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Method of Determination of Central Tendency of Non-negative Integral Valued Data: Application in Rainfall Data at Mumbai

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Abstract - *One formulation/method has been developed for determining central tendency of data in the situation where the data set consists of non-negative integral valued numbers. This formulation/method has been discussed in this article. Moreover, attempt has been made on numerical verification of the formulation/method by its application in data on rainfall (number of rainy days) at Mumbai.*

***Keywords*:** Non-negative integral valued observations, central tendency, formula, method.

1. INTRODUCTION

Central tendency [3 , 4 , 13 , 20 , 31] is one of the basic characteristics of data. A lot of measures have been developed in order to determine the central tendency of data [1 , 16 , 21 , 22 , 23 , 25 , 29 , 32].

There are a number of measures of central tendency of data which can be placed in two broad divisions namely mathematical measures and positional measures. The three popular mathematical measures of central tendency of data are arithmetic mean (AM), geometric mean (GM) and harmonic mean (HM), also known as Pythagorean Means [5 , 6 , 7 , 8 , 15 , 16 , 19]. The positional measures of central tendency are median, mode, mid range etc. [1 , 24 , 25, 28 , 30 , 33].

In addition to the above mathematical measures of central tendency, some more measures of the same have been developed in some recent studies. These are Arithmetic-Geometric Mean [2 , 9 , 15 , 19 , 21 , 22 , 27], Arithmetic-Harmonic Mean [10 , 11 , 15 , 17 , 18 , 19 , 21 , 22 , 24], Geometric-Harmonic Mean [12 , 15 , 19 , 21 , 22] and Arithmetic-Geometric-Harmonic [13 , 14 , 15 , 19 , 21 , 22].

In reality, data are not of the same type in different studies. In fact, data can be of too many types. The above measures may not be able and/or usually not able to measure of central tendency of all types of data. The above mathematical measures may suit the continuous data. Positional measures may suit ordinal data. There may be situation(s) and/or there are many situations where data set consists of integral valued numbers so that the central tendency of the data set is also an integral valued number. In such situation, the above measures of central tendency may fail to provide the value, which is a valid one, of central tendency since the values provided by them are not bound to be integers. For this reason, one formulation/method has been developed for determining the central tendency of integral valued numerical data [23]. In this attempt, one method has been developed for determining central tendency of data in the situation where the data set consists of non-negative integral valued numbers. This formulation/method has been discussed in this article. Moreover, attempt has been made on numerical verification of the formulation/method by its application in data on rainfall (number of rainy days) at Mumbai.

2. DETERMINATION OF CENTRAL TENDENCY-FORMULATION/METHOD

Let

$$x_1 , x_2 , \ldots\ldots\ldots , x_N$$

be N observations which are non-negative integral values observed on a non-negative integral valued random variable X so that its central tendency is also a non-negative integral value.

If μ is the central tendency of X, then the observations can be expressed as

$$x_i = \mu + \varepsilon_i \,, \quad (i = 1, 2, \ldots\ldots\ldots, N)$$

where

$$\varepsilon_1, \varepsilon_2, \ldots\ldots\ldots, \varepsilon_N$$

are the respective errors associated to the observations which are random and assume integral values.

This implies,

$$\text{AM}\,(x_1, x_2, \ldots\ldots, x_N) = \mu + \text{AM}\,(\varepsilon_2, \ldots\ldots, \varepsilon_N)$$

When the central tendency is 0 i.e. μ = 0 ,

then the only possibility is that some of

$$\varepsilon_1, \varepsilon_2, \ldots\ldots, \varepsilon_N$$

may be 0 while others are strictly positive integers so that AM $(\varepsilon_1, \varepsilon_2, \ldots\ldots, \varepsilon_N)$ is a positive real number.

Now, AM $(\varepsilon_2, \ldots\ldots, \varepsilon_N) \to 0$ as $N \to 0$

Hence for large N, AM $(x_1, x_2, \ldots\ldots, x_N)$ will be very near to 0 but > 0.

Therefore, the integer just below AM $(x_1, x_2, \ldots\ldots, x_N)$ will be the value of central tendency of X.

When the central tendency is 1 i.e. μ = 1,

then the possibility is that some of

$\varepsilon_1, \varepsilon_2, \ldots\ldots, \varepsilon_N$

maybe –1, some may be 0 while others are strictly positive integers so that AM $(\varepsilon_1, \varepsilon_2, \ldots\ldots, \varepsilon_N)$ is more likely to be a positive real number.

By the same logic as in the earlier case, the integer just below AM $(x_1, x_2, \ldots\ldots, x_N)$ will be the value of central tendency of X.

When the central tendency is m i.e. μ = m ,

then the possible values of errors are

$-m, -m+1, -m+2, \ldots\ldots, 0, 1, 2, 3, \ldots\ldots\ldots, m, m+1, m+2, \ldots\ldots\ldots$

In this case also, AM $(\varepsilon_1, \varepsilon_2, \ldots\ldots, \varepsilon_N)$ is more likely to be a positive real number since the set of positive errors is a super set to the set of negative errors,

which implies that the integer just below AM $(x_1, x_2, \ldots\ldots, x_N)$ will be the value of central tendency of X.

Again, since the tendency of the data set is μ, the observed values are most likely to be equal to μ. This implies that mode is theoretically the central tendency of the data set which further implies that mode tends to be identical with the value of central tendency as the size of data set tends to be large. Of course, for data set of small size it may not be so.

Possible Situations and determination of Central Tendency

(1) If the integer just below AM $(x_1, x_2, \ldots\ldots, x_N)$ and the mode of the data set are found to be identical then that common value is the value of central tendency of X.

(2) If the integer just below AM $(x_1, x_2, \ldots\ldots, x_N)$ and the mode of the data set are found to be different then identify the outlier(s) in the data set and repeat the process to obtain identical value of the integer just below the AM of modified data set and its mode. This common value is the value of central tendency of X.

(3) If mode is found not to be unique and/or if mode is found not to be identifiable, the integer just

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below AM ($x_1, x_2, \ldots\ldots, x_N$) is the value of central tendency of X.

3. NUMERICAL EXAMPLE

Data on number of rainy days (month-wise) at Mumbai corresponding to different months during the period from 1969 to 2001 have been collected from Indian Meteorological Department, which have been shown in the following table **(Table - 3.1):**

In order to determine central tendencies of number of rainy days in different months, cumulative arithmetic mean, and cumulative mode have been computed for the months as shown in the tables (from **Table - 3.2** to **Table - 3.16**).

The common value of mode and integral value just less than arithmetic mean for large number (> 30) of observations have been found for each of the months January (see **Table - 3.2**), February (see **Table - 3.3**), March (see **Table - 3.4**), April (see **Table - 3.5**), May (see **Table - 3.6**) and December (see **Table - 3.15**) as 0. Hence, the central tendency of number of rainy days in each of these six months is 0.

Similarly, the common value of mode and integral value just less than arithmetic mean for large number (> 30) of observations have been found for the month June as 12 (see **Table - 3.7**), July as 22 (see **Table - 3.8**), August as 21 (see **Table - 3.9**), and October as 3 (see **Table - 3.12**). Hence, these values are the central tendency of number of rainy days in the respective months.

But, the value of mode and the integral value just less than arithmetic mean for large number (> 30) of observations have been found for the month November as 0 and 1 respectively (see **Table - 3.13**). This difference may be due to the presence of outlier in the data set. The observation "7" corresponding to the year 1979 may most likely be the first outlier since it is the farthest observation from the mean of the data set. Accordingly, mode and integral value just less than arithmetic mean have been calculated from the other observations excluding this one. In doing this, the value of mode and the integral value just less than arithmetic mean have been found for this month as 0 and 0 respectively (see **Table - 3.14**). Hence, the central tendency of number of rainy days in November is 0.

Similarly, the value of mode and the integral value just less than arithmetic mean for large number (> 30) of observations have been found for the month September as 16 and 13 respectively (see **Table - 3.10**). After removing outlier also, these two values have been found as 16 and 13 respectively (see **Table - 3.11**). However, it is observed that though the mode "16" has appeared 4 times while the observation"13" has appeared 3 times. Thus, the observation "13" may also be the mode if more observations are taken in the study. Accordingly, the central tendency of number of rainy days in September is 0.

Table -3.1: (Number of Rainy Days at Mumbai)

Year	Number of Rainy Days in the month											
	Jan	Feb	Mar	April	May	June	Jul	Aug	Sept	Oct	Nov	Dec
1969	0	0	0	0	0	14	28	20	15	1	2	0
1970	0	0	0	1	1	18	19	27	17	5	0	0
1971	0	0	0	0	2	17	19	18	11	2	0	0
1972	0	1	0	0	0	0	22	12	6	0	1	0
1973	0	0	0	0	0	12	26	26	25	2	0	0
1974	0	0	0	1	3	10	24	26	18	10	0	0
1975	0	0	0	0	0	15	20	27	16	9	0	0
1976	0	0	0	0	0	15	24	22	16	0	2	0
1977	0	0	0	0	0	13	27	16	11	3	5	0
1978	0	0	0	0	0	19	24	23	13	2	3	1
1979	0	0	0	0	0	12	17	17	10	1	7	0
1980	0	0	0	0	0	15	17	25	10	2	2	2
1981	0	0	0	0	0	0	24	21	18	6	1	0
1982	0	0	0	0	0	0	20	24	15	0	2	0
1983	0	0	0	1	0	12	27	25	23	5	0	0
1984	0	1	0	0	0	14	24	19	9	3	0	0
1985	0	0	0	0	1	18	22	20	8	6	0	0
1986	0	0	0	0	0	16	16	15	6	0	2	1
1987	0	0	0	0	0	14	26	21	5	3	0	2
1988	0	0	0	0	0	17	27	24	25	3	0	0
1989	0	0	0	0	0	18	24	23	13	3	0	0
1990	0	1	1	0	5	13	23	27	21	6	0	0
1991	1	0	0	0	0	10	26	26	6	0	0	1
1992	0	0	0	0	0	9	22	22	11	3	0	0
1993	0	0	0	0	0	9	26	23	22	7	0	0
1994	1	0	0	0	1	13	28	21	16	2	0	0
1995	0	0	0	0	0	5	24	17	13	5	0	0
1996	0	0	0	0	0	12	29	25	15	6	0	0
1997	0	0	0	0	0	16	16	24	12	0	4	2
1998	0	0	0	0	0	16	22	19	14	12	2	0
1999	0	0	0	0	4	18	18	16	16	6	0	0
2000	0	0	0	0	7	4	19	19	7	4	0	1

(Source: Indian Meteorological Department, Pune)

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Table -3.2:

Year	Number of Rainy Days in Jan	Cumulative Arithmetic Mean	Cumulative Mode	Year	Number of Rainy Days in Jan	Cumulative Arithmetic Mean	Cumulative Mode
1969	0	0		1985	0	0	0
1970	0	0		1986	0	0	0
1971	0	0		1987	0	0	0
1972	0	0	0	1988	0	0	0
1973	0	0	0	1989	0	0	0
1974	0	0	0	1990	0	0	0
1975	0	0	0	1991	1	0.0434783	0
1976	0	0	0	1992	0	0.0416667	0
1977	0	0	0	1993	0	0.04	0
1978	0	0	0	1994	1	0.0769231	0
1979	0	0	0	1995	0	0.0740741	0
1980	0	0	0	1996	0	0.0714286	0
1981	0	0	0	1997	0	0.0689655	0
1982	0	0	0	1998	0	0.0666667	0
1983	0	0	0	1999	0	0.0645161	0
1984	0	0	0	2000	0	0.0625	0

Table -3.3:

Year	Number of Rainy Days in Feb	Cumulative Arithmetic Mean	Cumulative Mode	Year	Number of Rainy Days in Feb	Cumulative Arithmetic Mean	Cumulative Mode
1969	0	0		1985	0	0.1176471	0
1970	0	0		1986	0	0.1111111	0
1971	0	0		1987	0	0.1052632	0
1972	1	5	0	1988	0	0.1	0
1973	0	0.2	0	1989	0	0.0952381	0
1974	0	0.1666667	0	1990	1	0.1363636	0
1975	0	0.1428571	0	1991	0	0.1304348	0
1976	0	0.125	0	1992	0	0.125	0
1977	0	0.1111111	0	1993	0	1.5	0
1978	0	0.1	0	1994	0	0.1153846	0
1979	0	0.0090909	0	1995	0	0.1111111	0
1980	0	0.0833333	0	1996	0	0.1071429	0
1981	0	0.0769231	0	1997	0	0.1034483	0
1982	0	0.0714286	0	1998	0	0.1	0
1983	0	0.0666667	0	1999	0	0.0967742	0
1984	1	0.125	0	2000	0	0.09375	0

Table -3.4:

Year	Number of Rainy Days in March	Cumulative Arithmetic Mean	Cumulative Mode	Year	Number of Rainy Days in March	Cumulative Arithmetic Mean	Cumulative Mode
1969	0	0		1985	0	0	0
1970	0	0		1986	0	0	0
1971	0	0		1987	0	0	0
1972	0	0	0	1988	0	0	0
1973	0	0	0	1989	0	0	0
1974	0	0	0	1990	1	0.0454545	0
1975	0	0	0	1991	0	0.0434783	0
1976	0	0	0	1992	0	0.0416667	0
1977	0	0	0	1993	0	0.04	0
1978	0	0	0	1994	0	0.0384615	0
1979	0	0	0	1995	0	0.0370370	0
1980	0	0	0	1996	0	0.0357143	0
1981	0	0	0	1997	0	0.5	0
1982	0	0	0	1998	0	0.0333333	0
1983	0	0	0	1999	0	0.0322581	0
1984	0	0	0	2000	0	0.03125	0

Table -3.5:

Year	Number of Rainy Days in April	Cumulative Arithmetic Mean	Cumulative Mode	Year	Number of Rainy Days in April	Cumulative Arithmetic Mean	Cumulative Mode
1969	0	0		1985	0	0.1764706	0
1970	1	0.5		1986	0	0.1666667	0
1971	0	0.3333333		1987	0	0.1578947	0
1972	0	0.25	0	1988	0	0.15	0
1973	0	0.25	0	1989	0	0.1428571	0
1974	1	0.5	0	1990	0	0.1363636	0
1975	0	0.2857143	0	1991	0	0.1304348	0
1976	0	0.25	0	1992	0	0.125	0
1977	0	0.2222222	0	1993	0	1.5	0
1978	0	0.2	0	1994	0	0.1153846	0
1979	0	0.1818182	0	1995	0	0.1111111	0
1980	0	0.1666667	0	1996	0	0.1071429	0
1981	0	0.1538462	0	1997	0	0.1034483	0
1982	0	0.1428571	0	1998	0	0.1	0
1983	1	0.2	0	1999	0	0.0967742	0
1984	0	0.1875	0	2000	0	0.09375	0

Table -3.6:

Year	Number of Rainy Days in May	Cumulative Arithmetic Mean	Cumulative Mode	Year	Number of Rainy Days in May	Cumulative Arithmetic Mean	Cumulative Mode
1969	0	0		1985	1	0.4117647	0
1970	1	0.5		1986	0	0.3888889	0
1971	2	1		1987	0	0.3684211	0
1972	0	0.75	0	1988	0	0.35	0
1973	0	0.6	0	1989	0	0.3333333	0
1974	3	1	0	1990	5	0.5454545	0
1975	0	0.8571429	0	1991	0	0.5217391	0
1976	0	0.75	0	1992	0	0.5	0
1977	0	0.6666667	0	1993	0	0.48	0
1978	0	0.6	0	1994	1	0.5	0
1979	0	0.5454545	0	1995	0	0.4814815	0
1980	0	0.5	0	1996	0	0.4642857	0
1981	0	0.4615385	0	1997	0	0.4482759	0
1982	0	0.4285714	0	1998	0	0.4333333	0
1983	0	0.4	0	1999	4	0.5483871	0
1984	0	0.375	0	2000	7	0.75	0

Table -3.7:

Year	Number of Rainy Days in June	Cumulative Arithmetic Mean	Cumulative Mode	Year	Number of Rainy Days in June	Cumulative Arithmetic Mean	Cumulative Mode
1969	14	14		1985	18	12	
1970	18	16		1986	16	12	
1971	17	16.333333		1987	14	643.89474	
1972	0	12.25		1988	17	12.55	
1973	12	12.2		1989	18	12.809524	
1974	10	11.833333		1990	13	12.818182	
1975	15	12.285714		1991	10	12.695652	
1976	15	12.625	15	1992	9	12.541667	
1977	13	12.666667	15	1993	9	12.4	
1978	19	13.3	15	1994	13	12.423077	
1979	12	13.181818	12 , 15	1995	5	12.148148	
1980	15	13.333333	15	1996	12	12.142857	12
1981	0	12.307692	15	1997	16	12.275862	12
1982	0	11.428571	15	1998	16	12.4	12
1983	12	11.466667	12 , 15	1999	18	12.580645	12
1984	14	11.625	12 , 15	2000	18	12	12 , 15

Table -3.8:

Year	Number of Rainy Days in July	Cumulative Arithmetic Mean	Cumulative Mode	Year	Number of Rainy Days in July	Cumulative Arithmetic Mean	Cumulative Mode
1969	28	28		1985	22	384	
1970	19	23.5		1986	16	22.222222	
1971	19	22		1987	26	3	
1972	22	22		1988	27	453	
1973	26	22.8		1989	24	22.714286	
1974	24	23		1990	23	22.727273	
1975	20	22.571429		1991	26	22.869565	
1976	24	22.75		1992	22	22.833333	
1977	27	23.222222		1993	26	22.96	
1978	24	23.3		1994	28	23.153846	
1979	17	22.727273		1995	24	23.185185	
1980	17	22.25		1996	29	23.392857	
1981	24	22.384615		1997	16	23.137931	
1982	20	22.214286		1998	22	23.1	22
1983	27	22.533333		1999	18	22.935484	22
1984	24	22.625		2000	19	22.8125	22

Table -3.9:

Year	Number of Rainy Days in August	Cumulative Arithmetic Mean	Cumulative Mode	Year	Number of Rainy Days in August	Cumulative Arithmetic Mean	Cumulative Mode
1969	20	20		1985	20	21.647059	
1970	27	23.5		1986	15	21.277778	
1971	18	21.666667		1987	21	21.263158	
1972	12	19.25		1988	24	21.4	
1973	26	20.6		1989	23	21.476190	
1974	26	21.5		1990	27	21.727273	
1975	27	22.285714		1991	26	21.913043	
1976	22	22.25		1992	22	21.916667	
1977	16	21.555556		1993	23	21.96	
1978	23	21.7		1994	21	21.923077	21
1979	17	21.272727		1995	17	21.740741	
1980	25	21.583333		1996	25	21.857143	
1981	21	21.538462		1997	24	21.931034	
1982	24	21.714286		1998	19	21.833333	
1983	25	21.933333		1999	16	21.645161	
1984	19	21.75		2000	19	21.5625	19 , 21

Table -3.10:

Year	Number of Rainy Days in Sept	Cumulative Arithmetic Mean	Cumulative Mode	Year	Number of Rainy Days in Sept	Cumulative Arithmetic Mean	Cumulative Mode
1969	15	15		1985	8	14.176471	
1970	17	16		1986	6	13.722222	
1971	11	14.333333		1987	5	13.263158	
1972	6	12.25		1988	25	13.85	
1973	25	14.8		1989	13	13.809524	
1974	18	15.333333		1990	21	14.136364	
1975	16	15.428571		1991	6	13.782609	
1976	16	15.5		1992	11	13.666667	
1977	11	13.777778		1993	22	14	
1978	13	14.8		1994	16	14.076923	
1979	10	14.363636		1995	13	14.037037	
1980	10	14		1996	15	14.071429	
1981	18	14.307692		1997	12	14	
1982	15	14.357143		1998	14	14	
1983	23	14.933333		1999	16	14.064516	16
1984	9	14.5625		2000	7	13.84375	16

Table -3.11:

Year	Number of Rainy Days in Sept *	Cumulative Arithmetic Mean	Cumulative Mode	Year	Number of Rainy Days in Sept *	Cumulative Arithmetic Mean	Cumulative Mode
1969	15	15		1985	8	13.5	
1970	17	16		1986	6	13.058824	
1971	11	14.333333		1987	5	12.611111	
1972	6	12.25		1988			
1973				1989	13	12.631579	
1974	18	13.4		1990	21	13.05	
1975	16	13.833333		1991	6	12.714286	
1976	16	14.142857		1992	11	12.636364	
1977	11	13.75		1993	22	13.043478	
1978	13	13.666667		1994	16	13.166667	
1979	10	13.3		1995	13	13.16	
1980	10	13		1996	15	13.230769	
1981	18	13.416667		1997	12	13.185185	
1982	15	13.538462		1998	14	13.214286	
1983	23	14.214286		1999	16	13.310345	16
1984	9	13.866667		2000	7	13.1	16

Table -3.12:

Year	Number of Rainy Days in October	Cumulative Arithmetic Mean	Cumulative Mode	Year	Number of Rainy Days in October	Cumulative Arithmetic Mean	Cumulative Mode
1969	1	1		1985	6	3.3529412	
1970	5	3.5		1986	0	3.1666667	
1971	2	2.6666667		1987	3	3.1578947	
1972	0	2		1988	3	3.15	
1973	2	2		1989	3	33	
1974	10	3.3333333		1990	6	3.2727273	
1975	9	4.1428571		1991	0	3.1304349	
1976	0	3.625		1992	3	3.125	3
1977	3	3.5555556		1993	7	3.28	3
1978	2	3.4		1994	2	3.2307692	3
1979	1	3.1818182		1995	5	343.34615	3
1980	2	3.0833333		1996	6	3.3928571	3
1981	6	3.3076923		1997	0	3.2758621	3
1982	0	3.0714286		1998	12	3.5666667	3
1983	5	3.2		1999	6	3.6451613	3
1984	3	3.1875		2000	4	3.65625	3

Table -3.13:

Year	Number of Rainy Days in Nov	Cumulative Arithmetic Mean	Cumulative Mode	Year	Number of Rainy Days in Nov	Cumulative Arithmetic Mean	Cumulative Mode
1969	2	2		1985	0	1.4705882	0
1970	0	1		1986	2	1.5	0
1971	0	0.6666667		1987	0	1.4210526	0
1972	1	0.75		1988	0	1.35	0
1973	0	0.6	0	1989	0	1.2857143	0
1974	0	0.5	0	1990	0	1.2272727	0
1975	0	0.4285714	0	1991	0	1.1739130	0
1976	2	0.625	0	1992	0	1.125	0
1977	5	1.1111111	0	1993	0	1.08	0
1978	3	1.3	0	1994	0	1.0384615	0
1979	7	1.8181818	0	1995	0	1	0
1980	2	1.8333333	0	1996	0	0.9642857	0
1981	1	1.7692308	0	1997	4	1.0689655	0
1982	2	1.7857143	0	1998	2	1.1	0
1983	0	1.6666667	0	1999	0	1.0645161	0
1984	0	1.5625	0	2000	0	1.03125	0

Table -3.14:

Year	Number of Rainy Days in Nov *	Cumulative Arithmetic Mean	Cumulative Mode	Year	Number of Rainy Days in Nov *	Cumulative Arithmetic Mean	Cumulative Mode
1969	2	2		1985	0	1.125	0
1970	0	1		1986	2	1.1764706	0
1971	0	0.6666667		1987	0	1.1111111	0
1972	1	0.75		1988	0	1.0526315	0
1973	0	0.6	0	1989	0	1	0
1974	0	0.5	0	1990	0	0.9523809	0
1975	0	0.4285714	0	1991	0	0.9090909	0
1976	2	0.625	0	1992	0	0.8695652	0
1977	5	1.1111111	0	1993	0	0.8333333	0
1978	3	1.3	0	1994	0	0.8	0
1979		-----		1995	0	0.7692308	0
1980	2	1.3636364	0	1996	0	0.7407407	0
1981	1	1.3333333	0	1997	4	0.8571429	0
1982	2	1.3846154	0	1998	2	0.8965517	0
1983	0	1.2857143	0	1999	0	0.8666667	0
1984	0	1.2	0	2000	0	0.8387097	0

Table -3.15:

Year	Number of Rainy Days in Dec	Cumulative Arithmetic Mean	Cumulative Mode	Year	Number of Rainy Days in Dec	Cumulative Arithmetic Mean	Cumulative Mode
1969	0	0		1985	0	0.1764706	0
1970	0	0		1986	1	0.2222222	0
1971	0	0		1987	2	0.3157895	0
1972	0	0	0	1988	0	0.3	0
1973	0	0	0	1989	0	0.2857143	0
1974	0	0	0	1990	0	0.2727273	0
1975	0	0	0	1991	1	0.3043478	0
1976	0	0	0	1992	0	0.2916667	0
1977	0	0	0	1993	0	0.28	0
1978	1	0,1	0	1994	0	0.2692308	0
1979	0	0.0909091	0	1995	0	0.2592593	0
1980	2	0.25	0	1996	0	0.25	0
1981	0	0.0194615	0	1997	2	0.3103448	0
1982	0	0.2142857	0	1998	0	0.3	0
1983	0	0.2	0	1999	0	0.2903226	0
1984	0	0.1875	0	2000	1	0.3125	0

4. CONCLUSION

It can be concluded that the value of central tendency of a data set containing non-negative integral valued numbers is the common value of the mode and the integer just below the arithmetic mean of the data set if exists and simply the integer just below the arithmetic mean if does not exist. When the common value does not exist, the presence of outlier(s) in the data set is to be examined and necessary rectification of calculation is to be worked out if the presence of outlier is found in the data set.

Each existing measure of central tendency results in value which lies in the middle part or central part of the associated data. However, tendency of data may not always be towards the central portion of the data in reality. There are situations in reality where the tendency of data is not towards the central / middle portion of the data but towards one end point of the data set. Findings of this study provide information that the value of central tendency of data may not always lie in the central part of the data set. It may lie at one end point of the data set. Thus, it is more appropriate to say "measure of tendency of data" than to say "measure of central tendency of data".

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