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#### **LAB EXPERIMENT 1**

#### **INTRODUCTION TO PROGRAMMING IN R**

##### **AIM:**

To perform basic operations in R and to work with tables.

##### **Question: DATA SET- POPULATION OF INDIA**

1. Consider the following dataset:

<https://www.worldometers.info/world-population/india-population/>

# Population of India (2020 and historical)

Year	Population	Yearly % Change	Yearly Change	Migrants (net)	Median Age	Fertility Rate	Density (P/Km <sup>2</sup> )	Urban Pop %	Urban Population	Country's Share of World Pop	World Population	India Global Rank
2020	<b>1,380,004,385</b>	0.99 %	13,586,631	-532,687	28.4	2.24	464	35.0 %	483,098,640	17.70 %	7,794,798,739	2
2019	<b>1,366,417,754</b>	1.02 %	13,775,474	-532,687	27.1	2.36	460	34.5 %	471,828,295	17.71 %	7,713,468,100	2
2018	<b>1,352,642,280</b>	1.04 %	13,965,495	-532,687	27.1	2.36	455	34.1 %	460,779,764	17.73 %	7,631,091,040	2
2017	<b>1,338,676,785</b>	1.07 %	14,159,536	-532,687	27.1	2.36	450	33.6 %	449,963,381	17.74 %	7,547,858,925	2
2016	<b>1,324,517,249</b>	1.10 %	14,364,846	-532,687	27.1	2.36	445	33.2 %	439,391,699	17.75 %	7,464,022,049	2
2015	<b>1,310,152,403</b>	1.20 %	15,174,247	-470,015	26.8	2.40	441	32.7 %	429,069,459	17.75 %	7,379,797,139	2

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2010	<b>1,234,281,170</b>	1.47 %	17,334,249	-531,169	25.1	2.80	415	30.8 %	380,744,554	17.74 %	6,956,823,603	2
2005	<b>1,147,609,927</b>	1.67 %	18,206,876	-377,797	23.8	3.14	386	29.1 %	334,479,406	17.54 %	6,541,907,027	2
2000	<b>1,056,575,549</b>	1.85 %	18,530,592	-136,514	22.7	3.48	355	27.6 %	291,350,282	17.20 %	6,143,493,823	2
1995	<b>963,922,588</b>	1.99 %	18,128,958	-110,590	21.8	3.83	324	26.5 %	255,558,824	16.78 %	5,744,212,979	2
1990	<b>873,277,798</b>	2.17 %	17,783,558	9,030	21.1	4.27	294	25.5 %	222,296,728	16.39 %	5,327,231,061	2
1985	<b>784,360,008</b>	2.33 %	17,081,433	115,942	20.6	4.68	264	24.3 %	190,321,782	16.10 %	4,870,921,740	2
1980	<b>698,952,844</b>	2.32 %	15,169,989	222,247	20.2	4.97	235	23.0 %	160,941,941	15.68 %	4,458,003,514	2

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1975	<b>623,102,897</b>	2.33 %	13,582,621	421,208	19.7	5.41	210	21.3 %	132,533,810	15.27 %	4,079,480,606	2
1970	<b>555,189,792</b>	2.15 %	11,213,294	-68,569	19.3	5.72	187	19.7 %	109,388,950	15.00 %	3,700,437,046	2
1965	<b>499,123,324</b>	2.07 %	9,715,129	-17,078	19.6	5.89	168	18.7 %	93,493,844	14.95 %	3,339,583,597	2
1960	<b>450,547,679</b>	1.91 %	8,133,417	-30,805	20.2	5.90	152	17.9 %	80,565,723	14.85 %	3,034,949,748	2
1955	<b>409,880,595</b>	1.72 %	6,711,079	-21,140	20.7	5.90	138	17.6 %	71,958,495	14.78 %	2,773,019,936	2

1. Create a data frame with the above data.

## Syntax

```
tab1 = read.csv("C:\\\\Users\\\\monis\\\\Desktop\\\\world_population.csv")
tab1
```

## Output

```
> tab1 = read.csv("C:\\\\Users\\\\monis\\\\Desktop\\\\world_population.csv")
>
> tab1
   Year    TotPop YrlyChangePC YrlyChange MigrantsNet MedianAge FertilityRate Density.P.Km² UrbanPopPC UrbanPop ShareOfWorldPop  WorldPop GlbRnk
1 2020 1380004385      0.99  13586631     -532687     28.4       2.24        464      35.0 483098640      17.70 7794798739      2
2 2019 1366417754      1.02  13775474     -532687     27.1       2.36        460      34.5 471828295      17.71 7713468100      2
3 2018 1352642280      1.04  13965495     -532687     27.1       2.36        455      34.1 460779764      17.73 7631091040      2
4 2017 1338676785      1.07  14159536     -532687     27.1       2.36        450      33.6 449963381      17.74 7547858925      2
5 2016 1324517249      1.10  14364846     -532687     27.1       2.36        445      33.2 439391699      17.75 7464022049      2
6 2015 1310152403      1.20  15174247     -470015     26.8       2.40        441      32.7 429069459      17.75 7379797139      2
7 2010 1234281170      1.47  17334249     -531169     25.1       2.80        415      30.8 380744554      17.74 6956823603      2
8 2005 1147609927      1.67  18206876     -377797     23.8       3.14        386      29.1 334479406      17.54 6541907027      2
9 2000 1056575549      1.85  18530592     -136514     22.7       3.48        355      27.6 291350282      17.20 6143493823      2
10 1995 963922588      1.99  18128958     -110590     21.8       3.83        324      26.5 255558824      16.78 5744212979      2
11 1990 873277798      2.17  17783558      9030     21.1       4.27        294      25.5 222296728      16.39 5327231061      2
12 1985 784360008      2.33  17081433     115942     20.6       4.68        264      24.3 190321782      16.10 4870921740      2
13 1980 698952844      2.32  15169989     222247     20.2       4.97        235      23.0 160941941      15.68 4458003514      2
14 1975 623102897      2.33  13582621     421208     19.7       5.41        210      21.3 132533810      15.27 4079480606      2
15 1970 555189792      2.15  11213294     -68569     19.3       5.72        187      19.7 109388950      15.00 3700437046      2
16 1965 499123324      2.07  9715129     -17078     19.6       5.89        168      18.7 93493844      14.95 3339583597      2
17 1960 450547679      1.91  8133417     -30805     20.2       5.90        152      17.9 80565723      14.85 3034949748      2
18 1955 409880595      1.72  6711079     -21140     20.7       5.90        138      17.6 71958495      14.78 2773019936      2
```

2. Find the summary of the whole data set. (Use appropriate syntax)

## Syntax

```
summary(tab1)
```

## Output

```
> summary(tab1)
   Year      TotPop     YrlyChangePC    YrlyChange    MigrantsNet    MedianAge    FertilityRate    Density.P.Km²
Min. :1955  Min. :4.099e+08  Min. :0.990   Min. : 6711079  Min. :-532687  Min. :19.30  Min. :2.240  Min. :138.0
1st Qu.:1976 1st Qu.:6.421e+08  1st Qu.:1.125   1st Qu.:13583624  1st Qu.:-532308  1st Qu.:20.30  1st Qu.:2.370  1st Qu.:216.2
Median :1998  Median :1.010e+09  Median :1.785   Median :14262191  Median :-123552  Median :22.25  Median :3.655  Median :339.5
Mean   :1994  Mean   :9.650e+08  Mean   :1.689   Mean   :14256524  Mean   :-203260  Mean   :23.24  Mean   :3.893  Mean   :324.6
3rd Qu.:2016 3rd Qu.:1.321e+09  3rd Qu.:2.130   3rd Qu.:17271045  3rd Qu.:-18094   3rd Qu.:27.02  3rd Qu.:5.300  3rd Qu.:444.0
Max.   :2020  Max.   :1.380e+09  Max.   :2.330   Max.   :18530592  Max.   :421208  Max.   :28.40  Max.   :5.900  Max.   :464.0
   UrbanPopPC    UrbanPop    ShareOfWorldPop    WorldPop    GlbRnk
Min. :17.60  Min. : 71958495  Min. :14.78   Min. :2.773e+09  Min. :2
1st Qu.:21.73 1st Qu.:139635843  1st Qu.:15.37   1st Qu.:4.174e+09  1st Qu.:2
Median :27.05  Median :273454553  Median :16.99   Median :5.944e+09  Median :2
Mean   :26.95  Mean   :280986976  Mean   :16.59   Mean   :5.695e+09  Mean   :2
3rd Qu.:33.08 3rd Qu.:436811139  3rd Qu.:17.73   3rd Qu.:7.443e+09  3rd Qu.:2
Max.   :35.00  Max.   :483098640  Max.   :17.75   Max.   :7.795e+09  Max.   :2
```

3. Find the mean, median for the population of India between 1955 and 2020 and justify your answer.

### Syntax

```
mean(tab1$TotPop)

median(tab1$TotPop)
```

### Output

```
> mean(tab1$TotPop)
[1] 964957502
>
>
> median(tab1$TotPop)
[1] 1010249069
```

### Justification

From the data, we can find that the mean population of India between 1955 to 2020 is 964,957,502 (approximately in 1994-1995) and similarly median population is 1,010,249,069 (approximately in year 1999-2000). Thus, there was a greater rate of rise in population in the span of past 20 years (2000-20) compared to that of 45-year span of 1955-2000.

4. Find the variance, standard deviation of population of India and population of the world.

### Syntax

```
var(tab1$TotPop)
var(tab1$WorldPop)

sd(tab1$TotPop)
sd(tab1$WorldPop)
```

### Output

```
> var(tab1$TotPop)
[1] 1.277892e+17
> var(tab1$WorldPop)
[1] 3.190613e+18
>
> sd(tab1$TotPop)
[1] 357476221
> sd(tab1$WorldPop)
[1] 1786228737
```

5. calculate the average density.

### Syntax

```
mean(tab1$`Density.P.Km²`)
```

### Output

```
>  
> mean(tab1$`Density.P.Km²`)  
[1] 324.6111
```

6. Any other notable analysis from the above dataset.

### **Average of India's Share of Total World Population:**

#### **Syntax**

```
mean(tab1$ShareofworldPop)
```

#### **Output**

```
>
> mean(tab1$ShareofworldPop)
[1] 16.59222
```

From the dataset and output, we can conclude that India contributes an average of about 16.59% of world's population, and hence making it the second most populated nation.