In [ ]:

```
#Name: Sushrut Deshpande
#RBT23CB002
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.preprocessing import MinMaxScaler, LabelEncoder
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression, LinearRegression
from sklearn.metrics import accuracy_score, confusion_matrix, classification_report
```

In [2]:

```
raw_data = {
    'Region': ['USA', 'China', 'Russia', 'India', 'UK', 'Australia', 'Europe', 'Bra
    'Product': ['A', 'V', 'A', 'C', 'B', 'D', 'D', 'D', 'E', 'A'],
    'Sales': [100, 125, 130, 200, 124, 245, 524, 10000, 231, np.nan],
    'Profit': [23, 42, 12, 42, 53, 123, 52, 5000, 23, np.nan]
}
```

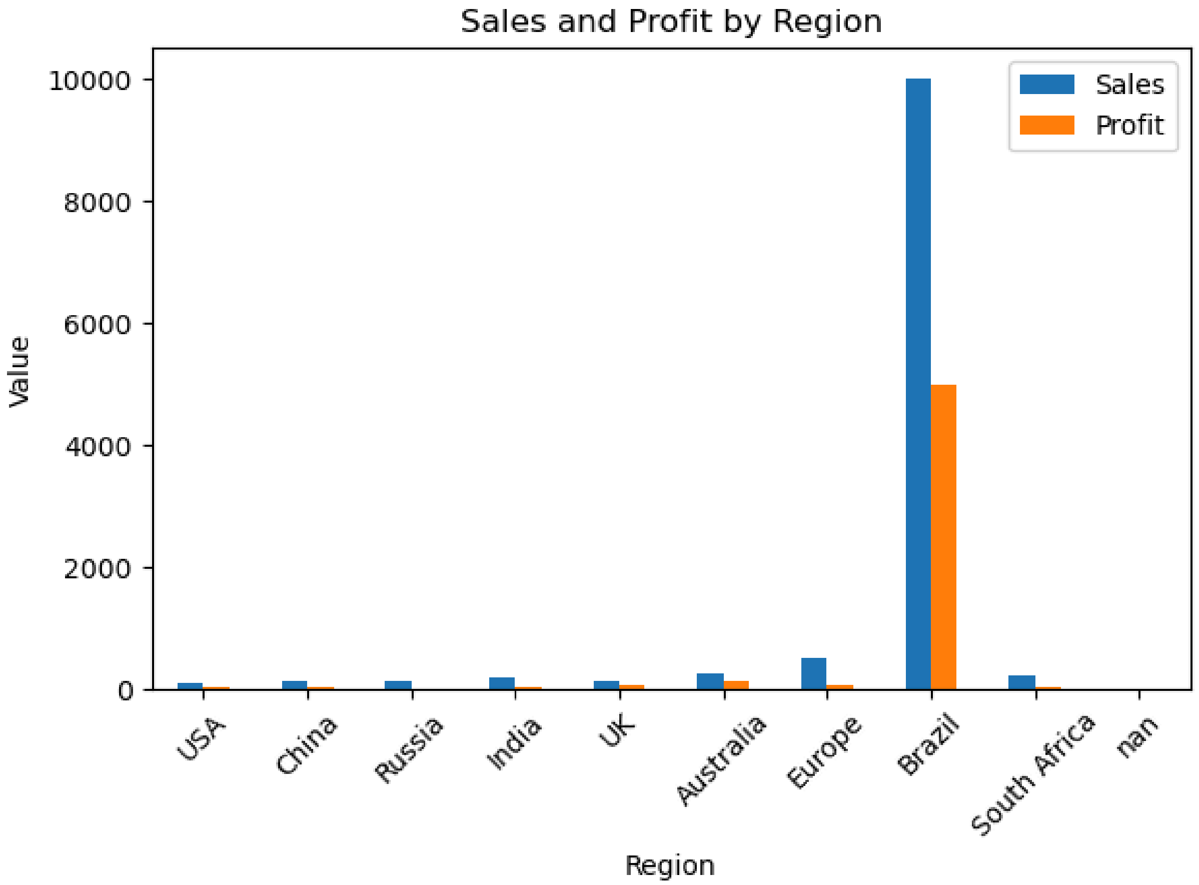
In [4]:

```
df_1 = pd.DataFrame(raw_data)
print(df_1)
```

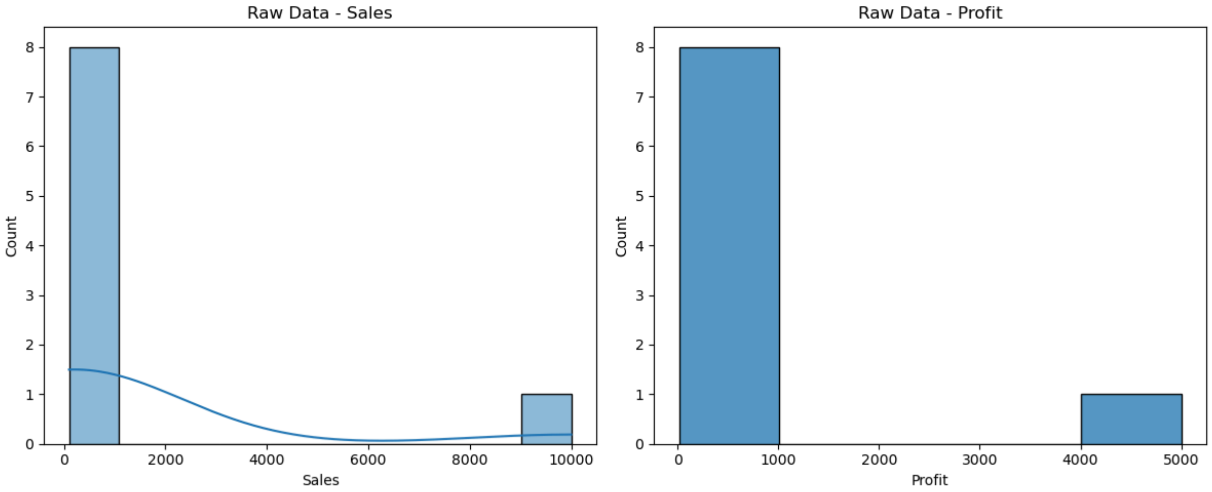
```
         Region Product    Sales  Profit
0           USA       A    100.0    23.0
1         China       V    125.0    42.0
2        Russia       A    130.0    12.0
3         India       C    200.0    42.0
4            UK       B    124.0    53.0
5     Australia       D    245.0   123.0
6        Europe       D    524.0    52.0
7        Brazil       D  10000.0  5000.0
8  South Africa       E    231.0    23.0
9           NaN       A      NaN     NaN
```

In [5]:

```
df_1.plot(x='Region', y=['Sales', 'Profit'], kind='bar')
plt.title('Sales and Profit by Region')
plt.ylabel('Value')
plt.xticks(rotation=45)
plt.tight_layout()
plt.show()
```



In [6]:
```
fig, axes = plt.subplots(1, 2, figsize=(12, 5))
sns.histplot(df_1['Sales'], bins=10, kde=True, ax=axes[0])
axes[0].set_title('Raw Data - Sales')
sns.histplot(df_1['Profit'], bins=5, kde=False, ax=axes[1])
axes[1].set_title('Raw Data - Profit')
plt.tight_layout()
plt.show()
df_1.info()
```



```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10 entries, 0 to 9
Data columns (total 4 columns):
 #   Column   Non-Null Count  Dtype  
---  ------   --------------  -----  
 0   Region   9 non-null      object 
 1   Product  10 non-null     object 
 2   Sales    9 non-null      float64
 3   Profit   9 non-null      float64
dtypes: float64(2), object(2)
memory usage: 452.0+ bytes
```

In [7]:

```
df = df_1.copy()
df['Region'].fillna(df['Region'].mode()[0], inplace=True)
df['Profit'].fillna(df['Profit'].mean(), inplace=True)
df['Sales'].fillna(df['Sales'].mean(), inplace=True)
print(df)
```

```
         Region Product         Sales       Profit
0           USA       A    100.000000    23.000000
1         China       V    125.000000    42.000000
2        Russia       A    130.000000    12.000000
3         India       C    200.000000    42.000000
4            UK       B    124.000000    53.000000
5     Australia       D    245.000000   123.000000
6        Europe       D    524.000000    52.000000
7        Brazil       D  10000.000000  5000.000000
8  South Africa       E    231.000000    23.000000
9     Australia       A   1297.666667   596.666667
```

```
C:\Users\USER\AppData\Local\Temp\ipykernel_14772\3058838888.py:2: FutureWarning: A v
alue is trying to be set on a copy of a DataFrame or Series through chained assignme
nt using an inplace method.
The behavior will change in pandas 3.0. This inplace method will never work because
the intermediate object on which we are setting values always behaves as a copy.

For example, when doing 'df[col].method(value, inplace=True)', try using 'df.method
({col: value}, inplace=True)' or df[col] = df[col].method(value) instead, to perform
the operation inplace on the original object.


  df['Region'].fillna(df['Region'].mode()[0], inplace=True)
C:\Users\USER\AppData\Local\Temp\ipykernel_14772\3058838888.py:3: FutureWarning: A v
alue is trying to be set on a copy of a DataFrame or Series through chained assignme
nt using an inplace method.
The behavior will change in pandas 3.0. This inplace method will never work because
the intermediate object on which we are setting values always behaves as a copy.

For example, when doing 'df[col].method(value, inplace=True)', try using 'df.method
({col: value}, inplace=True)' or df[col] = df[col].method(value) instead, to perform
the operation inplace on the original object.


  df['Profit'].fillna(df['Profit'].mean(), inplace=True)
C:\Users\USER\AppData\Local\Temp\ipykernel_14772\3058838888.py:4: FutureWarning: A v
alue is trying to be set on a copy of a DataFrame or Series through chained assignme
nt using an inplace method.
The behavior will change in pandas 3.0. This inplace method will never work because
the intermediate object on which we are setting values always behaves as a copy.

For example, when doing 'df[col].method(value, inplace=True)', try using 'df.method
({col: value}, inplace=True)' or df[col] = df[col].method(value) instead, to perform
the operation inplace on the original object.


  df['Sales'].fillna(df['Sales'].mean(), inplace=True)
```

In [8]:

```
for col in ['Sales', 'Profit']:
  Q1 = df[col].quantile(0.25)
  Q3 = df[col].quantile(0.75)
  print(Q1, Q3)
  IQR = Q3 - Q1
  lower = Q1 - 1.5 * IQR
  upper = Q3 + 1.5 * IQR
  df[col] = np.where(df[col] > upper, upper, np.where(df[col] < lower, lower, df[co

print(df)
```

```
126.25 454.25
27.75 105.5
         Region Product   Sales   Profit
0           USA       A  100.00   23.000
1         China       V  125.00   42.000
2        Russia       A  130.00   12.000
3         India       C  200.00   42.000
4            UK       B  124.00   53.000
5     Australia       D  245.00  123.000
6        Europe       D  524.00   52.000
7        Brazil       D  946.25  222.125
8  South Africa       E  231.00   23.000
9     Australia       A  946.25  222.125
```

In [9]:

```
scaler = MinMaxScaler()
df[['Profit', 'Sales']] = scaler.fit_transform(df[['Profit', 'Sales']])
print(df)
```

```
         Region Product     Sales    Profit
0           USA       A  0.000000  0.052350
1         China       V  0.029542  0.142772
2        Russia       A  0.035451  0.000000
3         India       C  0.118168  0.142772
4            UK       B  0.028360  0.195122
5     Australia       D  0.171344  0.528257
6        Europe       D  0.501034  0.190363
7        Brazil       D  1.000000  1.000000
8  South Africa       E  0.154801  0.052350
9     Australia       A  1.000000  1.000000
```

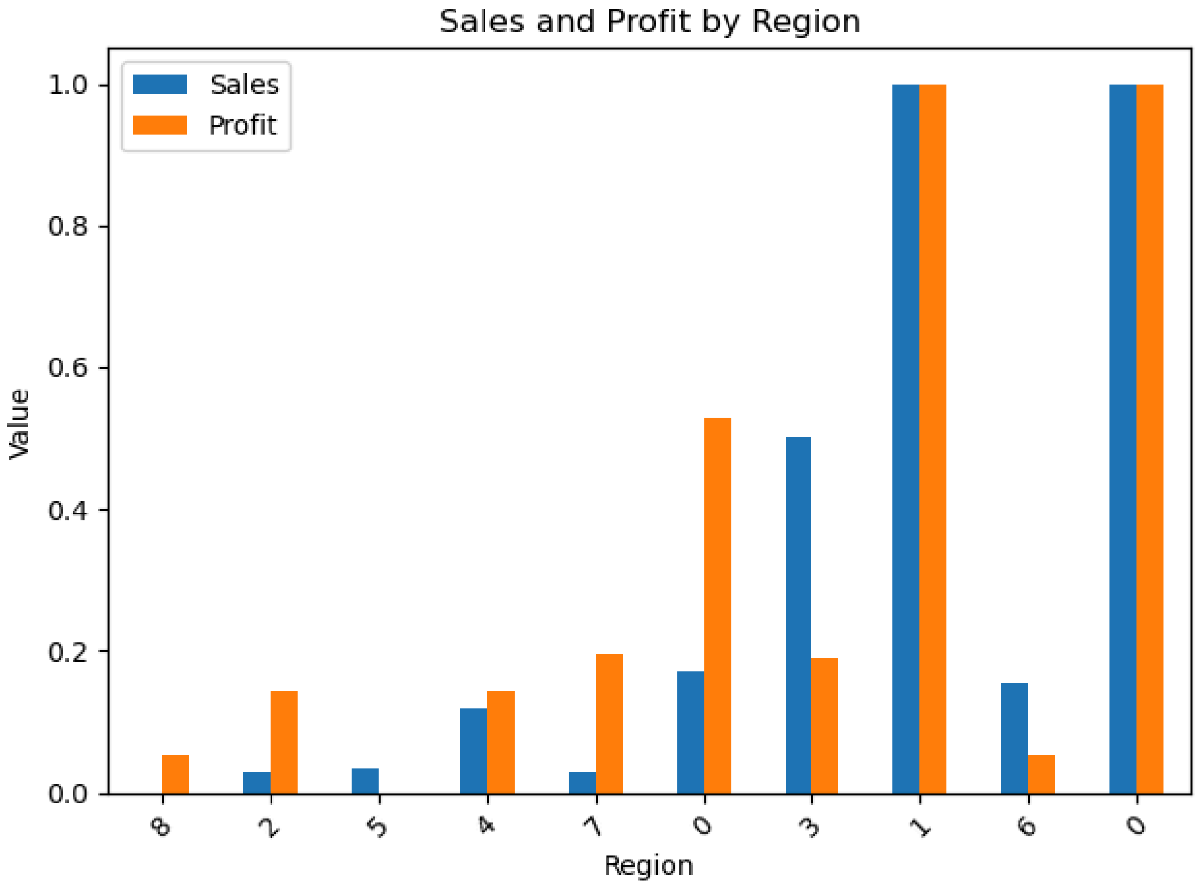
In [10]:

```
le_region = LabelEncoder()
le_product = LabelEncoder()

df['Region'] = le_region.fit_transform(df['Region'])
df['Product'] = le_product.fit_transform(df['Product'])

print(df)
```

```
   Region  Product     Sales    Profit
0       8        0  0.000000  0.052350
1       2        5  0.029542  0.142772
2       5        0  0.035451  0.000000
3       4        2  0.118168  0.142772
4       7        1  0.028360  0.195122
5       0        3  0.171344  0.528257
6       3        3  0.501034  0.190363
7       1        3  1.000000  1.000000
8       6        4  0.154801  0.052350
9       0        0  1.000000  1.000000
```

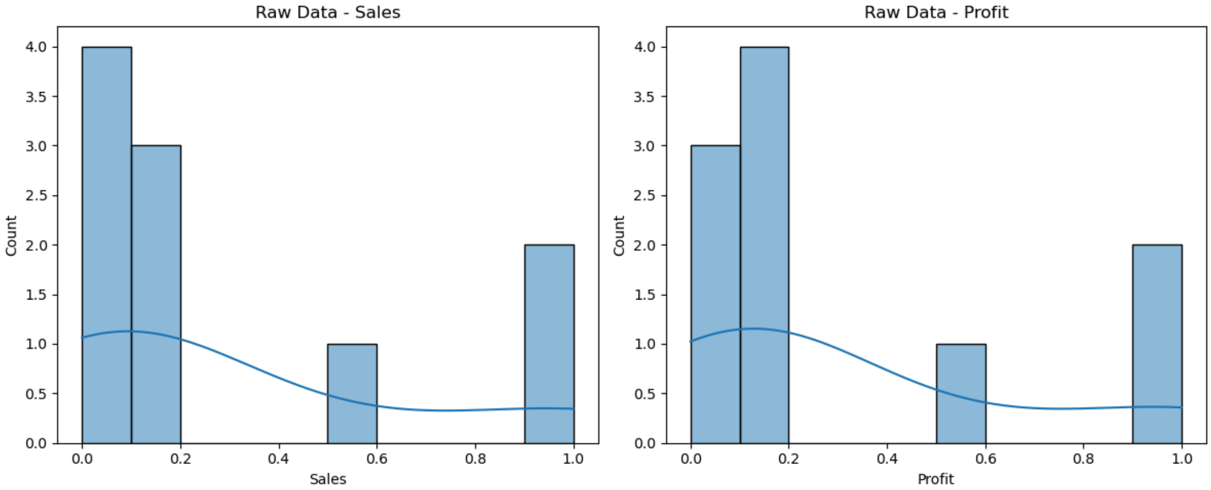
In [11]:

```
df.plot(x='Region', y=['Sales', 'Profit'], kind='bar')
plt.title('Sales and Profit by Region')
plt.ylabel('Value')
plt.xticks(rotation=45)
plt.tight_layout()
plt.show()
```



In [12]:

```
fig, axes = plt.subplots(1, 2, figsize=(12, 5))
sns.histplot(df['Sales'], bins=10, kde=True, ax=axes[0])
axes[0].set_title('Raw Data - Sales')
sns.histplot(df['Profit'], bins=10, kde=True, ax=axes[1])
axes[1].set_title('Raw Data - Profit')
plt.tight_layout()
plt.show()
```


Raw Data - Sales
Count
Sales
Raw Data - Profit
Count
Profit