In [30]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

In [31]:

```
df = pd.read_csv('Expanded_data_with_more_features.csv')
```

In [32]:

```
df
```

Out[32]:

	Unnamed: 0	Gender	EthnicGroup	ParentEduc	LunchType	TestPrep	Parent
0	0	female	NaN	bachelor's degree	standard	none	
1	1	female	group C	some college	standard	NaN	
2	2	female	group B	master's degree	standard	none	
3	3	male	group A	associate's degree	free/reduced	none	
4	4	male	group C	some college	standard	none	
...	...	...	...	...	...	...	
30636	816	female	group D	high school	standard	none	
30637	890	male	group E	high school	standard	none	
30638	911	female	NaN	high school	free/reduced	completed	
30639	934	female	group D	associate's degree	standard	completed	
30640	960	male	group B	some college	standard	none	

30641 rows × 15 columns

In [21]:

```
print(df.head())
```

```
   Unnamed: 0  Gender EthnicGroup          ParentEduc     LunchType TestPrep  \
0           0  female         NaN   bachelor's degree      standard     none   
1           1  female     group C        some college      standard      NaN   
2           2  female     group B     master's degree      standard     none   
3           3    male     group A  associate's degree  free/reduced     none   
4           4    male     group C        some college      standard     none   

  ParentMaritalStatus PracticeSport IsFirstChild  NrSiblings TransportMeans  \
0             married     regularly          yes         3.0     school_bus   
1             married     sometimes          yes         0.0            NaN   
2              single     sometimes          yes         4.0     school_bus   
3             married         never           no         1.0            NaN   
4             married     sometimes          yes         0.0     school_bus   

  WklyStudyHours  MathScore  ReadingScore  WritingScore  
0            < 5         71            71            74  
1         5 - 10         69            90            88  
2            < 5         87            93            91  
3         5 - 10         45            56            42  
4         5 - 10         76            78            75  
```

In [22]:
```
df.describe()
```

Out[22]:

	Unnamed: 0	NrSiblings	MathScore	ReadingScore	WritingScore
count	30641.000000	29069.000000	30641.000000	30641.000000	30641.000000
mean	499.556607	2.145894	66.558402	69.377533	68.418622
std	288.747894	1.458242	15.361616	14.758952	15.443525
min	0.000000	0.000000	0.000000	10.000000	4.000000
25%	249.000000	1.000000	56.000000	59.000000	58.000000
50%	500.000000	2.000000	67.000000	70.000000	69.000000
75%	750.000000	3.000000	78.000000	80.000000	79.000000
max	999.000000	7.000000	100.000000	100.000000	100.000000

In [23]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 30641 entries, 0 to 30640
Data columns (total 15 columns):
 #   Column               Non-Null Count  Dtype  
---  ------               --------------  -----  
 0   Unnamed: 0           30641 non-null  int64  
 1   Gender               30641 non-null  object 
 2   EthnicGroup          28801 non-null  object 
 3   ParentEduc           28796 non-null  object 
 4   LunchType            30641 non-null  object 
 5   TestPrep             28811 non-null  object 
 6   ParentMaritalStatus  29451 non-null  object 
 7   PracticeSport        30010 non-null  object 
 8   IsFirstChild         29737 non-null  object 
 9   NrSiblings           29069 non-null  float64
 10  TransportMeans       27507 non-null  object 
 11  WklyStudyHours       29686 non-null  object 
 12  MathScore            30641 non-null  int64  
 13  ReadingScore         30641 non-null  int64  
 14  WritingScore         30641 non-null  int64  
dtypes: float64(1), int64(4), object(10)
memory usage: 3.5+ MB
```

In [24]:

```python
df.isnull().sum()
```

Out[24]:

```
Unnamed: 0                0
Gender                    0
EthnicGroup            1840
ParentEduc             1845
LunchType                 0
TestPrep               1830
ParentMaritalStatus    1190
PracticeSport           631
IsFirstChild            904
NrSiblings             1572
TransportMeans         3134
WklyStudyHours          955
MathScore                 0
ReadingScore              0
WritingScore              0
dtype: int64
```

Drop Unnamed Column

In [62]:

```python
df = df.drop(['Unnamed: 0'],axis = 1)
print(df.head())
```

```
   Gender EthnicGroup          ParentEduc     LunchType TestPrep  \
0  female         NaN   bachelor's degree      standard     none
1  female     group C        some college      standard      NaN
2  female     group B     master's degree      standard     none
3    male     group A  associate's degree  free/reduced     none
4    male     group C        some college      standard     none

  ParentMaritalStatus PracticeSport IsFirstChild  NrSiblings TransportMeans
\
0             married     regularly          yes         3.0      school_bus
1             married     sometimes          yes         0.0             NaN
2              single     sometimes          yes         4.0      school_bus
3             married         never           no         1.0             NaN
4             married     sometimes          yes         0.0      school_bus

  WklyStudyHours  MathScore  ReadingScore  WritingScore
0            < 5         71            71            74
1         5 - 10         69            90            88
2            < 5         87            93            91
3         5 - 10         45            56            42
4         5 - 10         76            78            75
```

Change Weekly Study Hours Column

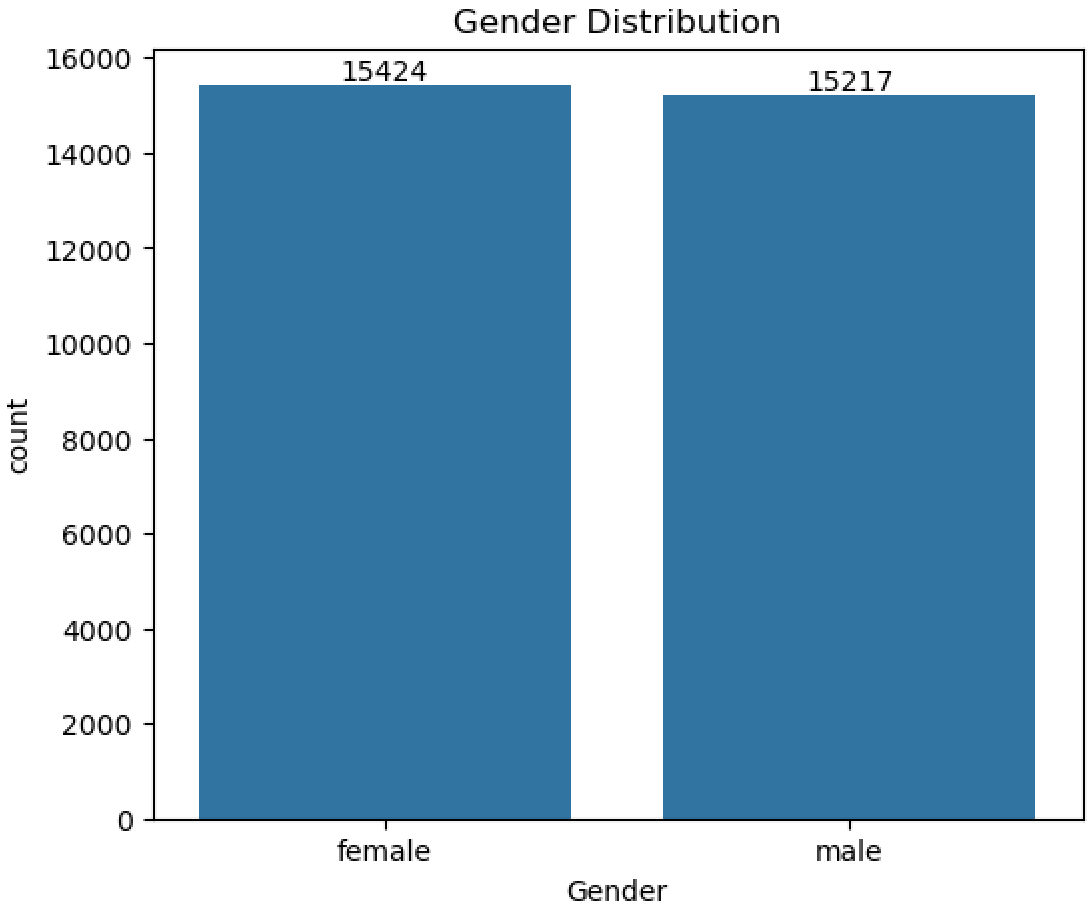
In [63]:
```
df['WklyStudyHours'] = df['WklyStudyHours'].str.replace("5-10", "10-May")
df.head()
```

Out[63]:

	Gender	EthnicGroup	ParentEduc	LunchType	TestPrep	ParentMaritalStatus	Pra
0	female	NaN	bachelor's degree	standard	none	married	
1	female	group C	some college	standard	NaN	married	
2	female	group B	master's degree	standard	none	single	
3	male	group A	associate's degree	free/reduced	none	married	
4	male	group C	some college	standard	none	married	

Gender Distribution

In [64]:
```
plt.figure(figsize=(6,5))
ax = sns.countplot(data = df,x = "Gender")
ax.bar_label(ax.containers[0])
plt.title("Gender Distribution")
plt.show()
```

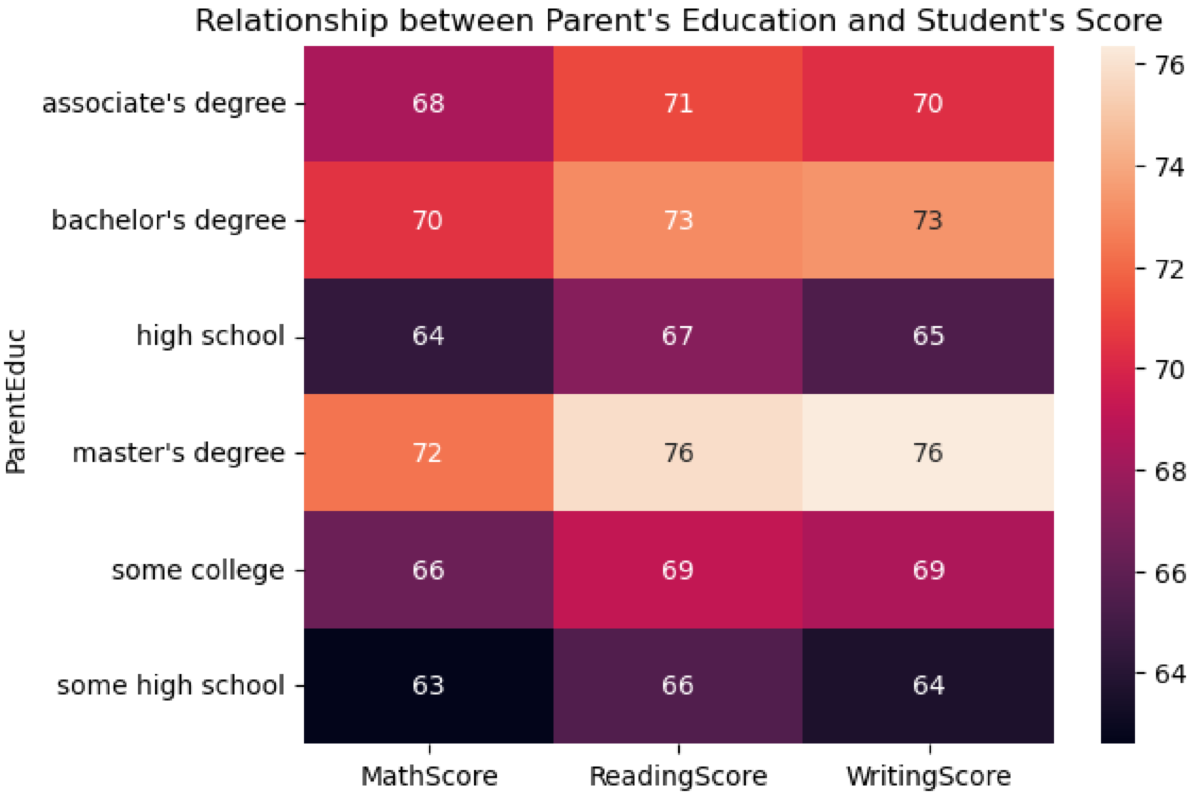


```
In [65]: #from the above chart we have analysed that:
         #the number of females in the data is more than the number of males
```

```
In [66]: gb = df.groupby('ParentEduc').agg({"MathScore" : 'mean',
                                            "ReadingScore" : 'mean',
                                            "WritingScore" : 'mean'})
         print(gb)
```

```
                    MathScore  ReadingScore  WritingScore
ParentEduc
associate's degree  68.365586     71.124324     70.299099
bachelor's degree   70.466627     73.062020     73.331069
high school         64.435731     67.213997     65.421136
master's degree     72.336134     75.832921     76.356896
some college        66.390472     69.179708     68.501432
some high school    62.584013     65.510785     63.632409
```

```
In [67]: sns.heatmap(gb, annot = True)
         plt.title("Relationship between Parent's Education and Student's Score")
         plt.show()
```

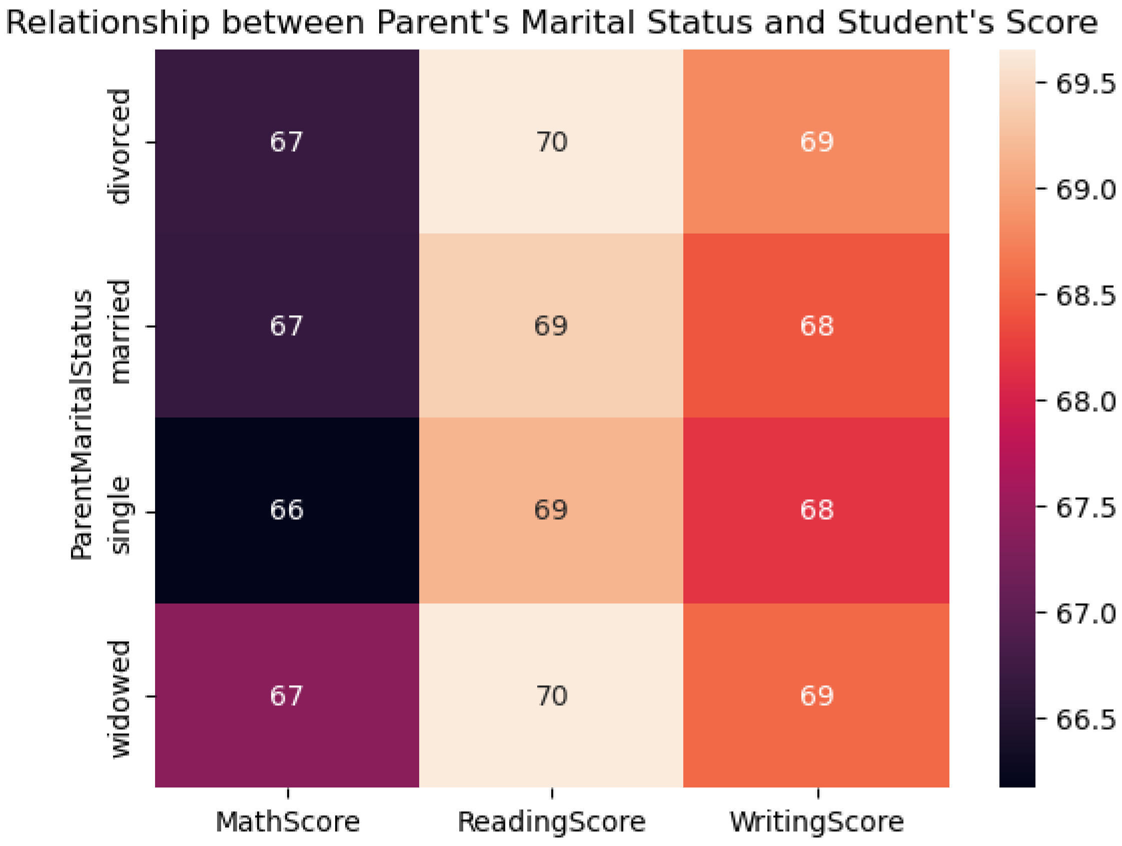


```
In [68]: #From the above chart we have concluded that the education of the parent hav
```

```
In [69]: gb1 = df.groupby('ParentMaritalStatus').agg({"MathScore" : 'mean',
                                                     "ReadingScore" : 'mean',
                                                     "WritingScore" : 'mean'})
         print(gb1)
```

```
                     MathScore  ReadingScore  WritingScore
ParentMaritalStatus
divorced             66.691197     69.655011     68.799146
married              66.657326     69.389575     68.420981
single               66.165704     69.157250     68.174440
widowed              67.368866     69.651438     68.563452
```

```
In [70]: sns.heatmap(gb1, annot = True)
         plt.title("Relationship between Parent's Marital Status and Student's Score"
         plt.show()
```

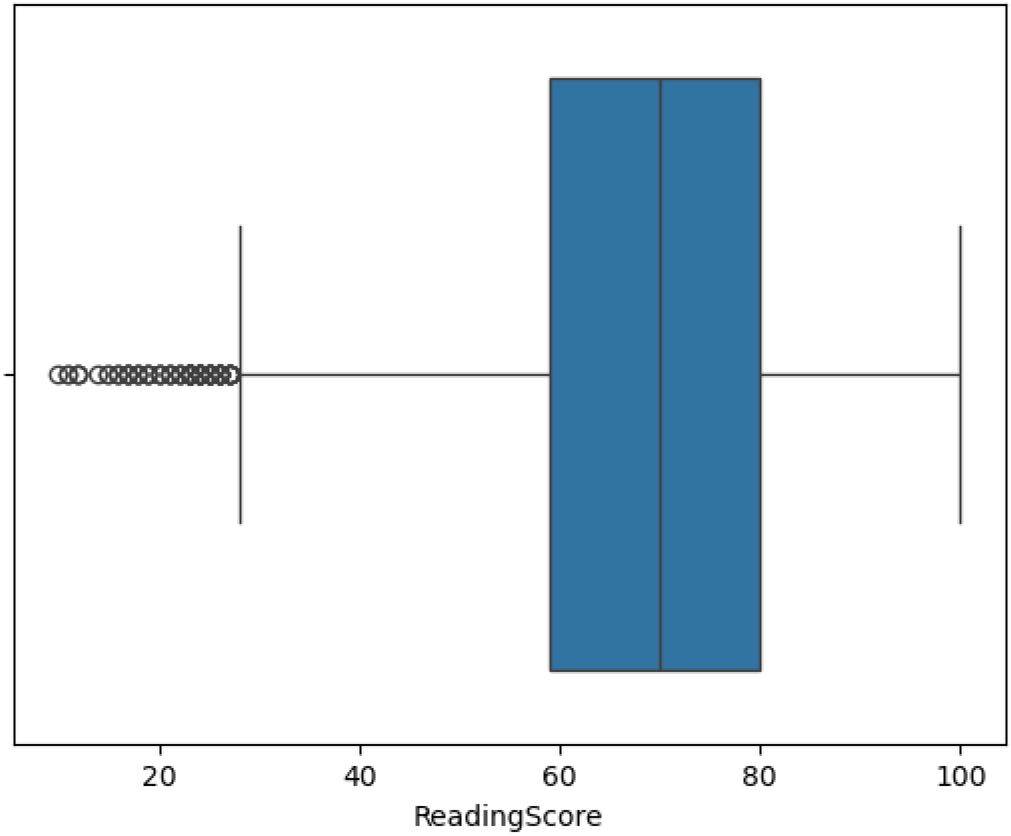


In [71]:

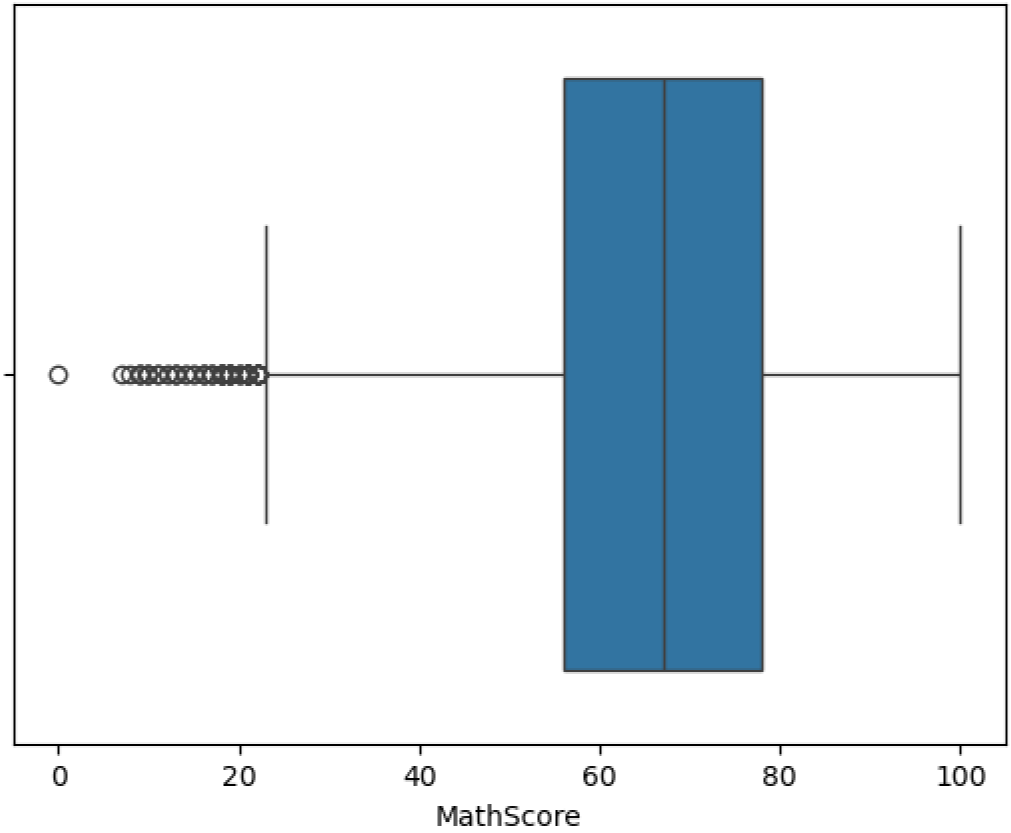
```
#From the above charts we have concluded that:
#there is no/negligible impact on the student's score due to there parents m
```

In [72]:

```
sns.boxplot(data = df, x = "ReadingScore")
plt.show()
```

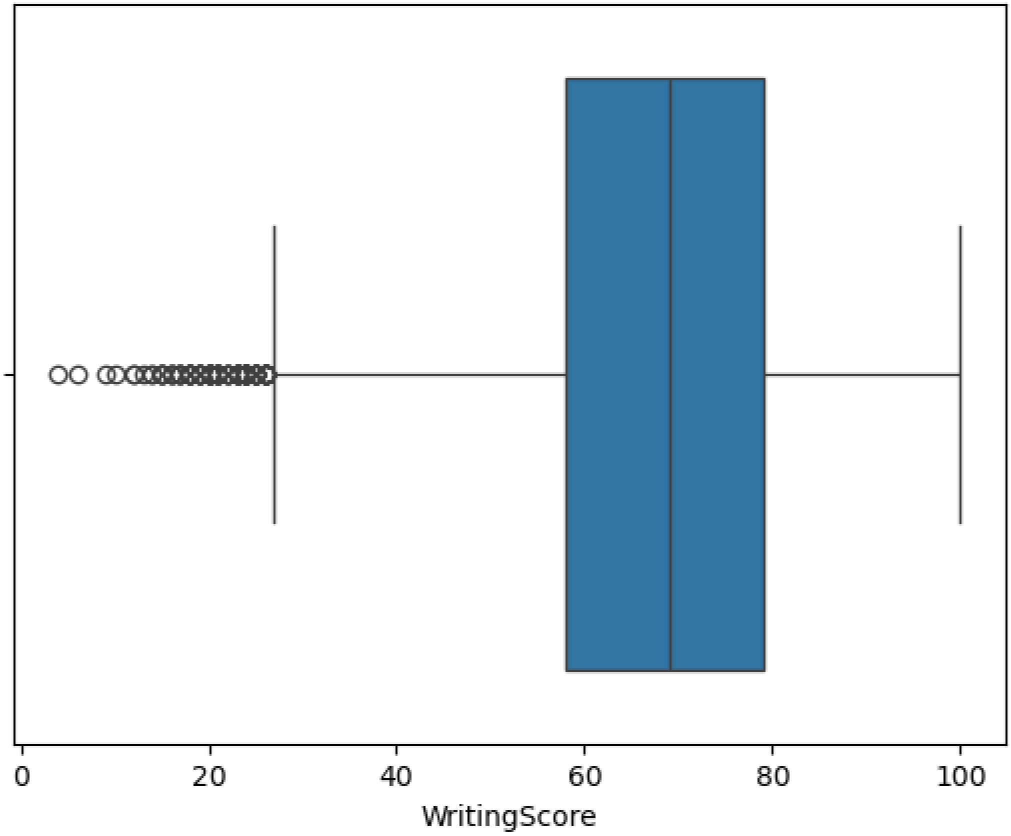


In [73]:
```
sns.boxplot(data = df, x = "MathScore")
plt.show()
```



In [74]:
```
sns.boxplot(data = df, x = "WritingScore")
```

```
plt.show()
```



In [75]:

```
print(df['EthnicGroup'].unique())
```

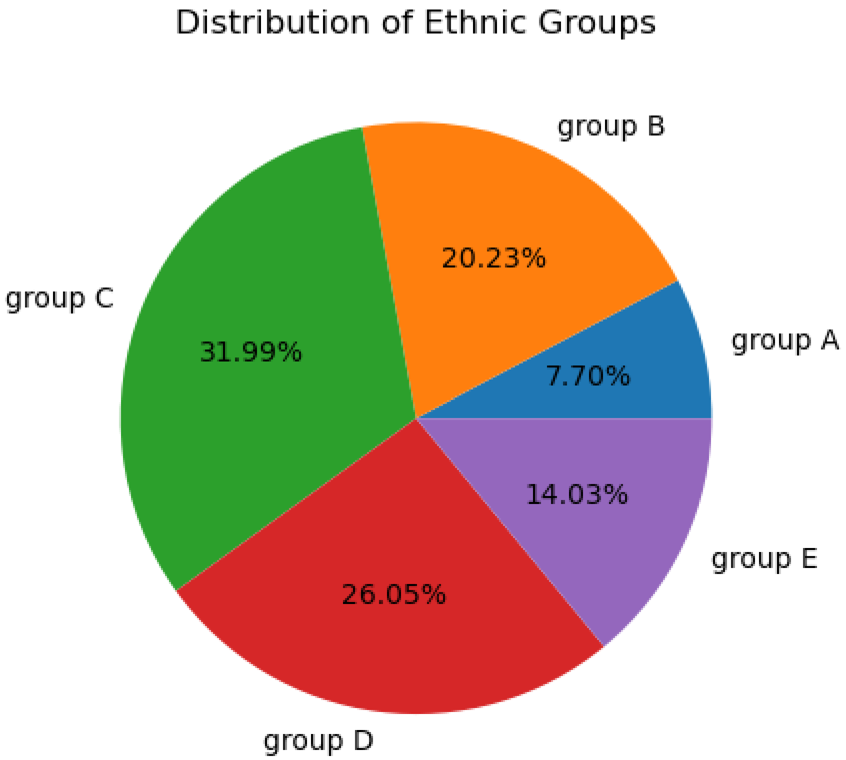
```
[nan 'group C' 'group B' 'group A' 'group D' 'group E']
```

Distribution of Ethnic Group

In [88]:

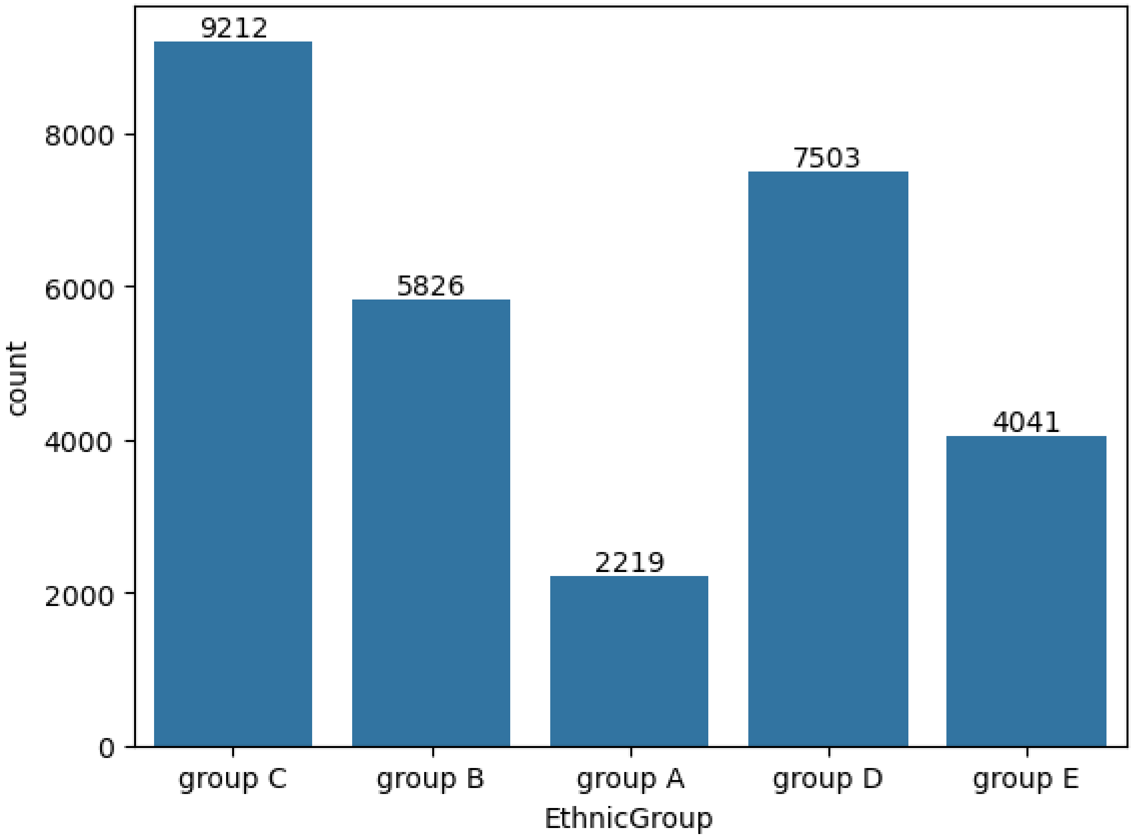
```
groupA = df.loc[(df['EthnicGroup'] == "group A")].count()
groupB = df.loc[(df['EthnicGroup'] == "group B")].count()
groupC = df.loc[(df['EthnicGroup'] == "group C")].count()
groupD = df.loc[(df['EthnicGroup'] == "group D")].count()
groupE = df.loc[(df['EthnicGroup'] == "group E")].count()

l = ["group A","group B","group C","group D","group E"]
mlist = [groupA["EthnicGroup"], groupB["EthnicGroup"], groupC["EthnicGroup"]
plt.pie(mlist,labels = l, autopct = "%1.2f%%")
plt.title("Distribution of Ethnic Groups")
plt.show()
```



```
In [87]: ax = sns.countplot(data = df, x='EthnicGroup')
         ax.bar_label(ax.containers[0])
```

```
Out[87]: [Text(0, 0, '9212'),
          Text(0, 0, '5826'),
          Text(0, 0, '2219'),
          Text(0, 0, '7503'),
          Text(0, 0, '4041')]
```


9212
5826
2219
7503
4041
count
0
2000
4000
6000
8000
group C
group B
group A
group D
group E
EthnicGroup

```
In [ ]:
```