

**Exp No: 3**  
**Date:**

## EDA-Data Cleaning

### Aim

To clean data by handling missing values, duplicates, data types, and normalization.

### Problem Statement

Clean a dataset by removing nulls, duplicates, and normalizing numeric fields.

### Algorithm

1. Load dataset.
2. Detect missing values (isnull).
3. Fill or drop missing values.
4. Remove duplicates.
5. Convert data types.
6. Normalize numeric columns.

### Sample Code

```
import pandas as pd  
from sklearn.preprocessing import StandardScaler, MinMaxScaler  
import matplotlib.pyplot as plt
```

# Step 1: Load dataset

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

```
df.head()
```

	gender	race/ethnicity	level of education	lunch	preparation course	math score	reading score	writing score
0	female	group B	bachelor's degree	standard	none	72	72	74
1	female	group C	some college	standard	completed	69	90	88
2	female	group B	master's degree	standard	none	90	95	93
3	male	group A	associate's degree	free/reduced	none	47	57	44
4	male	group C	some college	standard	none	76	78	75

```

df.shape
(1005, 8)

# Step 2: Handle Missing Values

# Detect
missing_info = df.isnull().sum()
print("Missing values:\n", missing_info)

Missing values:
   gender              0
   race/ethnicity       0
   parental level of education  7
   lunch                0
   test preparation course  0
   math score            0
   reading score          0
   writing score          0
dtype: int64

# Fill or Drop (based on context)
df.fillna({
    'parental level of education': df['parental level of education'].mode()[0],
    'lunch': df['lunch'].mode()[0]
}, inplace=True)

missing_info = df.isnull().sum()
missing_info

gender              0
race/ethnicity       0
parental level of education  0
lunch                0
test preparation course  0
math score            0
reading score          0
writing score          0
dtype: int64

duplicates = df[df.duplicated()]
duplicates

```

	gender	race/ethnicity	parental level of education	lunch	test preparation course	math score	reading score	writing score
1000	male	group D	some college	standard	none	76	64	66
1001	male	group C	associate's degree	standard	none	46	43	42
1002	female	group B	bachelor's degree	standard	none	67	86	83
1003	male	group E	some high school	standard	none	92	87	78
1004	male	group C	bachelor's degree	standard	completed	83	82	84

duplicates.shape

(5, 8)

# Drop duplicates

```
df.drop_duplicates(inplace=True)
```

df.shape

# Step 4: Convert Data Types (if needed)

# For consistency, make sure string columns are lowercase

```
categorical_cols = ['gender', 'race/ethnicity', 'parental level of education', 'lunch', 'test preparation course']
```

for col in categorical\_cols:

```
    df[col] = df[col].astype(str).str.lower().str.strip()
```

categorical\_cols

```
['gender',
 'race/ethnicity',
 'parental level of education',
 'lunch',
 'test preparation course']
```

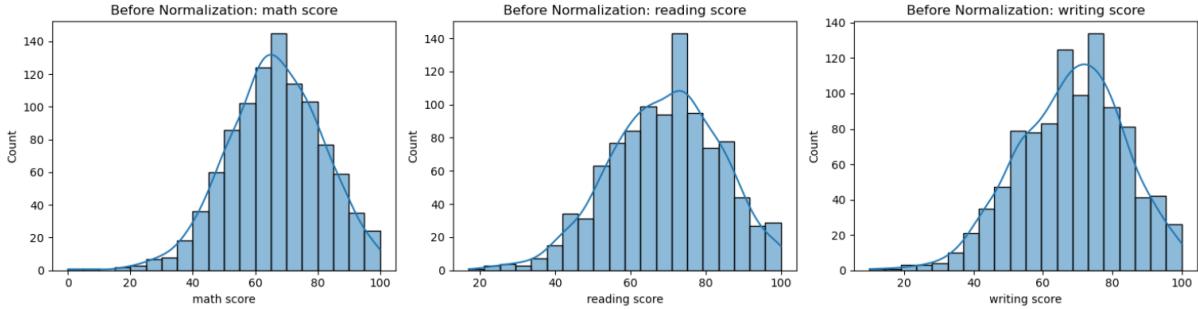
```
numeric_cols = ['math score', 'reading score', 'writing score']
```

numeric\_cols

```
['math score', 'reading score', 'writing score']
```

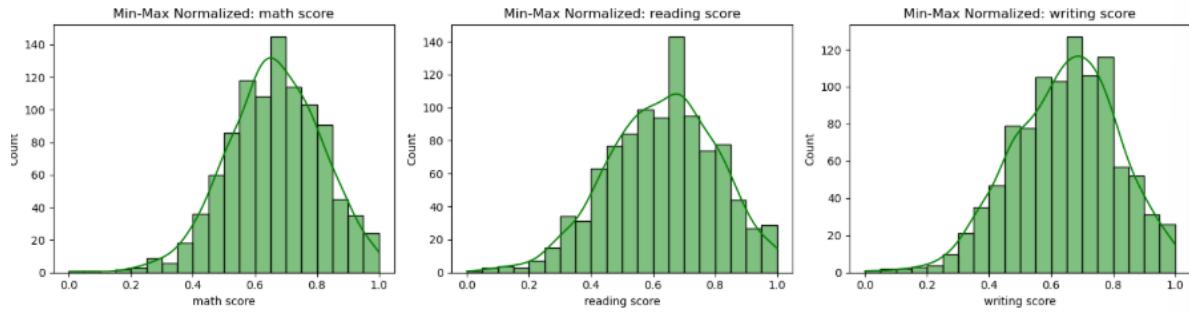
```
plt.figure(figsize=(15, 4))

for i, col in enumerate(numeric_cols):
    plt.subplot(1, 3, i+1)
    sns.histplot(df[col], kde=True, bins=20)
    plt.title(f'Before Normalization: {col}')
    plt.tight_layout()
plt.show()
```



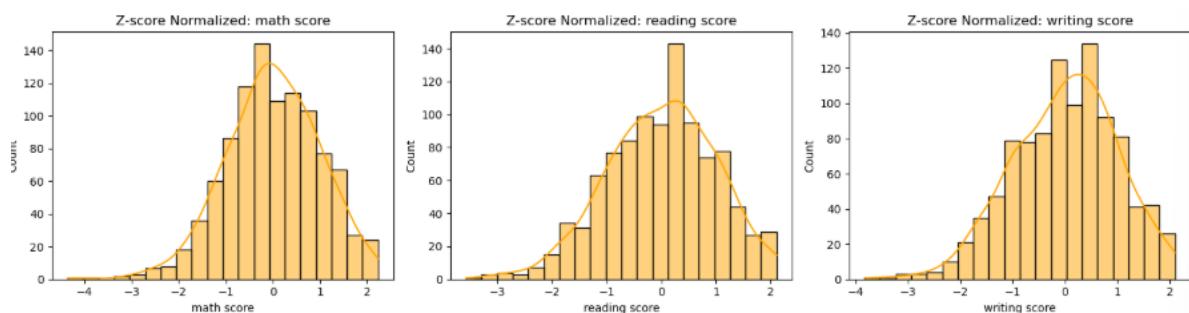
```
minmax_scaler = MinMaxScaler()
df_minmax = df.copy()
df_minmax[numeric_cols] = minmax_scaler.fit_transform(df[numeric_cols])
plt.figure(figsize=(15, 4))

for i, col in enumerate(numeric_cols):
    plt.subplot(1, 3, i+1)
    sns.histplot(df_minmax[col], kde=True, bins=20, color='green')
    plt.title(f'Min-Max Normalized: {col}')
    plt.tight_layout()
plt.show()
```



```
# Standard Scaling (Z-score)
zscore_scaler = StandardScaler()
df_zscore = df.copy()
df_zscore[numeric_cols] = zscore_scaler.fit_transform(df[numeric_cols])
```

```
plt.figure(figsize=(15, 4))
for i, col in enumerate(numeric_cols):
    plt.subplot(1, 3, i+1)
    sns.histplot(df_zscore[col], kde=True, bins=20, color='orange')
    plt.title(f'Z-score Normalized: {col}')
plt.tight_layout()
plt.show()
```



## Result :

Thus, the program successfully created a Jupyter Notebook showcasing Python code handling missing values, removing duplicates and unnecessary data, Data type conversion and normalizing data.