In [2]:

```
# pip install numpy
# pip install pandas
# pip install matplotlib
# pip install seaborn
```

In [5]:

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

In [10]:

```
df = pd.read_csv("C:/Users/priya/Downloads/Expanded_data_with_more_features.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 [11]:

```
df.describe()
```

Out[11]:

	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 [12]:

```
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 [16]:

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

Out[16]:

```
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 colum

df = df.drop ("Unnamed: 0", axis=1) print(df.head())

change weekly study hours column

In [30]:

```
df["WklyStudyHours"] = df["WklyStudyHours"].str.replace("5-10","5-10")
df.head()
```

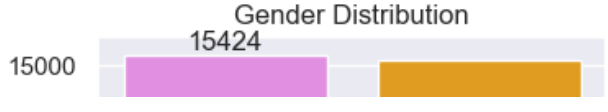
Out[30]:

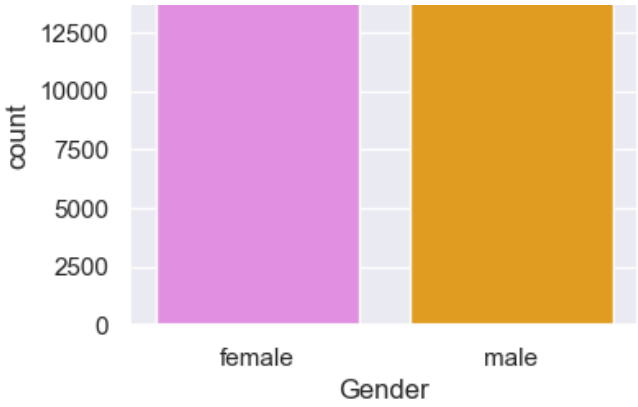
	Gender	EthnicGroup	ParentEduc	LunchType	TestPrep	ParentMaritalStatus	PracticeSport	IsFirstChild	NrSiblings	TransportMeans	Wk
0	female	NaN	bachelor's degree	standard	none	married	regularly	yes	3.0	school_bus	
1	female	group C	some college	standard	NaN	married	sometimes	yes	0.0	NaN	
2	female	group B	master's degree	standard	none	single	sometimes	yes	4.0	school_bus	
3	male	group A	associate's degree	free/reduced	none	married	never	no	1.0	NaN	
4	male	group C	some college	standard	none	married	sometimes	yes	0.0	school_bus	

gender distribution

In [139]:

```
plt.figure(figsize= (4,3))
custom_palette = {"male": "orange", "female": "violet"}
ax = sns.countplot(data=df, x="Gender", hue="Gender", palette=custom_palette, legend=False)
ax.bar_label(ax.containers[0])
plt.title("Gender Distribution")
plt.show()
```





In [ ]:

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

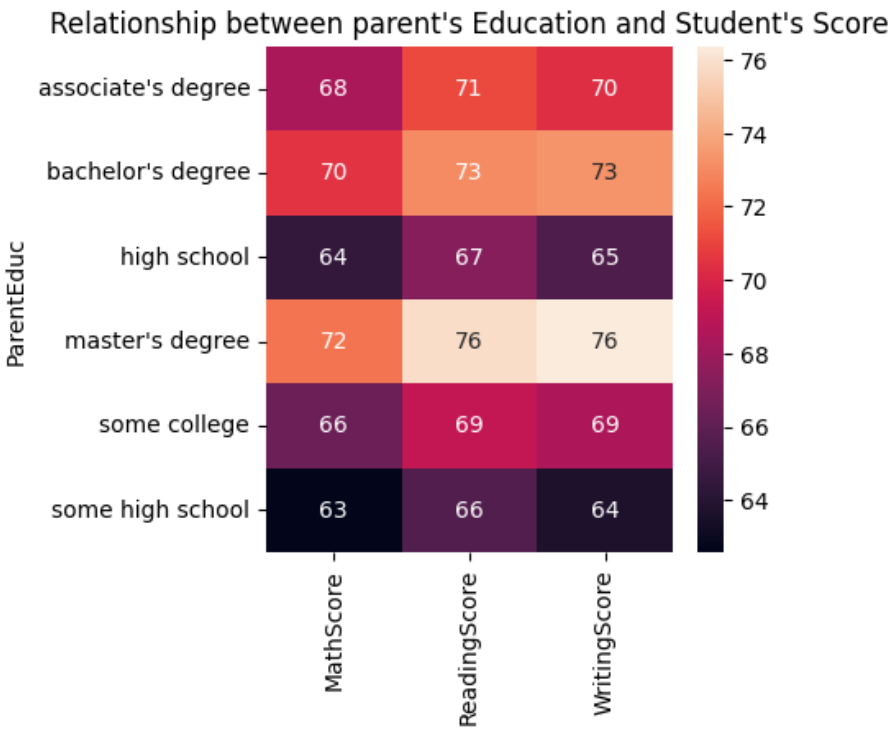
In [42]:

```
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 [53]:

```
plt.figure(figsize= (4,4))
sns.heatmap(gb, annot = True)
plt.title("Relationship between parent's Education and Student's Score")
plt.show()
```



In [ ]:

```
#from the above chart we have concluded that the education of the parents have a good imapact on there sco
res
```

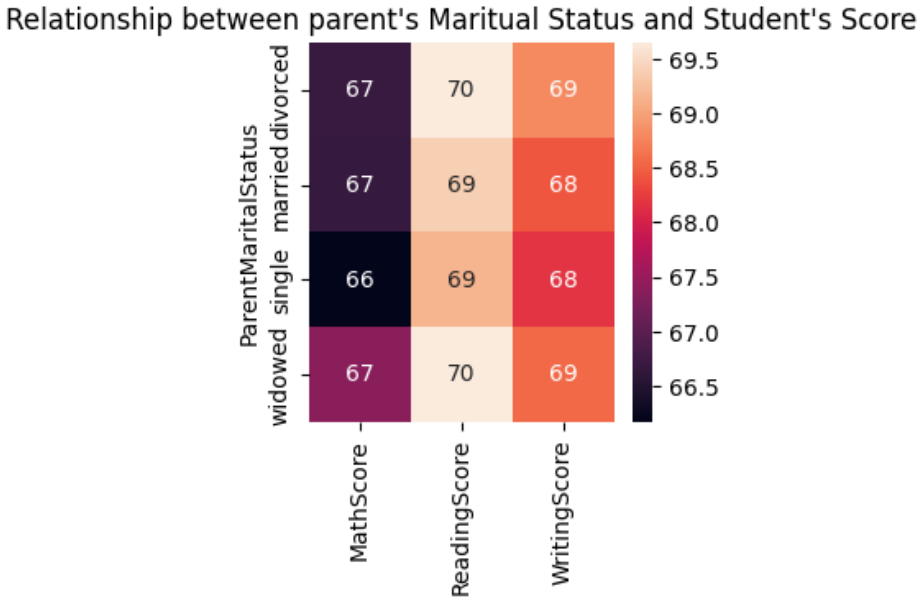
In [49]:

```
gb1 = df.groupby("ParentMaritalStatus").agg({"MathScore":'mean',"ReadingScore":"mean","WritingScore":"mea
n"})
print(gb1)
```

ParentMaritalStatus	MathScore	ReadingScore	WritingScore
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 [54]:

```
plt.figure(figsize= (3,3))
sns.heatmap(gb1, annot = True)
plt.title("Relationship between parent's Maritual Status and Student's Score")
plt.show()
```

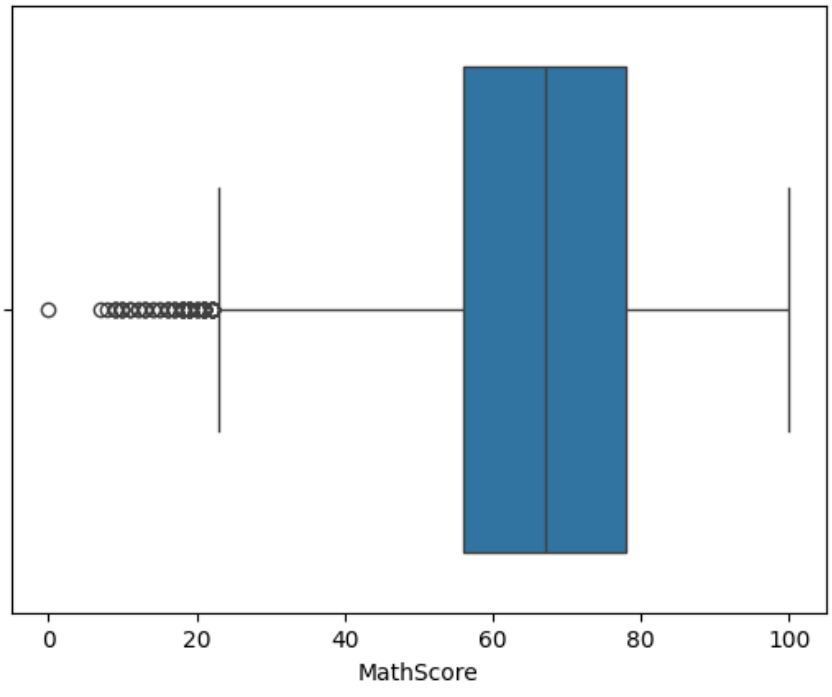


In [ ]:

```
#from the above chart above chart we have concluded that there is no/negligible
#impact on the student's score due to their parents maritual status
```

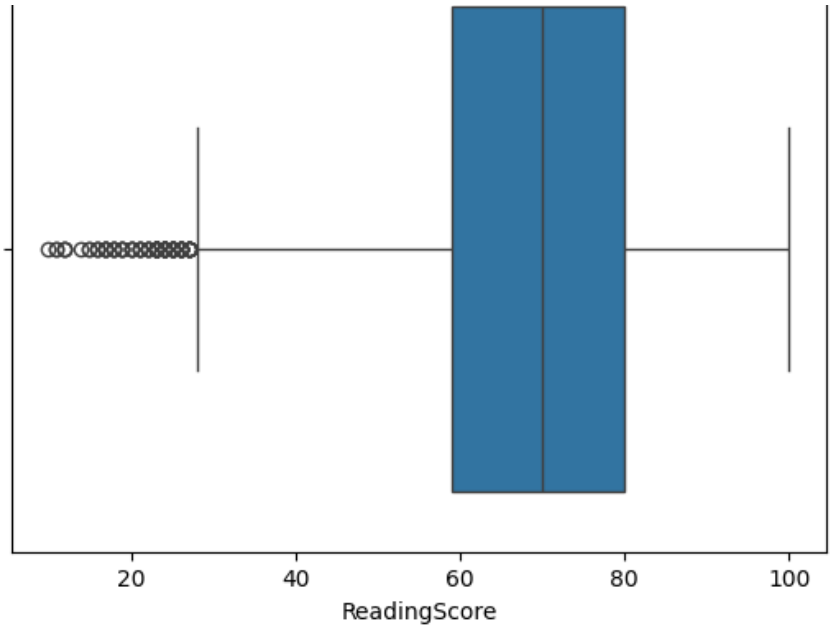
In [58]:

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



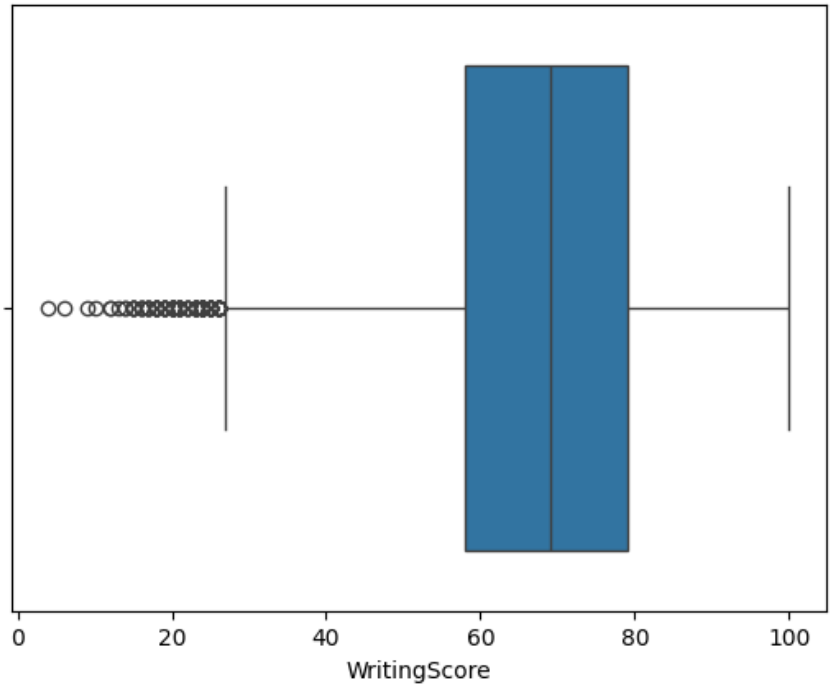
In [56]:

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



In [60]:

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



In [62]:

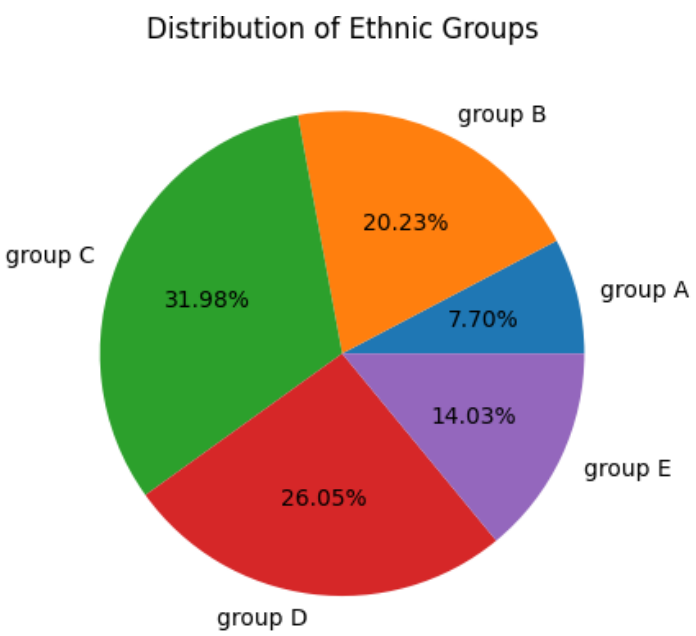
```
print(df["EthnicGroup"].unique())
```

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

Distribution of Ethnic Groups

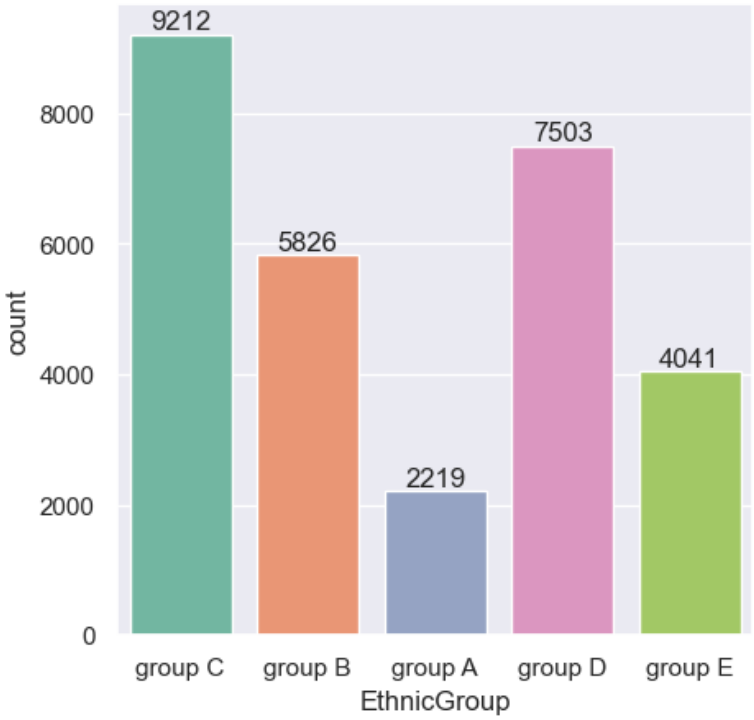
In [93]:

```
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"], groupD["EthnicGroup"], grou
pE["EthnicGroup"]]

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



In [164]:

```
plt.figure(figsize= (5,5))
ax = sns.countplot(data = df, x = 'EthnicGroup', hue='EthnicGroup',palette='Set2', dodge=False, legend=F
alse)
for bars in ax.containers:
    ax.bar_label(bars)
plt.show()
```

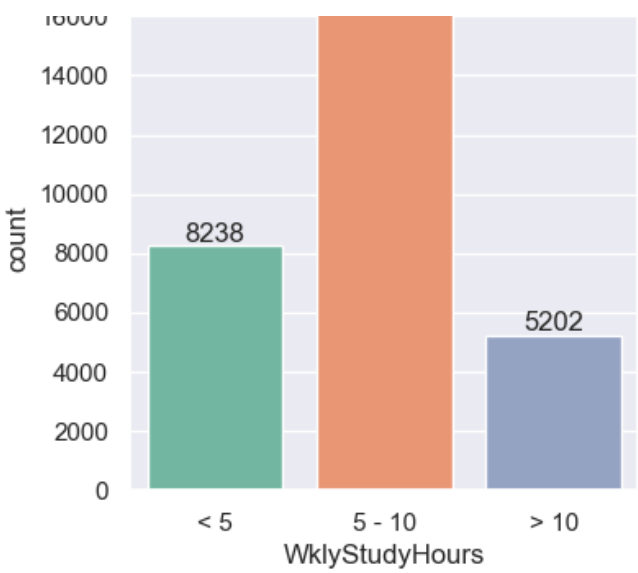


In [166]:

```
#The bar chart visualizes the distribution of different ethnic groups within the dataset. Each bar represe
nts an ethnic
#group and the height of the bar indicates the count of occurrences for that group in the dataset.

#This visualization helps to understand the relative size of each ethnic group in the dataset,
#showing that Groups C and D are the most prevalent, while Group A is the least prevalent.
```

In [120]:

```
sns.set(rc={'figure.figsize':(4,4)})
ax = sns.countplot(data=df, x='WklyStudyHours', hue='WklyStudyHours', palette='Set2', dodge=False, legend
=False)

for bars in ax.containers:
    ax.bar_label(bars)
```



In [121]:

```
#from The above graph we find most common range of weekly study hours is **5-10 hours**, indicating that a
significant
#portion of individuals in the dataset study within this range.
#followed by **less than 5 hours**, suggesting that many individuals study relatively few hours each week.
```

conclusion

In [165]:

```
#we can conclude that parental education likely plays a role in students' academic performance,
#while factors such as gender and parental marital status may have minimal influence.
#Additionally, the distribution of ethnic groups in the dataset suggests diversity, and the study hours
#indicate varying levels of dedication to academic work.
```