ² |
|--------|---------|----------|----------------|----------------|
| 1 | 143 | 143 | 1 | 20449 |
| 3 | 116 | 348 | 9 | 13456 |
| 5 | 100 | 500 | 25 | 10000 |
| 7 | 98 | 686 | 49 | 9604 |
| 9 | 90 | 810 | 81 | 8100 |
| Sum=25 | Sum=547 | Sum=2487 | Sum=165 | Sum=61609 |

$$r = \frac{n \sum xy - (\sum X)(\sum Y)}{\sqrt{(n \sum x^2 - (\sum x)^2)(n \sum y^2 - (\sum y)^2)}}$$

$$r = \frac{(5)(2487) - (25)(547)}{\sqrt{(5(165) - (25)^2)(5(61609) - (547)^2)}}$$

$$r = \frac{12435 - 13675}{\sqrt{(825 - 625)(308045 - 299209)}}$$

$$r = \frac{-1240}{\sqrt{(200)(8836)}}$$

$$r = \frac{-1240}{\sqrt{1767200}}$$

$$r = \frac{-1240}{1329}$$

$$r = -0.933$$

Question No: 48 (Marks: 5)

Find the probability that a man flipping a coin gets the sixth head on the tenth flip.

Solution:

The probability of success (P) is 0.50, the number of trials (x) is 10, and the number of successes (r) is 6. We enter these values into the negative binomial formula.

Negative Binomial Distribution $P(X = r) = {}_{n-1}C_{r-1} p^r (1-p)^{n-r}$

(r) is 1. We enter these values into the negative binomial formula.

$$b^*(x; r, P) = {}_{x-1}C_{r-1} * P^r * Q^{x-r}$$

$$b^*(10,6,0.50) = {}_{10-1}C_{6-1} * 0.50^6 * (1-0.5)^{10-6}$$

$$b^*(10,6,0.50) = {}_9C_5 * 0.015625 * (0.5)^4$$

$$b^*(10,6,0.50) = 126 * 0.015625 * 0.0625$$


$$b^*(10,6,0.50) = 0.123046$$

Question No: 49 (Marks: 5)

Calculate the mean, median and mode for the following set of data 1,2,8,5,4,9,3,4,5,8,6,2,4,5,8,8000.

Solution

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|------|
| 1 | 2 | 2 | 3 | 4 | 4 | 4 | 5 | 5 | 5 | 6 | 8 | 8 | 8 | 9 | 8000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|------|


$$\text{Mean} = \frac{\sum x}{n}$$

$$\text{Mean} = \frac{8074}{16}$$

$$\text{Mean} = 504.625$$

$$\text{Median} = \frac{n+1}{2}$$

$$\text{Median} = \frac{16+1}{2}$$

$$\text{Median} = \frac{17}{2}$$

$$\text{Median} = 8.5^{\text{th}} \text{ Value}$$

$$\text{Median} = 5 + .5(5 - 5)$$

$$\text{Median} = 5 + .5(0)$$

$$\text{Median} = 5$$

$$\text{Mode} = 4, 5, 8$$

Question No: 50 (Marks: 10)

A

family has 3 boys and 2 girls.

- Find the number of ways they can sit in a row
- How many ways are there if the boys and girls are each to sit together?

Solution:


- The Five can sit in a row.

$$5 \times 4 \times 3 \times 2 \times 1 = 5! = 120$$

- There are two ways to distribute them according to sex.

BBBGG or GGGBB

In each case boys can sit in $3 \times 2 \times 1 = 3! = 6$ ways



The girls can sit $2 \times 1 = 2! = 2$ ways

Thus together they are...

$$= 2 \times 3! \times 2!$$

$$= 2 \times 6 \times 2$$

$$= 24 \text{ ways}$$