Yashoda Girls' Arts & Commerce College, Nagpur

Department of Commerce

Assignment

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INDEX

SUBJECT : Statistics and Business mathematics

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TOPIC

1. Mean, Median and mode merits demerits and problem with Solution.

2. Standard deviation 2 problem with Solution.

3. Business mathematics 3 problem with answers.

Mean

Q. What is mean?

Ans: Mean is an essential Concept in Mathematics and Statistics. The Mean is the average or the most common value in a collection of numbers.

In Statistics, it is a measure of central Tendency of a probability distribution along median and mode. It is also referred to as an expected Value.

MEAN : (Arithmetic Average) 'a'

Calculation of mean in individual Series:

Steps : 1) Obtain the total Size and denote it by 'n'

2) Apply the following formula:

$$a = \frac{\Sigma M}{n}$$

where 'a' Stands for mean

'M' Stands for total of Size of item.

'n' Number of items.

Arithmetic Mean:

It is also known a mean, it is defined as the sum of all items divided by the number of items.

Merits of Mean:

It is simple to understand and easy to calculate. It is based on each and every item of the Series. It is least effected by fluctuations of Sampling. It balences the values on either side of it.

Demerits mean:

It is affected by extreme items. It gives more importance to larger value and less important to smaller values. It is not an actual value in the data.

Calculation of mean in Continous Series:

Step: 1) obtain the mid - value (mid

point) of each class and denote them by M.V.

2) Take an assumed mean and denote it 'x'.

3) From mid-value and each class deduct the assumed mean and denote it by 'dx'.

4) Multiply the respective frequency of each class by these deviation and denote by 'Fdx' and obtain total Σfdx.

5) Apply the formula.

$$a = x + \frac{\Sigma fdx}{n}$$

Median

Q. What is Median?

Ans: Median is a statistical measure that determines the middle vale of dataset listed in ascending order. (i.e. From smallest to largest value.) The measure divides the lower half from the higher half of the dataset. Along with mean and mode, median is measure of central tendency.

MEDIAN -(M)

Calculation of median in individual series.

Steps: 1) Arrange the data in ascending order of magnitude.

2) Apply the formula.

Median $\therefore$ M = Size of $\left(\frac{n+1}{2}\right)$ the item

The median would be value of variable of the size of item which

is obtained as mentioned above.

If the number of size of item is in decimal point then apply the following formula and obtain the median.

Calculation of Median from Continuous Series.

Steps: Arrange the series in ascending order.

2) Find the cumulative frequency.

3) Determine the particular class in which the value of Median.

use $\left(\frac{n}{2}\right)$ as rank of median.

4) Apply the formula of interpolation for determining the exact value of Median.

$$\text{Median} = l_1 + \frac{l_2 - l_1}{f_1}(m - c)$$

Where l_1 - lower limit of Median group.

l_2 - Upper limit of median group.

f_1 - Frequency of Median group.

m - Rank of the median

C - Cumulative frequency of Class preceeding to Median group.

Median :

Median is the Middlemost item of the Series, provided the Series is arranged either in ascending order or in descending order of magnitude.

Merits of Median :

It is simple to understand and rigid to define. It is easy to calculate. It is deter

mined by graph. It is not changed by addition of some items.

Demerits of Median:

It is necessary to arrange the data for calculating median. It is affected by sampling fluctuations. It is not suitable of algebraic method.

Mode

Q. What is the mode?

Ans: The mode is the value that appears most frequently in a data set. A set of data may have one mode, more than, or no mode at all. other popular measures of central tendency include the mean or the average of a set, and the median, the middle value in a set.

Mode is the item which repeat the highest time.

Mode :

It is the value which occurs most frequently in a set of observation on the point of maximum frequency. It is the positional value. The item which represents more number of times in the series is known as mode.

Merits of mode :

Mode can be determined by inspection. It is easy to calculate. It is determined by graph. It is not affected by extreme items.

Demerits of mode :

It is not stable average. Many times, it is difficult to determine mode. The value is not based on each and every item.

Q1.

Marks	10-20	20-30	30-40	40-50	50-60	60-70
f	2	1	1	2	1	3

Solution:

Marks (M)	No. of Student (f)	Mid-value (M.v)	Dev. from as av. (dx / x = 35)
10-20	2	15	-20
20-30	1	25	-10
30-40	1	35	0
40-50	2	45	+10
50-60	1	55	+20
60-70	3	65	+30

Dev. from as av. xf. (fdx)
-40
-10
0
+20
+20
+90
$\Sigma fdx = 80$

$$a = x + \frac{\Sigma fdx}{n}$$

$$= 35 + \frac{80}{10}$$

$$= 35 + 8$$

$$= 43$$

Thus the mean is 43 Marks.

Q2. Determine the median from the following table.

Income	No. of Persons
Below 30	69
30 - 40	167
40 - 50	207
50 - 60	65
60 - 70	58
70 & above	10

Solution:

Income (m)	No. of Person (f)	Cumulative Frequency (cf)
20 - 30	69	69
30 - 40	167	236
40 - 50	207	443
50 - 60	65	508
60 - 70	58	566
70 - 80	10	576
	N = 576	

M = Size of $\left(\frac{n}{2}\right)$ th item.

= Size of $\left(\frac{576}{2}\right)$ th item.

= Size of (288) th item.

Size of (288) th item which lies in the group of 40-50

By interpolation :

$$= l_1 + \frac{l_2 - l_1}{f_1} (m - c)$$

$$= 40 + \frac{50-40}{207} (288 - 236)$$

$$= 40 + \frac{10}{207} (52)$$

$$= 40 + \frac{520}{207}$$

$$= 40 + 2.51$$

$$= 42.51$$

Thus Median is Rs. 42.51

Q3. Compute mode from the following series:

Age:	10	20	30	40	50	60
No. of Persons	15	32	51	78	97	110

Age	Tally bars	I	II	III	IV	V	VI
0-10		15					
10-20	I	17	32				
20-30	III	19		36	51		
30-40	III III	27	46			63	
40-50	III	19		46	59		65
50-60	I	13	32				

Mode lies in group of 30-40
By Interpolation:

$$= l_1 + \frac{f_1 - f_0}{2f_1 - f_0 - f_2}(l_2 - l_1)$$

$$= 30 + \frac{27 - 19}{2(27) - 19 - 19}(40 - 30)$$

$$= 30 + \frac{8}{16} \times 10$$

$$= 30 + \frac{80}{16} = 30 + 5 = 35$$

Thus mode is 35 years.

Standard Deviation (σ)

Calculation of Standard deviation in Individual Series:

Steps:

1) Take the deviations of the item from an assumed mean and denote these deviation by 'dx'.

2) Square these deviations and obtain the total Σdx^2.

3) Apply the following formula.

$$S.D = \sigma = \sqrt{\frac{\Sigma dx^2}{n} - \left(\frac{\Sigma dx}{n}\right)^2}$$

Q. 1 Goals scored by two teams A and B in a football season were as follows. State which team is more constant.

No. of goals Scored in a match	No. of matches played Team (A)	(Team B)
0	27	17
1	9	9
2	8	6
3	5	5
4	4	3

Team A

Goals Scored in a match (m)	No. of Matches (f)	Dev. from as.av. xf (dx/x=2)	Dev. as.av . xf (fdx)	Dev. as.a Squared x (fdx)^2
0	27	-2	-54	108
1	9	-1	-9	9
2	8	0	0	0
3	5	+1	+5	5
4	4	+2	+8	16
	n=53		Σfdx -50	Σfdx^2=138

$$a = X + \frac{\Sigma fdx}{n}$$

$$= 2 + \frac{-50}{53}$$

$$= 2 - .94$$

$$= 1.06$$

$$S.D. = \sigma = \sqrt{\frac{\Sigma fdx^2}{n} - \left(\frac{\Sigma fdx}{n}\right)^2}$$

$$= \sqrt{\frac{138}{53} - \left(\frac{-50}{53}\right)^2}$$

$$= \sqrt{2.60 - (.94)^2}$$

$$= \sqrt{2.60 - .89}$$

$$= \sqrt{1.71}$$

$$= 1.31$$

$$C.V = \frac{\sigma}{a} \times 100$$

$$= \frac{1.31}{1.06} \times 100$$

$$= 123.58\%$$

Q.2 Calculate the Standard deviation of the following Series.

Mark (more than) :	0	10	20	30	40	50	60	70
No. of Student :	100	90	75	50	25	15	5	0

Solution:

x	f	m.v	dx(25)	i(10)	fdx	fdx²
0-10	10	5	-20	-2	-20	40
10-20	15	15	-10	-1	-15	15
20-30	25	25	0	0	0	0
30-40	25	35	+10	+1	25	25
40-50	10	45	+20	+2	20	40
50-60	10	55	+30	+3	30	90
60-70	5	65	+40	+4	20	80
					Σfdx	Σfdx²
	n=100				=60	290

Standard deviation → (σ):

$$\sigma = \sqrt{\frac{\Sigma f dx^2}{n} - \left(\frac{\Sigma f dx}{n}\right)^2} \times i$$

$$= \sqrt{\frac{290}{100} - \left(\frac{60}{100}\right)^2} \times 10$$

$$= \sqrt{2.90 - (0.60)^2} \times 10$$

$$= \sqrt{2.90 - 0.36} \times 10$$

$$= \sqrt{2.54} \times 10$$

$$= 1.594 \times 10$$

$$= 159.4$$

Business Mathematics

Mathematics is the Soul of any business. Because a business primarily revolves around the transaction of money or products that have some monetary value. Involvement of money makes it extremely important to have sufficient knowledge about the basics of Calculations. This is where business Mathematics comes into play.

It deals with the fundamental topics that one needs to carry out business related Calculations. So, here we are going to learn about mathematical tools needed for business Calculating along with their applications

Sequence and Series

If a Set is a collection of objects, then we can think of a Sequence as a collection with its objects arranged in a fixed linear pattern. That means all the elements should follow

a particular Scheme and thus unlike in Sets, these elements can't inter change places. But, an element may occur twice depending upon the rule governing the Sqience. Now, a Series is nothing but the adelition of all the terms of a Sequence. The knowledge of these two topics comes in very handy while working with problems related to Compound interest, recurring deposits etc.

1. Arithmetic progression:

An arithmetic progression or arithmetic Sequence is a sequence in which the difference between any two Consecutive terms is Constant. The difference between the Consecutive term is known as the Common difference and is denoted by 'd'.

2. Geometric progression :

A geometric progression is a sequence in which any element after the first its obtained by multiplying the proceding elements by a constant called the common ration which is denoted by 'R'.

Mathematics is an important part of managing bussiness. Bnsiness and mathematics go hand in hand this is because business deals with money and money encompasses everything in itself. There is a need for everyone to manage money as some point or the other to take decisions which requires everyone to know mathematics. Commercial organizations use mathematics in accounting, inventory management, marketing, sales forecasting, and financial analysis. It helps you know the financial formulas fractions; measurements involved in interest calculation, hire rates, Salary Calculation, tax Calculation etc.

Q.1 Find the amount of Rs. 40,000 at 12% per annum in 4 years compounded quarterly.

Solution:

Here: $P = 40,000$; $R = 12\%$ p.a (quarterly 3%)

$N = 4$ years (quarterly 16)

Now: $A = P\left(1 + \frac{R}{100}\right)^n$

$A = 40,000\left(1 + \frac{3}{100}\right)^{16}$

$= 40,000\ (1.03)^{16}$

$= 40,000 \times 1.6047$

$= Rs.\ 64,188$

Q.2 The amount with compound interest of a certain principal at 5% p.a. for two years in Rs. 35280. Find out the principal. (Mar 2009)

Ans: $A = 35280, \quad P = ?, \quad N = 2, \quad R = 5\%$

$$A = \left(1 + \frac{R}{100}\right)^N$$

$$35280 = P\left(1 + \frac{5}{100}\right)^2$$

$$35280 = P(1 + 0.05)^2$$

$$35280 = P(1.05)^2$$

$$35280 = P.1025$$

$$P = \frac{35280}{1.1025}$$

principal is Rs. 32000

Q.3 The Compound interest of a certain Sum for 3 years at 10% P.a. interest is Rs. 1489.50. Find the Simple interest of this Sum at the Same rate and for the Same period.

Solution: Compound interest Rs = 1489.50

Rate of Compound interest (R) = 10% P.a.

Time (T) = 3 years

Let Sum of principal (P) = Rs. P

Compound interest $= P\left(1+\frac{R}{100}\right)^T - P$

$1489.50\ P\left(1+\frac{10}{100}\right)^3 - 1$

$P(1.331 - 1)$

$= 0.331P$

$P = \frac{1489 - 50}{0.331}$

$P = 4500$

principal = Rs 4500

Rate of simple interest (R) = 10% P.a.

Time (T) = 3 years

Simple interest $= \frac{P \times R \times T}{100}$

$$= \frac{4500 \times 10 \times 3}{100}$$

$$= 1350$$

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