```
B - Good                81
A - Very Good           59
dtype: int64
======================KNN Results======================
------Math Class Dataset------
Confusion Matrix:
[[ 4  4  3  0  0]
 [ 6  7  4  0  0]
 [ 1  5 34  1  5]
 [ 0  0  6  6  5]
 [ 0  0 11  4  5]]
Classification Report:
                    precision    recall  f1-score   support

      A - Very Good       0.36      0.36      0.36        11
           B - Good       0.44      0.41      0.42        17
     C - Sufficient       0.59      0.74      0.65        46
     F - Poor (Mau)       0.55      0.35      0.43        17
F - Poor (Mediocre)       0.33      0.25      0.29        20

           accuracy                           0.50       111
          macro avg       0.45      0.42      0.43       111
       weighted avg       0.49      0.50      0.49       111

------Portuguese Class Dataset------
Confusion Matrix:
[[16  6  0  0  1]
 [ 8 11 12  0  0]
 [ 6 20 69  1  4]
 [ 0  0  5  0  1]
 [ 0  0 17  0  5]]
Classification Report:
                    precision    recall  f1-score   support

      A - Very Good       0.53      0.70      0.60        23
           B - Good       0.30      0.35      0.32        31
     C - Sufficient       0.67      0.69      0.68       100
     F - Poor (Mau)       0.00      0.00      0.00         6
F - Poor (Mediocre)       0.45      0.23      0.30        22

           accuracy                           0.55       182
          macro avg       0.39      0.39      0.38       182
       weighted avg       0.54      0.55      0.54       182

======================Decision Tree Results======================
------Math Class Dataset------
Confusion Matrix:
[[ 7  3  1  0  0]
 [ 4  7  6  0  0]
 [ 0  3 34  3  6]
 [ 0  0  3 11  3]
 [ 0  0  6  7  7]]
Classification Report:
                    precision    recall  f1-score   support

      A - Very Good       0.64      0.64      0.64        11
           B - Good       0.54      0.41      0.47        17
     C - Sufficient       0.68      0.74      0.71        46
```

```
     F - Poor (Mau)       0.52      0.65      0.58        17
F - Poor (Mediocre)       0.44      0.35      0.39        20

           accuracy                           0.59       111
          macro avg       0.56      0.56      0.56       111
       weighted avg       0.59      0.59      0.59       111

------Portuguese Class Dataset------
Confusion Matrix:
[[14  7  2  0  0]
 [ 7 20  4  0  0]
 [ 2 24 66  0  8]
 [ 0  0  2  2  2]
 [ 1  0  9  6  6]]
Classification Report:
                     precision    recall  f1-score   support

      A - Very Good       0.58      0.61      0.60        23
           B - Good       0.39      0.65      0.49        31
     C - Sufficient       0.80      0.66      0.72       100
     F - Poor (Mau)       0.25      0.33      0.29         6
F - Poor (Mediocre)       0.38      0.27      0.32        22

           accuracy                           0.59       182
          macro avg       0.48      0.50      0.48       182
       weighted avg       0.63      0.59      0.60       182

======================Logistic Regression======================
------Math Class Dataset------
Score for logistic regression
0.5495495495495496
Confusion_matrix:
[[ 7  4  0  0  0]
 [ 5  8  4  0  0]
 [ 2  3 33  4  4]
 [ 0  0  5  7  5]
 [ 0  0  8  6  6]]
Classification Report:
                     precision    recall  f1-score   support

      A - Very Good       0.50      0.64      0.56        11
           B - Good       0.53      0.47      0.50        17
     C - Sufficient       0.66      0.72      0.69        46
     F - Poor (Mau)       0.41      0.41      0.41        17
F - Poor (Mediocre)       0.40      0.30      0.34        20

           accuracy                           0.55       111
          macro avg       0.50      0.51      0.50       111
       weighted avg       0.54      0.55      0.54       111

------Portuguese Class Dataset------
Score for logistic regression
0.6428571428571429
Confusion_matrix:
[[16  7  0  0  0]
 [ 9  8 14  0  0]
 [ 2 13 81  0  4]
 [ 0  0  3  2  1]
```

```
 [ 0  0 12  0 10]]
Classification Report:
                     precision    recall  f1-score   support

      A - Very Good       0.59      0.70      0.64        23
           B - Good       0.29      0.26      0.27        31
     C - Sufficient       0.74      0.81      0.77       100
     F - Poor (Mau)       1.00      0.33      0.50         6
F - Poor (Mediocre)       0.67      0.45      0.54        22

           accuracy                           0.64       182
          macro avg       0.66      0.51      0.54       182
       weighted avg       0.64      0.64      0.63       182

======================Support Vector Machines=======================
------Math Class Dataset------
Confusion_matrix:
[[ 1  6  4  0  0]
 [ 1  1 15  0  0]
 [ 0  0 42  3  1]
 [ 0  0  7  9  1]
 [ 0  0 12  4  4]]
Classification Report:
                     precision    recall  f1-score   support

      A - Very Good       0.50      0.09      0.15        11
           B - Good       0.14      0.06      0.08        17
     C - Sufficient       0.53      0.91      0.67        46
     F - Poor (Mau)       0.56      0.53      0.55        17
F - Poor (Mediocre)       0.67      0.20      0.31        20

           accuracy                           0.51       111
          macro avg       0.48      0.36      0.35       111
       weighted avg       0.50      0.51      0.44       111

------Portuguese Class Dataset------
Confusion_matrix:
[[ 15   4   4   0   0]
 [  4   1  26   0   0]
 [  0   0 100   0   0]
 [  0   0   6   0   0]
 [  0   0  21   0   1]]
Classification Report:
                     precision    recall  f1-score   support

      A - Very Good       0.79      0.65      0.71        23
           B - Good       0.20      0.03      0.06        31
     C - Sufficient       0.64      1.00      0.78       100
     F - Poor (Mau)       0.00      0.00      0.00         6
F - Poor (Mediocre)       1.00      0.05      0.09        22

           accuracy                           0.64       182
          macro avg       0.53      0.35      0.33       182
       weighted avg       0.60      0.64      0.54       182

======================Multi-layer Preceptron=======================
------Math Class Dataset------
D:\SERNi\anaconda3\Lib\site-packages\sklearn\metrics\_classification.py:1469:
```

```
UndefinedMetricWarning: Precision and F-score are ill-defined and being set to 0.0 in
labels with no predicted samples. Use `zero_division` parameter to control this behavior.
  _warn_prf(average, modifier, msg_start, len(result))
D:\SERNi\anaconda3\Lib\site-packages\sklearn\metrics\_classification.py:1469:
UndefinedMetricWarning: Precision and F-score are ill-defined and being set to 0.0 in
labels with no predicted samples. Use `zero_division` parameter to control this behavior.
  _warn_prf(average, modifier, msg_start, len(result))
D:\SERNi\anaconda3\Lib\site-packages\sklearn\metrics\_classification.py:1469:
UndefinedMetricWarning: Precision and F-score are ill-defined and being set to 0.0 in
labels with no predicted samples. Use `zero_division` parameter to control this behavior.
  _warn_prf(average, modifier, msg_start, len(result))
0.4774774774774775
Confusion_matrix:
[[ 6  3  2  0  0]
 [ 4  7  6  0  0]
 [ 2  4 31  3  6]
 [ 0  0  3  3 11]
 [ 0  0 11  3  6]]
Classification Report:
                    precision    recall  f1-score   support

      A - Very Good       0.50      0.55      0.52        11
           B - Good       0.50      0.41      0.45        17
     C - Sufficient       0.58      0.67      0.63        46
     F - Poor (Mau)       0.33      0.18      0.23        17
F - Poor (Mediocre)       0.26      0.30      0.28        20

           accuracy                           0.48       111
          macro avg       0.44      0.42      0.42       111
       weighted avg       0.47      0.48      0.47       111

------Portuguese Class Dataset------
0.532967032967033
Confusion_matrix:
[[14  5  3  0  1]
 [ 7 12 12  0  0]
 [ 3 24 60  3 10]
 [ 0  1  2  2  1]
 [ 0  0 12  1  9]]
Classification Report:
                    precision    recall  f1-score   support

      A - Very Good       0.58      0.61      0.60        23
           B - Good       0.29      0.39      0.33        31
     C - Sufficient       0.67      0.60      0.63       100
     F - Poor (Mau)       0.33      0.33      0.33         6
F - Poor (Mediocre)       0.43      0.41      0.42        22

           accuracy                           0.53       182
          macro avg       0.46      0.47      0.46       182
       weighted avg       0.56      0.53      0.54       182


In [63]:          'C:/Users/SERNi/OneDrive/Documents/CPTR-418/student-performance/student-
performance.py'      ='C:/Users/SERNi/OneDrive/Documents/CPTR-418/student-performance'
Reloaded modules: knn, dt, lr, svm, ann, cleaner

indices to drop
```

```
[]

final data:
[]

indices to drop
[]

final data:
[]
======================Count how many are in math grade range======================
C - Sufficient         165
F - Poor (Mediocre)     69
F - Poor (Mau)          61
B - Good                60
A - Very Good           40
Name: bins, dtype: int64
======================Count how many are in Portugueses grade
range=======================
C - Sufficient         355
B - Good               112
A - Very Good           82
F - Poor (Mediocre)     80
F - Poor (Mau)          20
Name: bins, dtype: int64
======================Head of Math Data Set======================
   school  sex  age  address  ...  G1  G2  G3            bins
0       0    0   18        1  ...   5   6   6  F - Poor (Mau)
1       0    0   17        1  ...   5   5   6  F - Poor (Mau)
2       0    0   15        1  ...   7   8  10  C - Sufficient
3       0    0   15        1  ...  15  14  15       B - Good
4       0    0   16        1  ...   6  10  10  C - Sufficient

[5 rows x 34 columns]
======================Head of Portuguese Data Set======================
   school  sex  age  address  ...  G1  G2  G3            bins
0       0    0   18        1  ...   0  11  11  C - Sufficient
1       0    0   17        1  ...   9  11  11  C - Sufficient
2       0    0   15        1  ...  12  13  12  C - Sufficient
3       0    0   15        1  ...  14  14  14       B - Good
4       0    0   16        1  ...  11  13  13  C - Sufficient

[5 rows x 34 columns]
======================Count how many are in port y test grade
range=======================
F - Poor (Mau)           6
F - Poor (Mediocre)     22
C - Sufficient         100
B - Good                31
A - Very Good           23
dtype: int64
======================Count how many are in port y train  grade
range=======================
F - Poor (Mau)          14
F - Poor (Mediocre)     58
C - Sufficient         255
B - Good                81
A - Very Good           59
```

```
dtype: int64
======================KNN Results======================
------Math Class Dataset------
Confusion Matrix:
[[ 4  4  3  0  0]
 [ 6  7  4  0  0]
 [ 1  5 34  1  5]
 [ 0  0  6  6  5]
 [ 0  0 11  4  5]]
Classification Report:
                     precision    recall  f1-score   support

      A - Very Good       0.36      0.36      0.36        11
           B - Good       0.44      0.41      0.42        17
     C - Sufficient       0.59      0.74      0.65        46
     F - Poor (Mau)       0.55      0.35      0.43        17
F - Poor (Mediocre)       0.33      0.25      0.29        20

           accuracy                           0.50       111
          macro avg       0.45      0.42      0.43       111
       weighted avg       0.49      0.50      0.49       111

------Portuguese Class Dataset------
Confusion Matrix:
[[16  6  0  0  1]
 [ 8 11 12  0  0]
 [ 6 20 69  1  4]
 [ 0  0  5  0  1]
 [ 0  0 17  0  5]]
Classification Report:
                     precision    recall  f1-score   support

      A - Very Good       0.53      0.70      0.60        23
           B - Good       0.30      0.35      0.32        31
     C - Sufficient       0.67      0.69      0.68       100
     F - Poor (Mau)       0.00      0.00      0.00         6
F - Poor (Mediocre)       0.45      0.23      0.30        22

           accuracy                           0.55       182
          macro avg       0.39      0.39      0.38       182
       weighted avg       0.54      0.55      0.54       182

======================Decision Tree Results======================
------Math Class Dataset------
Confusion Matrix:
[[ 7  2  2  0  0]
 [ 4  7  6  0  0]
 [ 0  4 30  4  8]
 [ 0  0  3  9  5]
 [ 0  0  6  6  8]]
Classification Report:
                     precision    recall  f1-score   support

      A - Very Good       0.64      0.64      0.64        11
           B - Good       0.54      0.41      0.47        17
     C - Sufficient       0.64      0.65      0.65        46
     F - Poor (Mau)       0.47      0.53      0.50        17
F - Poor (Mediocre)       0.38      0.40      0.39        20
```

```
           accuracy                           0.55       111
          macro avg       0.53      0.53      0.53       111
       weighted avg       0.55      0.55      0.55       111

------Portuguese Class Dataset------
Confusion Matrix:
[[14  6  3  0  0]
 [11 16  4  0  0]
 [ 2 24 66  0  8]
 [ 0  0  3  1  2]
 [ 0  0 11  7  4]]
Classification Report:
                    precision    recall  f1-score   support

      A - Very Good       0.52      0.61      0.56        23
           B - Good       0.35      0.52      0.42        31
     C - Sufficient       0.76      0.66      0.71       100
     F - Poor (Mau)       0.12      0.17      0.14         6
F - Poor (Mediocre)       0.29      0.18      0.22        22

           accuracy                           0.55       182
          macro avg       0.41      0.43      0.41       182
       weighted avg       0.58      0.55      0.56       182

======================Logistic Regression======================
------Math Class Dataset------
Score for logistic regression
0.5495495495495496
Confusion_matrix:
[[ 7  4  0  0  0]
 [ 5  8  4  0  0]
 [ 2  3 33  4  4]
 [ 0  0  5  7  5]
 [ 0  0  8  6  6]]
Classification Report:
                    precision    recall  f1-score   support

      A - Very Good       0.50      0.64      0.56        11
           B - Good       0.53      0.47      0.50        17
     C - Sufficient       0.66      0.72      0.69        46
     F - Poor (Mau)       0.41      0.41      0.41        17
F - Poor (Mediocre)       0.40      0.30      0.34        20

           accuracy                           0.55       111
          macro avg       0.50      0.51      0.50       111
       weighted avg       0.54      0.55      0.54       111

------Portuguese Class Dataset------
Score for logistic regression
0.6428571428571429
Confusion_matrix:
[[16  7  0  0  0]
 [ 9  8 14  0  0]
 [ 2 13 81  0  4]
 [ 0  0  3  2  1]
 [ 0  0 12  0 10]]
Classification Report:
```

```
                    precision    recall  f1-score   support

      A - Very Good       0.59      0.70      0.64        23
           B - Good       0.29      0.26      0.27        31
     C - Sufficient       0.74      0.81      0.77       100
     F - Poor (Mau)       1.00      0.33      0.50         6
F - Poor (Mediocre)       0.67      0.45      0.54        22

           accuracy                           0.64       182
          macro avg       0.66      0.51      0.54       182
       weighted avg       0.64      0.64      0.63       182

======================Support Vector Machines=======================
------Math Class Dataset------
Confusion_matrix:
[[ 1  6  4  0  0]
 [ 1  1 15  0  0]
 [ 0  0 42  3  1]
 [ 0  0  7  9  1]
 [ 0  0 12  4  4]]
Classification Report:
                    precision    recall  f1-score   support

      A - Very Good       0.50      0.09      0.15        11
           B - Good       0.14      0.06      0.08        17
     C - Sufficient       0.53      0.91      0.67        46
     F - Poor (Mau)       0.56      0.53      0.55        17
F - Poor (Mediocre)       0.67      0.20      0.31        20

           accuracy                           0.51       111
          macro avg       0.48      0.36      0.35       111
       weighted avg       0.50      0.51      0.44       111

------Portuguese Class Dataset------
Confusion_matrix:
[[ 15   4   4   0   0]
 [  4   1  26   0   0]
 [  0   0 100   0   0]
 [  0   0   6   0   0]
 [  0   0  21   0   1]]
Classification Report:
                    precision    recall  f1-score   support

      A - Very Good       0.79      0.65      0.71        23
           B - Good       0.20      0.03      0.06        31
     C - Sufficient       0.64      1.00      0.78       100
     F - Poor (Mau)       0.00      0.00      0.00         6
F - Poor (Mediocre)       1.00      0.05      0.09        22

           accuracy                           0.64       182
          macro avg       0.53      0.35      0.33       182
       weighted avg       0.60      0.64      0.54       182

======================Multi-layer Preceptron=======================
------Math Class Dataset------
D:\SERNi\anaconda3\Lib\site-packages\sklearn\metrics\_classification.py:1469:
UndefinedMetricWarning: Precision and F-score are ill-defined and being set to 0.0 in
labels with no predicted samples. Use `zero_division` parameter to control this behavior.
```

```
  _warn_prf(average, modifier, msg_start, len(result))
D:\SERNi\anaconda3\Lib\site-packages\sklearn\metrics\_classification.py:1469:
UndefinedMetricWarning: Precision and F-score are ill-defined and being set to 0.0 in
labels with no predicted samples. Use `zero_division` parameter to control this behavior.
  _warn_prf(average, modifier, msg_start, len(result))
D:\SERNi\anaconda3\Lib\site-packages\sklearn\metrics\_classification.py:1469:
UndefinedMetricWarning: Precision and F-score are ill-defined and being set to 0.0 in
labels with no predicted samples. Use `zero_division` parameter to control this behavior.
  _warn_prf(average, modifier, msg_start, len(result))
0.4774774774774775
Confusion_matrix:
[[ 6  3  2  0  0]
 [ 4  7  6  0  0]
 [ 2  4 31  3  6]
 [ 0  0  3  3 11]
 [ 0  0 11  3  6]]
Classification Report:
                     precision    recall  f1-score   support

      A - Very Good       0.50      0.55      0.52        11
           B - Good       0.50      0.41      0.45        17
     C - Sufficient       0.58      0.67      0.63        46
     F - Poor (Mau)       0.33      0.18      0.23        17
F - Poor (Mediocre)       0.26      0.30      0.28        20

           accuracy                           0.48       111
          macro avg       0.44      0.42      0.42       111
       weighted avg       0.47      0.48      0.47       111

------Portuguese Class Dataset------
0.532967032967033
Confusion_matrix:
[[14  5  3  0  1]
 [ 7 12 12  0  0]
 [ 3 24 60  3 10]
 [ 0  1  2  2  1]
 [ 0  0 12  1  9]]
Classification Report:
                     precision    recall  f1-score   support

      A - Very Good       0.58      0.61      0.60        23
           B - Good       0.29      0.39      0.33        31
     C - Sufficient       0.67      0.60      0.63       100
     F - Poor (Mau)       0.33      0.33      0.33         6
F - Poor (Mediocre)       0.43      0.41      0.42        22

           accuracy                           0.53       182
          macro avg       0.46      0.47      0.46       182
       weighted avg       0.56      0.53      0.54       182


In [64]:
```