In [ ]:
```
#pip install numpy
#pip install pandas
#pip install matplotlib
#pip install seaborn
```

In [1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

In [2]:
```
df = pd.read_csv("Expanded_data_with_more_features.csv")
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 [3]:
```
df.describe()
```

Out[3]:

	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 [4]:
```
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 [5]:
```
df.isnull().sum()
```

Out[5]:
```
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 coloumn

In [14]:
```
df = df.drop("Unnamed: 0", axis=1)
print(df.head())
```

```
---------------------------------------------------------------------------
KeyError                                  Traceback (most recent call last)
Cell In[14], line 1
----> 1 df = df.drop("Unnamed: 0", axis=1)
      2 print(df.head())

File ~\anaconda3\Lib\site-packages\pandas\core\frame.py:5344, in DataFrame.drop(s
elf, labels, axis, index, columns, level, inplace, errors)
   5196 def drop(
   5197     self,
   5198     labels: IndexLabel | None = None,
   (...)
   5205     errors: IgnoreRaise = "raise",
   5206 ) -> DataFrame | None:
   5207     """
   5208     Drop specified labels from rows or columns.
   5209
   (...)
   5342             weight  1.0     0.8
   5343     """
-> 5344     return super().drop(
   5345         labels=labels,
   5346         axis=axis,
   5347         index=index,
   5348         columns=columns,
   5349         level=level,
   5350         inplace=inplace,
   5351         errors=errors,
   5352     )

File ~\anaconda3\Lib\site-packages\pandas\core\generic.py:4711, in NDFrame.drop(s
elf, labels, axis, index, columns, level, inplace, errors)
   4709 for axis, labels in axes.items():
   4710     if labels is not None:
-> 4711         obj = obj._drop_axis(labels, axis, level=level, errors=errors)
   4713 if inplace:
   4714     self._update_inplace(obj)

File ~\anaconda3\Lib\site-packages\pandas\core\generic.py:4753, in NDFrame._drop_
axis(self, labels, axis, level, errors, only_slice)
   4751         new_axis = axis.drop(labels, level=level, errors=errors)
   4752     else:
-> 4753         new_axis = axis.drop(labels, errors=errors)
   4754     indexer = axis.get_indexer(new_axis)
   4756 # Case for non-unique axis
   4757 else:

File ~\anaconda3\Lib\site-packages\pandas\core\indexes\base.py:7000, in Index.dro
p(self, labels, errors)
   6998 if mask.any():
   6999     if errors != "ignore":
-> 7000         raise KeyError(f"{labels[mask].tolist()} not found in axis")
   7001     indexer = indexer[~mask]
   7002 return self.delete(indexer)

KeyError: "['Unnamed: 0'] not found in axis"
```

In [15]:
```
# Double-check the column names
print(df.columns)
```

```
# Drop the column only if it exists
if 'Unnamed: 0' in df.columns:
    df = df.drop('Unnamed: 0', axis=1)
    print(df.head())
else:
    print("Column 'Unnamed: 0' not found in DataFrame.")
```

```
Index(['Gender', 'EthnicGroup', 'ParentEduc', 'LunchType', 'TestPrep',
       'ParentMaritalStatus', 'PracticeSport', 'IsFirstChild', 'NrSiblings',
       'TransportMeans', 'WklyStudyHours', 'MathScore', 'ReadingScore',
       'WritingScore'],
      dtype='object')
Column 'Unnamed: 0' not found in DataFrame.
```

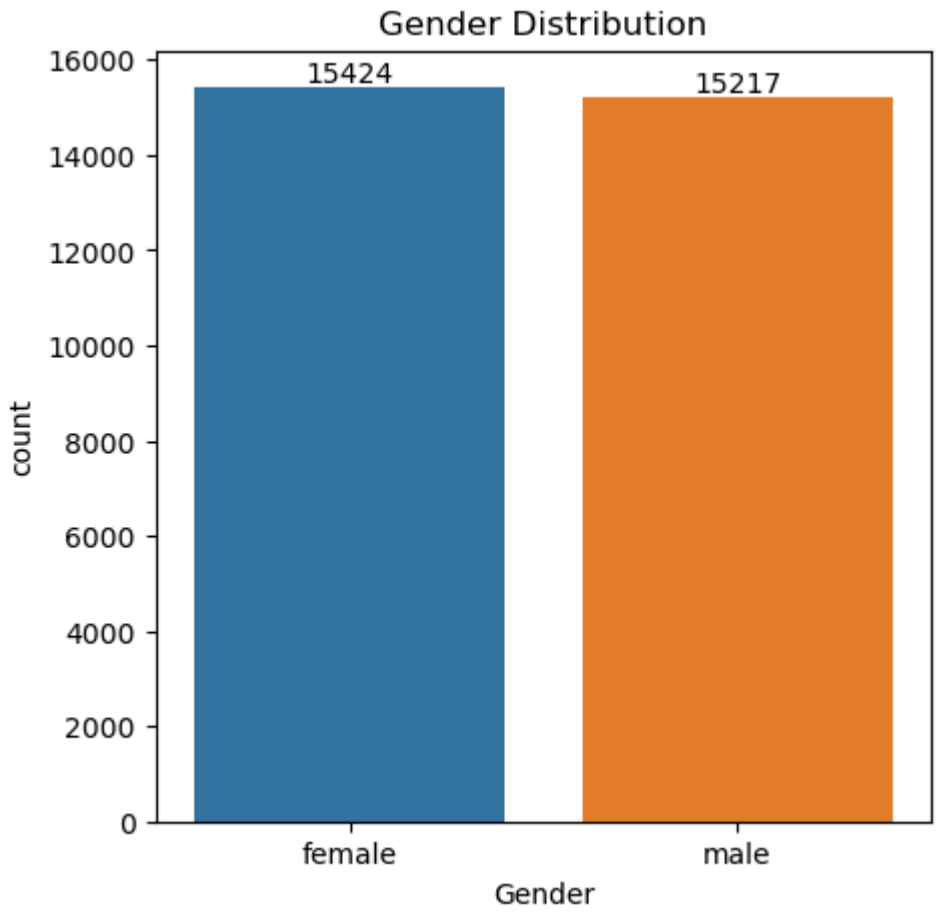
In [16]:
```
df["WklyStudyHours"] = df["WklyStudyHours"]
df.head()
```

Out[16]:

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

Gender Distribution

In [34]:
```
plt.figure(figsize=(5,5))
ax = sns.countplot(data = df, x = "Gender")
ax.bar_label(ax.containers[0])
plt.title("Gender Distribution")
plt.show()
```

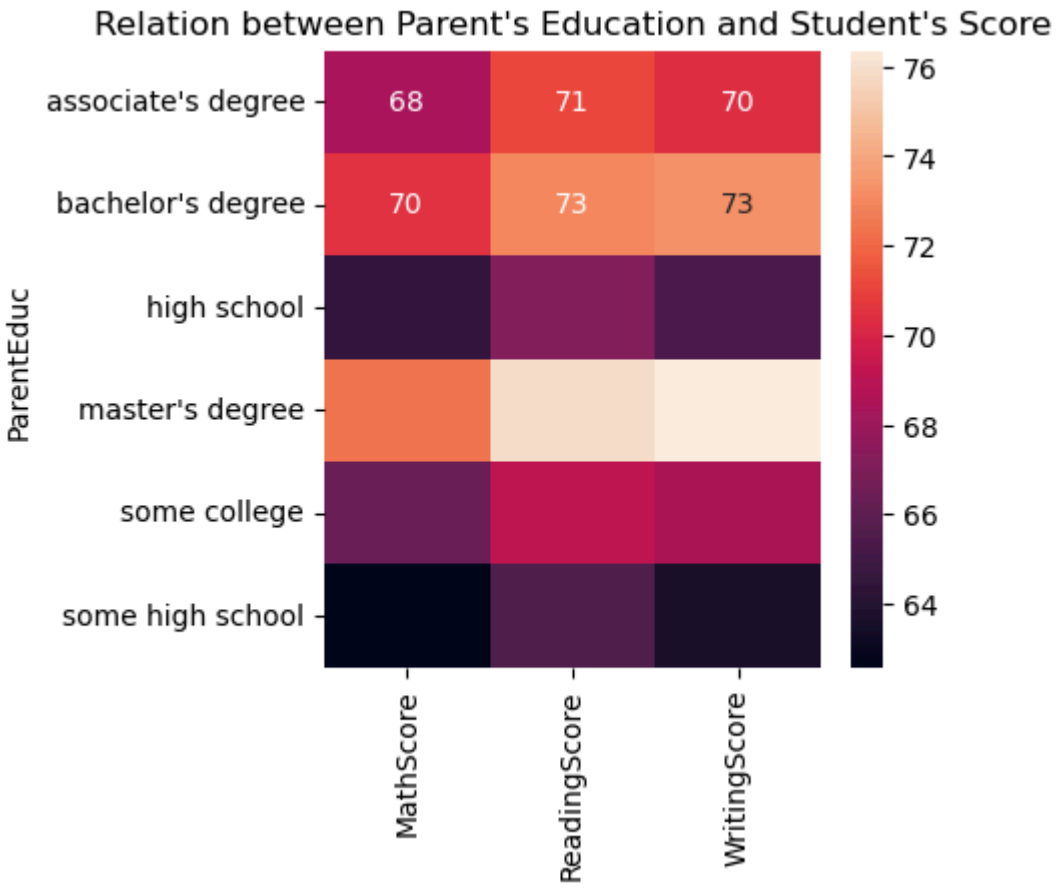


#from the above chart we have analyzed that: #the number of females in the data is more than the number of males

In [22]:
```
gb = df.groupby("ParentEduc").agg({"MathScore":'mean', "ReadingScore":'mean', "W
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 [35]:
```
plt.figure(figsize=(4,4))
sns.heatmap(gb, annot = True)
plt.title("Relation between Parent's Education and Student's Score")
plt.show()
```

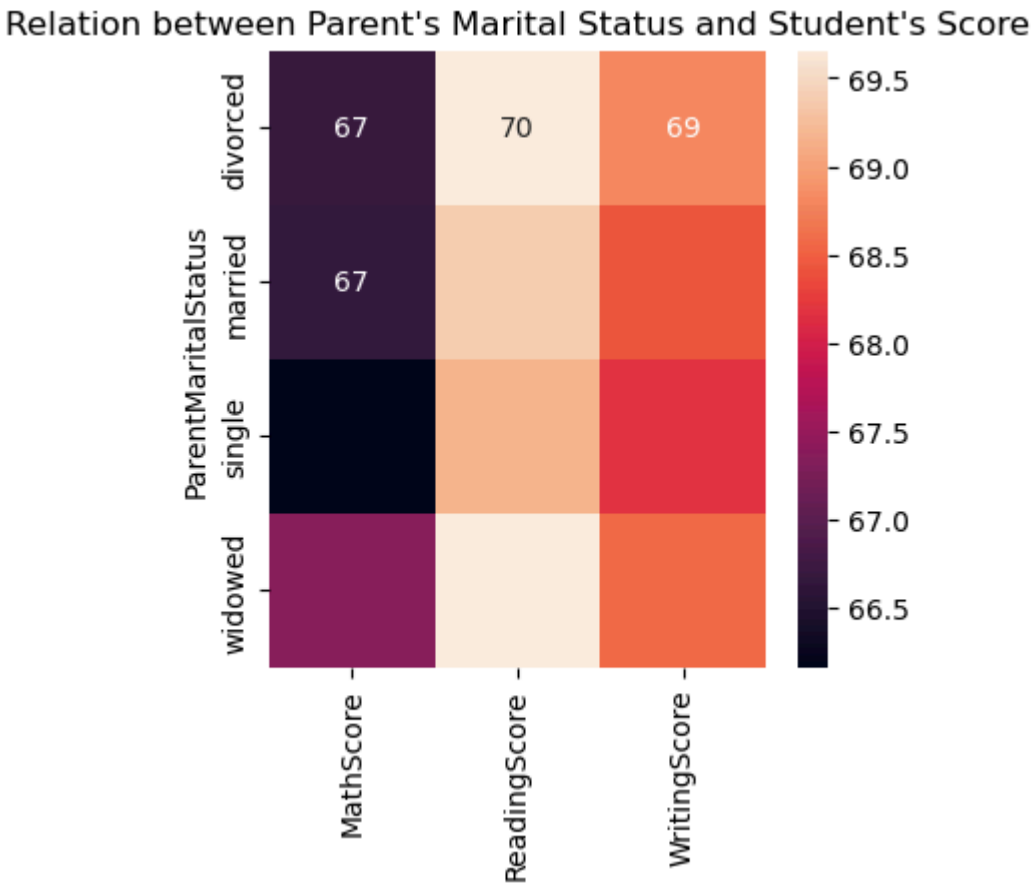


#from the above chart we have concluded that the education of the parents have a good impact on their scores

In [32]:
```
gb1 = df.groupby("ParentMaritalStatus").agg({"MathScore":'mean', "ReadingScore":
print(gb1)
```

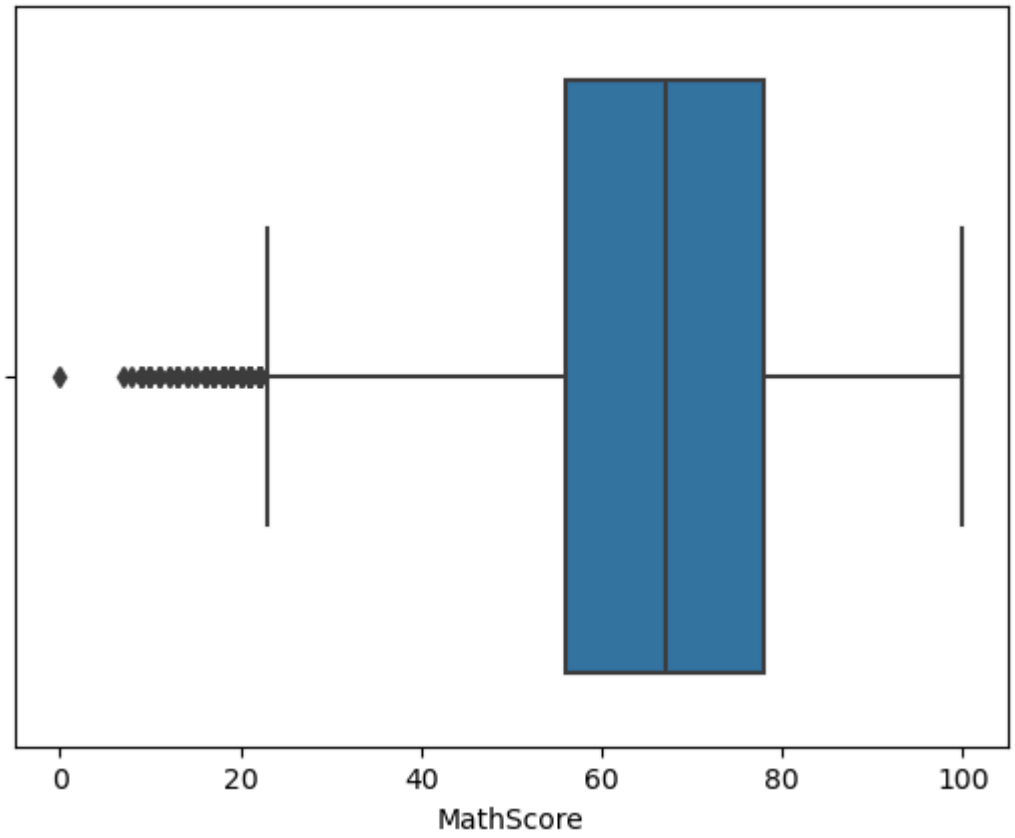
```
                   MathScore  ReadingScore  WritingScore
ParentMaritalStatus
divorced           66.691197     69.655011     68.799146
married            66.657326     69.389575     68.420981
single             66.165704     69.157250     68.174440
widowed            67.368866     69.651438     68.563452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

In [36]:
```
plt.figure(figsize=(4,4))
sns.heatmap(gb1, annot = True)
plt.title("Relation between Parent's Marital Status and Student's Score")
plt.show()
```

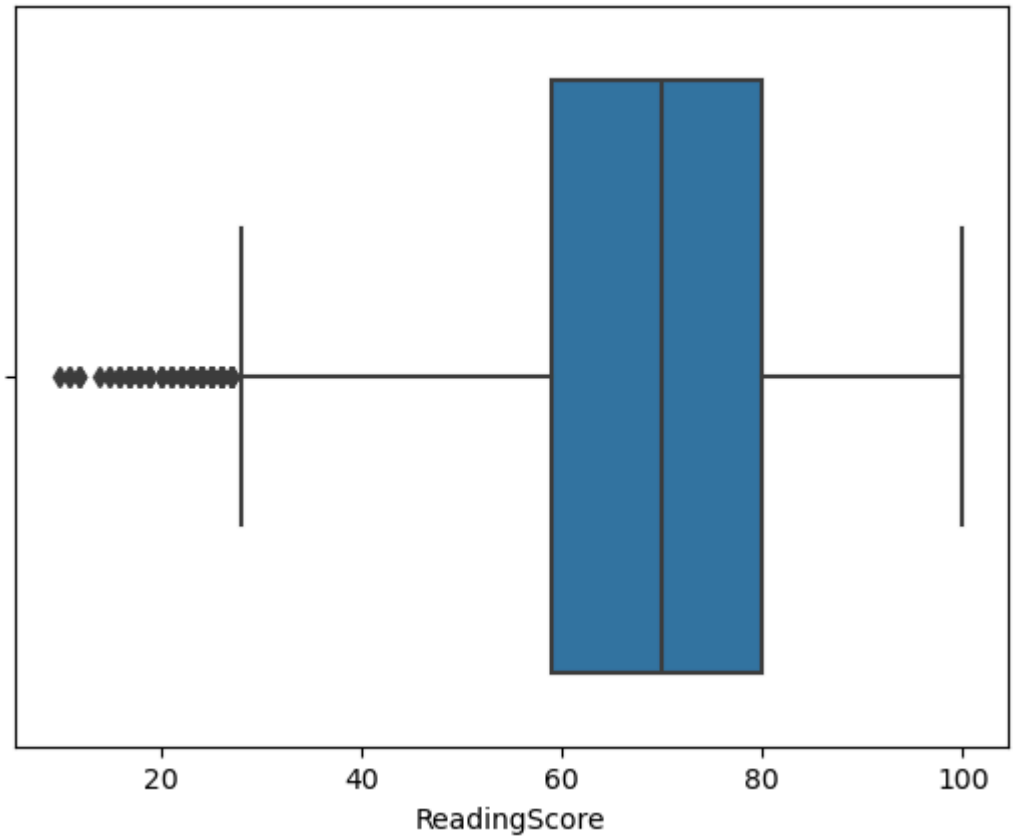


#from the above chart we have analyzed that the marital status of the parents have no impact or negligible impact on the student scores

In [37]:
```
sns.boxplot(data = df, x = "MathScore")
plt.show()
```



In [41]:
```
sns.boxplot(data = df, x = "ReadingScore")
plt.show()
```



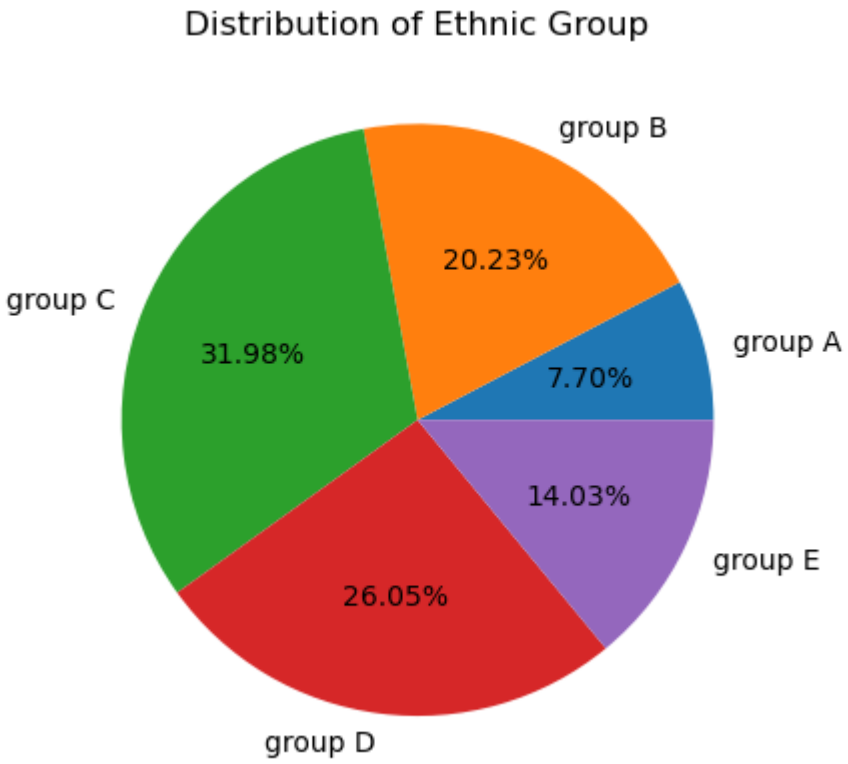
In [42]:
```
print(df["EthnicGroup"].unique())
```

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

Distribution of Ethnic Groups

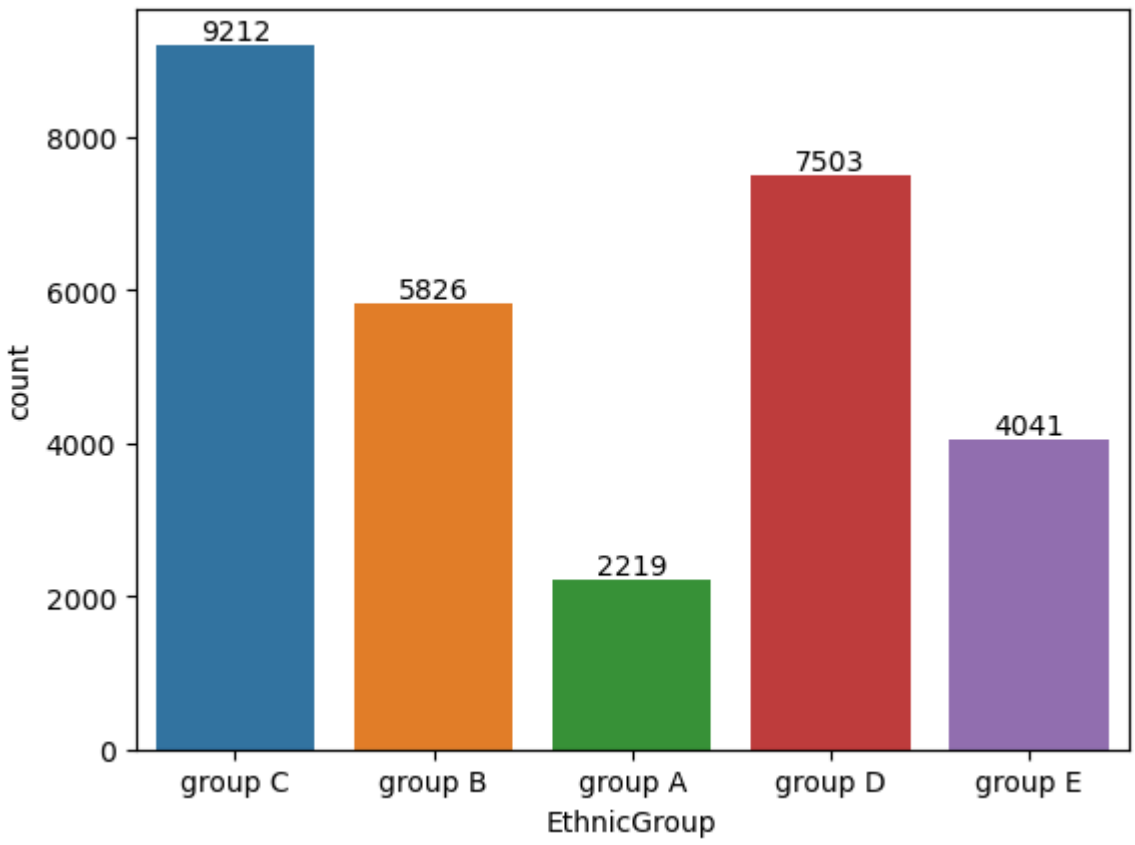
In [55]:
```
groupA = df.loc[(df['EthnicGroup'] == "group A")].count()
groupB = df.loc[(df['EthnicGroup'] == "group B")].count()
groupC = df.loc[(df['EthnicGroup'] == "group C")].count()
groupD = df.loc[(df['EthnicGroup'] == "group D")].count()
groupE = df.loc[(df['EthnicGroup'] == "group E")].count()

l = ["group A", "group B", "group C", "group D", "group E"]
mlist = [groupA["EthnicGroup"], groupB["EthnicGroup"], groupC["EthnicGroup"], gr

print(mlist)

plt.pie(mlist, labels = l, autopct = "%1.2f%%" )
plt.title("Distribution of Ethnic Group")
plt.show()
```

```
[2219, 5826, 9212, 7503, 4041]
```



In [54]:
```
ax = sns.countplot(data = df, x = 'EthnicGroup')
ax.bar_label(ax.containers[0])
```

Out[54]:
```
[Text(0, 0, '9212'),
 Text(0, 0, '5826'),
 Text(0, 0, '2219'),
 Text(0, 0, '7503'),
 Text(0, 0, '4041')]
```



In [ ]: