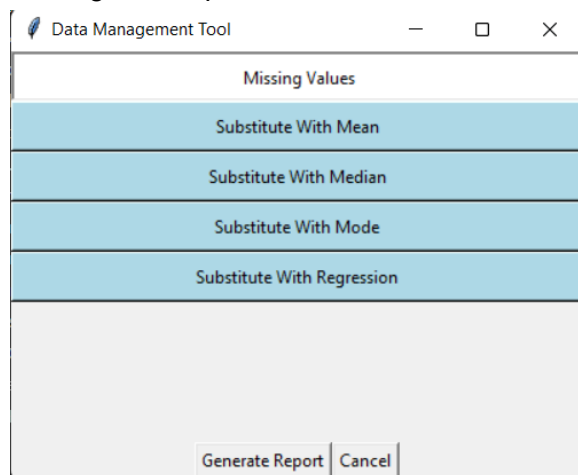
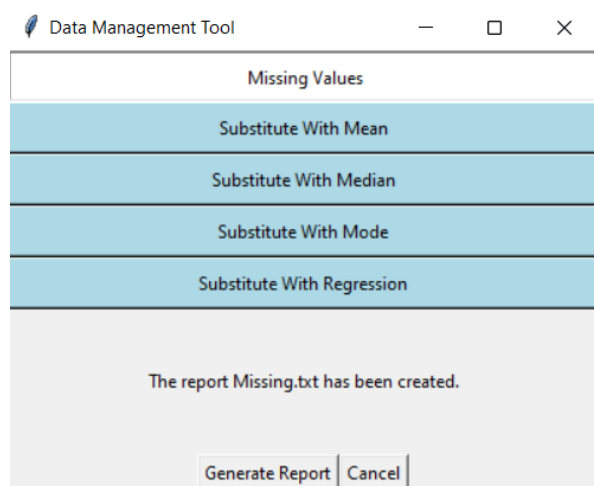


Launching Program

The windowed view of the program has 5 buttons that either substitute data or generate a missing data report.



Missing Values



Console Output:

The number of missing values in each column

| | |
|---------------|----|
| CustomerID | 0 |
| Gender | 0 |
| Age | 8 |
| Education | 2 |
| Occupation | 3 |
| MaritalStatus | 0 |
| ProductRating | 14 |

The data types of the columns are:

Nicholas Thomson, Brian Butzen

| | |
|---------------|---------|
| CustomerID | int64 |
| Gender | object |
| Age | float64 |
| Education | object |
| Occupation | object |
| MaritalStatus | object |
| ProductRating | float64 |

The number of missing values in each row is

| | |
|----|---|
| 0 | 0 |
| 1 | 0 |
| 2 | 0 |
| 3 | 1 |
| 4 | 1 |
| 5 | 0 |
| 6 | 0 |
| 7 | 1 |
| 8 | 1 |
| 9 | 1 |
| 10 | 0 |
| 11 | 1 |
| 12 | 1 |
| 13 | 0 |
| 14 | 1 |
| 15 | 1 |
| 16 | 1 |
| 17 | 0 |
| 18 | 1 |
| 19 | 0 |
| 20 | 0 |
| 21 | 0 |
| 22 | 0 |
| 23 | 1 |
| 24 | 1 |
| 25 | 0 |
| 26 | 0 |
| 27 | 1 |
| 28 | 1 |
| 29 | 1 |
| 30 | 0 |
| 31 | 1 |
| 32 | 1 |
| 33 | 0 |
| 34 | 1 |

Nicholas Thomson, Brian Butzen

| | |
|----|---|
| 35 | 1 |
| 36 | 1 |
| 37 | 0 |
| 38 | 1 |
| 39 | 0 |
| 40 | 0 |
| 41 | 0 |
| 42 | 0 |
| 43 | 1 |
| 44 | 1 |
| 45 | 0 |
| 46 | 0 |
| 47 | 1 |
| 48 | 1 |
| 49 | 1 |

The total number of missing values is 27

Statistical values of the present data

Age - Mean: 35.23809523809524

Median: 35.0

Product Rating - Mean: 4.269444444444445

Median: 4.2

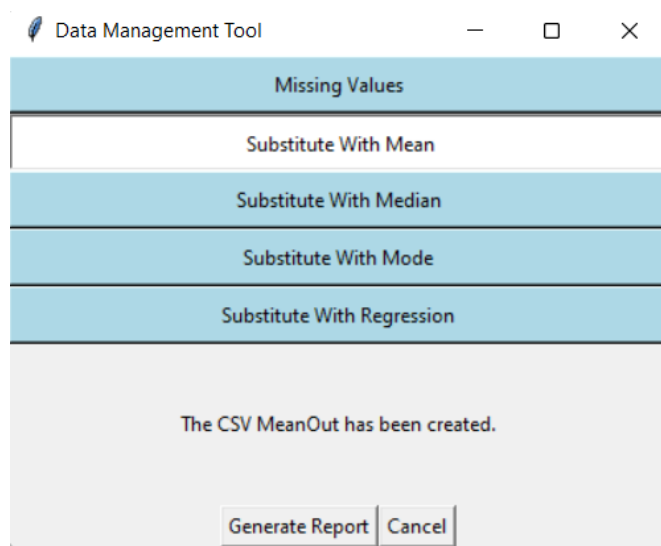
Gender - Mode: Female

Education - Mode: Bachelor's

Occupation - Mode: Marketing

Marital Status - Mode: Married

Substitution with Mean

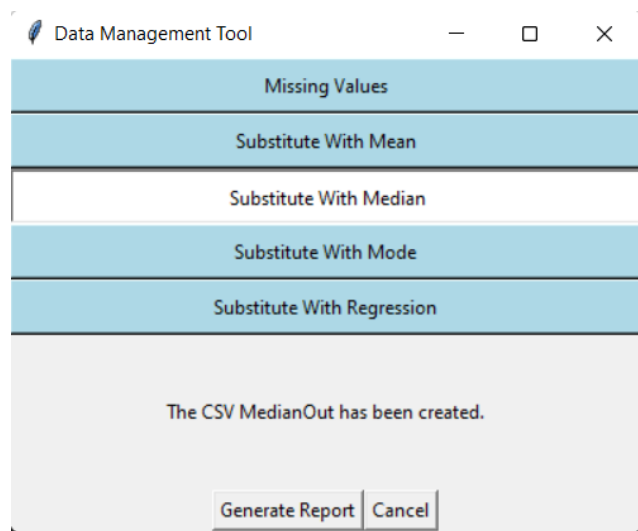


Output CSV File:

```
CustomerID,Gender,Age,Education,Occupation,MaritalStatus,ProductRating
1001,Male,35.0,Bachelor's,Digital Marketing,Married,4.5
1002,Female,28.0,Bachelor's,Software Engineer,Single,3.8
1003,Male,45.0,Master's,Finance,Married,4.2
1004,Female,32.0,High School,Sales,Single,4.269444444444445
1005,Female,35.23809523809524,Master's,Teacher,Married,4.0
1006,Male,40.0,Doctorate,Operations,Married,4.7
1007,Male,38.0,Bachelor's,Marketing,Single,4.3
1008,Female,35.0,Master's,,Single,4.1
1009,Male,33.0,High School,Construction,Single,4.269444444444445
1010,Female,35.23809523809524,Bachelor's,Data Analyst,Married,3.9
1011,Male,29.0,Bachelor's,Software Developer,Single,4.6
1012,Female,41.0,Master's,HR,Married,4.269444444444445
1013,Male,45.0,Master's,Finance,Single,4.269444444444445
1014,Female,36.0,Bachelor's,Operations,Married,4.8
1015,Male,35.23809523809524,High School,Marketing,Single,4.2
1016,Female,27.0,Master's,Engineer,Married,4.269444444444445
1017,Male,39.0,,Operations,Single,4.4
1018,Female,34.0,Bachelor's,Marketing,Married,4.9
1019,Male,31.0,Bachelor's,Sales,Single,4.269444444444445
1020,Female,29.0,Master's,HR,Married,3.7
1021,Male,35.0,Bachelor's,Digital Marketing,Married,4.5
1022,Female,28.0,Bachelor's,Software Engineer,Single,3.8
1023,Male,45.0,Master's,Finance,Married,4.2
1024,Female,32.0,High School,Sales,Single,4.269444444444445
```

```
1025,Female,35.23809523809524,Master's,Teacher,Married,4.0
1026,Male,40.0,Doctorate,Operations,Married,4.7
1027,Male,38.0,Bachelor's,Marketing,Single,4.3
1028,Female,35.0,Master's,,Single,4.1
1029,Male,33.0,High School,Construction,Single,4.269444444444445
1030,Female,35.23809523809524,Bachelor's,Data Analyst,Married,3.9
1031,Male,29.0,Bachelor's,Software Developer,Single,4.6
1032,Female,41.0,Master's,HR,Married,4.269444444444445
1033,Male,45.0,Master's,Finance,Single,4.269444444444445
1034,Female,36.0,Bachelor's,Operations,Married,4.8
1035,Male,35.23809523809524,High School,Marketing,Single,4.2
1036,Female,27.0,Master's,Engineer,Married,4.269444444444445
1037,Male,39.0,,Operations,Single,4.4
1038,Female,34.0,Bachelor's,Marketing,Married,4.9
1039,Male,31.0,Bachelor's,Sales,Single,4.269444444444445
1040,Female,29.0,Master's,HR,Married,3.7
1041,Male,35.0,Bachelor's,Digital Marketing,Married,4.5
1042,Female,28.0,Bachelor's,Software Engineer,Single,3.8
1043,Male,45.0,Master's,Finance,Married,4.2
1044,Female,32.0,High School,Sales,Single,4.269444444444445
1045,Female,35.23809523809524,Master's,Teacher,Married,4.0
1046,Male,40.0,Doctorate,Operations,Married,4.7
1047,Male,38.0,Bachelor's,Marketing,Single,4.3
1048,Female,35.0,Master's,,Single,4.1
1049,Male,33.0,High School,Construction,Single,4.269444444444445
1050,Female,35.23809523809524,Bachelor's,Data Analyst,Married,3.9
```

Substitution with Median

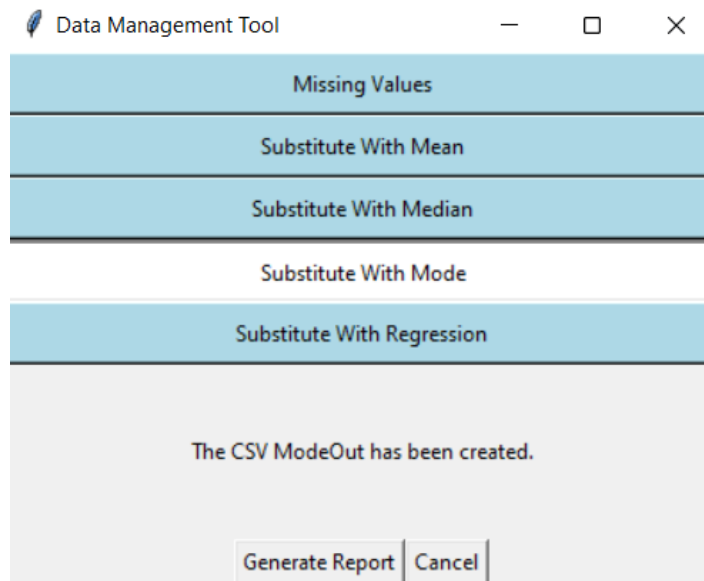


Output CSV File:

```
CustomerID,Gender,Age,Education,Occupation,MaritalStatus,ProductRating
1001,Male,35.0,Bachelor's,Digital Marketing,Married,4.5
1002,Female,28.0,Bachelor's,Software Engineer,Single,3.8
1003,Male,45.0,Master's,Finance,Married,4.2
1004,Female,32.0,High School,Sales,Single,4.2
1005,Female,35.0,Master's,Teacher,Married,4.0
1006,Male,40.0,Doctorate,Operations,Married,4.7
1007,Male,38.0,Bachelor's,Marketing,Single,4.3
1008,Female,35.0,Master's,,Single,4.1
1009,Male,33.0,High School,Construction,Single,4.2
1010,Female,35.0,Bachelor's>Data Analyst,Married,3.9
1011,Male,29.0,Bachelor's,Software Developer,Single,4.6
1012,Female,41.0,Master's,HR,Married,4.2
1013,Male,45.0,Master's,Finance,Single,4.2
1014,Female,36.0,Bachelor's,Operations,Married,4.8
1015,Male,35.0,High School,Marketing,Single,4.2
1016,Female,27.0,Master's,Engineer,Married,4.2
1017,Male,39.0,,Operations,Single,4.4
1018,Female,34.0,Bachelor's,Marketing,Married,4.9
1019,Male,31.0,Bachelor's,Sales,Single,4.2
1020,Female,29.0,Master's,HR,Married,3.7
1021,Male,35.0,Bachelor's,Digital Marketing,Married,4.5
1022,Female,28.0,Bachelor's,Software Engineer,Single,3.8
1023,Male,45.0,Master's,Finance,Married,4.2
1024,Female,32.0,High School,Sales,Single,4.2
1025,Female,35.0,Master's,Teacher,Married,4.0
```

```
1026, Male, 40.0, Doctorate, Operations, Married, 4.7
1027, Male, 38.0, Bachelor's, Marketing, Single, 4.3
1028, Female, 35.0, Master's, , Single, 4.1
1029, Male, 33.0, High School, Construction, Single, 4.2
1030, Female, 35.0, Bachelor's, Data Analyst, Married, 3.9
1031, Male, 29.0, Bachelor's, Software Developer, Single, 4.6
1032, Female, 41.0, Master's, HR, Married, 4.2
1033, Male, 45.0, Master's, Finance, Single, 4.2
1034, Female, 36.0, Bachelor's, Operations, Married, 4.8
1035, Male, 35.0, High School, Marketing, Single, 4.2
1036, Female, 27.0, Master's, Engineer, Married, 4.2
1037, Male, 39.0, , Operations, Single, 4.4
1038, Female, 34.0, Bachelor's, Marketing, Married, 4.9
1039, Male, 31.0, Bachelor's, Sales, Single, 4.2
1040, Female, 29.0, Master's, HR, Married, 3.7
1041, Male, 35.0, Bachelor's, Digital Marketing, Married, 4.5
1042, Female, 28.0, Bachelor's, Software Engineer, Single, 3.8
1043, Male, 45.0, Master's, Finance, Married, 4.2
1044, Female, 32.0, High School, Sales, Single, 4.2
1045, Female, 35.0, Master's, Teacher, Married, 4.0
1046, Male, 40.0, Doctorate, Operations, Married, 4.7
1047, Male, 38.0, Bachelor's, Marketing, Single, 4.3
1048, Female, 35.0, Master's, , Single, 4.1
1049, Male, 33.0, High School, Construction, Single, 4.2
1050, Female, 35.0, Bachelor's, Data Analyst, Married, 3.9
```

Substitution with mode



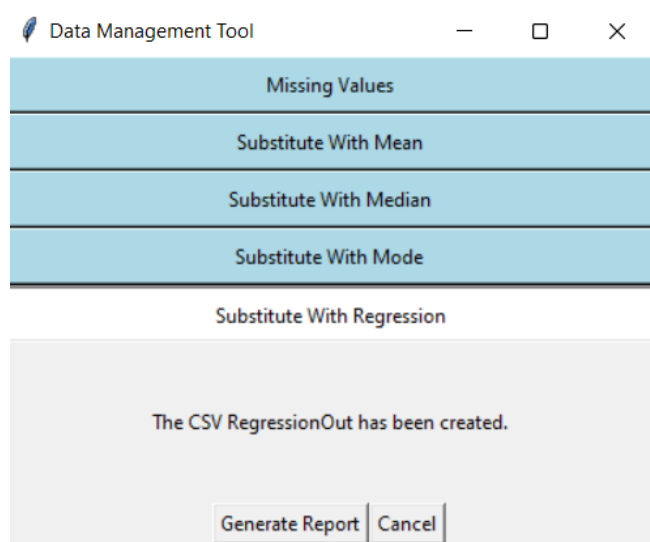
Output CSV File:

```
CustomerID,Gender,Age,Education,Occupation,MaritalStatus,ProductRating
1001,Male,35.0,Bachelor's,Digital Marketing,Married,4.5
1002,Female,28.0,Bachelor's,Software Engineer,Single,3.8
1003,Male,45.0,Master's,Finance,Married,4.2
1004,Female,32.0,High School,Sales,Single,
1005,Female,,Master's,Teacher,Married,4.0
1006,Male,40.0,Doctorate,Operations,Married,4.7
1007,Male,38.0,Bachelor's,Marketing,Single,4.3
1008,Female,35.0,Master's,Marketing,Single,4.1
1009,Male,33.0,High School,Construction,Single,
1010,Female,,Bachelor's,Data Analyst,Married,3.9
1011,Male,29.0,Bachelor's,Software Developer,Single,4.6
1012,Female,41.0,Master's,HR,Married,
1013,Male,45.0,Master's,Finance,Single,
1014,Female,36.0,Bachelor's,Operations,Married,4.8
1015,Male,,High School,Marketing,Single,4.2
1016,Female,27.0,Master's,Engineer,Married,
1017,Male,39.0,Bachelor's,Operations,Single,4.4
1018,Female,34.0,Bachelor's,Marketing,Married,4.9
1019,Male,31.0,Bachelor's,Sales,Single,
1020,Female,29.0,Master's,HR,Married,3.7
1021,Male,35.0,Bachelor's,Digital Marketing,Married,4.5
1022,Female,28.0,Bachelor's,Software Engineer,Single,3.8
```



```
1023, Male, 45.0, Master's, Finance, Married, 4.2
1024, Female, 32.0, High School, Sales, Single,
1025, Female, , Master's, Teacher, Married, 4.0
1026, Male, 40.0, Doctorate, Operations, Married, 4.7
1027, Male, 38.0, Bachelor's, Marketing, Single, 4.3
1028, Female, 35.0, Master's, Marketing, Single, 4.1
1029, Male, 33.0, High School, Construction, Single,
1030, Female, , Bachelor's, Data Analyst, Married, 3.9
1031, Male, 29.0, Bachelor's, Software Developer, Single, 4.6
1032, Female, 41.0, Master's, HR, Married,
1033, Male, 45.0, Master's, Finance, Single,
1034, Female, 36.0, Bachelor's, Operations, Married, 4.8
1035, Male, , High School, Marketing, Single, 4.2
1036, Female, 27.0, Master's, Engineer, Married,
1037, Male, 39.0, Bachelor's, Operations, Single, 4.4
1038, Female, 34.0, Bachelor's, Marketing, Married, 4.9
1039, Male, 31.0, Bachelor's, Sales, Single,
1040, Female, 29.0, Master's, HR, Married, 3.7
1041, Male, 35.0, Bachelor's, Digital Marketing, Married, 4.5
1042, Female, 28.0, Bachelor's, Software Engineer, Single, 3.8
1043, Male, 45.0, Master's, Finance, Married, 4.2
1044, Female, 32.0, High School, Sales, Single,
1045, Female, , Master's, Teacher, Married, 4.0
1046, Male, 40.0, Doctorate, Operations, Married, 4.7
1047, Male, 38.0, Bachelor's, Marketing, Single, 4.3
1048, Female, 35.0, Master's, Marketing, Single, 4.1
1049, Male, 33.0, High School, Construction, Single,
1050, Female, , Bachelor's, Data Analyst, Married, 3.9
```

Predictive Modeling (Linear Regression)



Output CSV File:

```
CustomerID,Gender,Age,Education,Occupation,MaritalStatus,ProductRating
1001,Male,35.0,Bachelor's,Digital Marketing,Married,4.5
1002,Female,28.0,Bachelor's,Software Engineer,Single,3.8
1003,Male,45.0,Master's,Finance,Married,4.2
1004,Female,32.0,High School,Sales,Single,4.52171375636869
1005,Female,35.13230205577045,Master's,Teacher,Married,4.0
1006,Male,40.0,Doctorate,Operations,Married,4.7
1007,Male,38.0,Bachelor's,Marketing,Single,4.3
1008,Female,35.0,Master's,,Single,4.1
1009,Male,33.0,High School,Construction,Single,4.265826771653544
1010,Female,31.328719723183426,Bachelor's,Data Analyst,Married,3.9
1011,Male,29.0,Bachelor's,Software Developer,Single,4.6
1012,Female,41.0,Master's,HR,Married,3.784261232051875
1013,Male,45.0,Master's,Finance,Single,3.834821676702176
1014,Female,36.0,Bachelor's,Operations,Married,4.8
1015,Male,36.84571544880928,High School,Marketing,Single,4.2
1016,Female,27.0,Master's,Engineer,Married,4.4090041685965735
1017,Male,39.0,,Operations,Single,4.4
1018,Female,34.0,Bachelor's,Marketing,Married,4.9
1019,Male,31.0,Bachelor's,Sales,Single,4.044761463640573
1020,Female,29.0,Master's,HR,Married,3.7
1021,Male,35.0,Bachelor's,Digital Marketing,Married,4.5
1022,Female,28.0,Bachelor's,Software Engineer,Single,3.8
1023,Male,45.0,Master's,Finance,Married,4.2
1024,Female,32.0,High School,Sales,Single,4.52171375636869
```

```
1025,Female,35.13230205577042,Master's,Teacher,Married,4.0
1026,Male,40.0,Doctorate,Operations,Married,4.7
1027,Male,38.0,Bachelor's,Marketing,Single,4.3
1028,Female,35.0,Master's,,Single,4.1
1029,Male,33.0,High School,Construction,Single,4.265826771653544
1030,Female,31.328719723183394,Bachelor's,Data Analyst,Married,3.9
1031,Male,29.0,Bachelor's,Software Developer,Single,4.6
1032,Female,41.0,Master's,HR,Married,3.784261232051875
1033,Male,45.0,Master's,Finance,Single,3.834821676702176
1034,Female,36.0,Bachelor's,Operations,Married,4.8
1035,Male,36.845715448809244,High School,Marketing,Single,4.2
1036,Female,27.0,Master's,Engineer,Married,4.4090041685965735
1037,Male,39.0,,Operations,Single,4.4
1038,Female,34.0,Bachelor's,Marketing,Married,4.9
1039,Male,31.0,Bachelor's,Sales,Single,4.044761463640573
1040,Female,29.0,Master's,HR,Married,3.7
1041,Male,35.0,Bachelor's,Digital Marketing,Married,4.5
1042,Female,28.0,Bachelor's,Software Engineer,Single,3.8
1043,Male,45.0,Master's,Finance,Married,4.2
1044,Female,32.0,High School,Sales,Single,4.52171375636869
1045,Female,35.13230205577039,Master's,Teacher,Married,4.0
1046,Male,40.0,Doctorate,Operations,Married,4.7
1047,Male,38.0,Bachelor's,Marketing,Single,4.3
1048,Female,35.0,Master's,,Single,4.1
1049,Male,33.0,High School,Construction,Single,4.265826771653544
1050,Female,31.32871972318336,Bachelor's,Data Analyst,Married,3.9
```