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import pandas as pd

# Read the CSV file
data = pd.read_csv('grainsales.csv')

# 1. Identify 10 grains for the given dataset
grains = data['GrainName'].unique()[:10]
print("10 grains in the dataset:", grains)

10 grains in the dataset: ['Ragi' 'Bajra' 'Oats' 'Sattu' 'Sooji' 'Brown rice' 'Wheat' 'Corn']

# 2. Implement all 20 grains using Pandas methods
all_grains = data['GrainName'].unique()
print("All 20 grains in the dataset:", all_grains)

All 20 grains in the dataset: ['Ragi' 'Bajra' 'Oats' 'Sattu' 'Sooji' 'Brown rice' 'Wheat' 'Corn']

# 3. Which was the best month for sales? How much was earned that month?
monthly_sales = data.groupby('Months')['Sales'].sum()
best_month = monthly_sales.idxmax()
earning = monthly_sales.max()
print("Best month for sales:", best_month)
print("Earnings in the best month:", earning)

Best month for sales: JULY
Earnings in the best month: 16000000

# 4. Which product sold the most? Why do you think it did?
product_sales = data.groupby('GrainName')['Sales'].sum()
best_product = product_sales.idxmax()
print("Product sold the most:", best_product)

Product sold the most: Wheat

# 5. Which city sold the most products?
city_sales = data.groupby('City')['Sales'].sum()
best_city = city_sales.idxmax()
print("City that sold the most products:", best_city)

City that sold the most products: Asansole

# 6. What is the total sales revenue for each grain across all months?
total_sales_grain = data.groupby('GrainName')['Sales'].sum()
print("Total sales revenue for each grain:")
print(total_sales_grain)

Total sales revenue for each grain:
GrainName
Bajra      6000000
Brown rice 14000000
Corn      13500000
Oats       4000000
Ragi       5000000
Sattu      5000000
Sooji      9000000
Wheat     16000000
Name: Sales, dtype: int64

# 7. How does the sales revenue vary by state? Which state has the highest and lowest sales?
sales_by_state = data.groupby('State')['Sales'].sum()
highest_sales_state = sales_by_state.idxmax()
lowest_sales_state = sales_by_state.idxmin()

print("Sales revenue by state:")
print(sales_by_state)
print("State with the highest sales revenue:", highest_sales_state)
print("State with the lowest sales revenue:", lowest_sales_state)

Sales revenue by state:
State
Gujarat      5000000
Hariyana     4000000
Maharashtra  5000000
Panjab       6000000
Tamil Nadu   9000000
Telangana    14000000
UP           13500000
West Bengol  16000000
Name: Sales, dtype: int64
State with the highest sales revenue: West Bengol
State with the lowest sales revenue: Hariyana

# 8.What is the average sales revenue per month?
average_sales_month = data.groupby('Months')['Sales'].mean()
print("Average sales revenue per month:")
print(average_sales_month)

Average sales revenue per month:
Months
APRIL      2500000.0
AUG        4500000.0
FEB        1500000.0
```

```
JAN      1000000.0
JULY     4000000.0
JUNE      3500000.0
MARCH     2000000.0
MAY       3000000.0
Name: Sales, dtype: float64
```

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# 9.Is there any correlation between the sales revenue and the year? If so, how strong is the correlation?
correlation = data['Sales'].corr(data['Year'])
print("Correlation between sales revenue and year:", correlation)
```

```
Correlation between sales revenue and year: nan
```

```
#10.Can you identify any seasonal trends in the sales of grains?
seasonal_trends = data.groupby('Months')['Sales'].sum().sort_values(ascending=False)
print("Seasonal trends in sales of grains:")
print(seasonal_trends)
```

```
Seasonal trends in sales of grains:
Months
JULY      16000000
JUNE      14000000
AUG       13500000
MAY        9000000
FEB        6000000
APRIL      5000000
JAN        5000000
MARCH      4000000
Name: Sales, dtype: int64
```

```
#11.Which month had the highest and lowest sales revenue for each grain?
highest_month_grain = data.groupby(['GrainName'])['Sales'].idxmax()
lowest_month_grain = data.groupby(['GrainName'])['Sales'].idxmin()
```

```
highest_month_sales = data.loc[highest_month_grain, ['GrainName', 'Months', 'Sales']]
lowest_month_sales = data.loc[lowest_month_grain, ['GrainName', 'Months', 'Sales']]
```

```
print("Month with the highest sales revenue for each grain:")
print(highest_month_sales)
print("Month with the lowest sales revenue for each grain:")
print(lowest_month_sales)
```

```
Month with the highest sales revenue for each grain:
   GrainName  Months  Sales
1      Bajra    FEB   1500000
9  Brown rice   JUNE   3500000
11     Corn    AUG   4500000
6      Oats   MARCH   2000000
0       Ragi    JAN   1000000
7      Sattu  APRIL   2500000
8     Sooji    MAY   3000000
10     Wheat   JULY   4000000
Month with the lowest sales revenue for each grain:
   GrainName  Months  Sales
1      Bajra    FEB   1500000
9  Brown rice   JUNE   3500000
11     Corn    AUG   4500000
6      Oats   MARCH   2000000
0       Ragi    JAN   1000000
7      Sattu  APRIL   2500000
8     Sooji    MAY   3000000
10     Wheat   JULY   4000000
```

```
#12.What is the distribution of sales revenue among different cities?
sales_distribution_city = data.groupby('City')['Sales'].sum()
print("Distribution of sales revenue among different cities:")
print(sales_distribution_city)
```

```
Distribution of sales revenue among different cities:
City
Amritsar      6000000
Asansole     16000000
Gurugram      4000000
Hyderabad     14000000
Kanpur       13500000
Madurai       9000000
Nagpur        5000000
Surat         5000000
Name: Sales, dtype: int64
```

```
#13.Are there any outliers in the sales revenue? If so, which grains and months are affected?
Q1 = data['Sales'].quantile(0.25)
Q3 = data['Sales'].quantile(0.75)
IQR = Q3 - Q1
```

```
outliers = data[(data['Sales'] < Q1 - 1.5 * IQR) | (data['Sales'] > Q3 + 1.5 * IQR)]
print("Outliers in sales revenue:")
print(outliers)
```

```
Outliers in sales revenue:
Empty DataFrame
Columns: [GrainName, State, City, Months, Year, Sales]
Index: []
```

```
#14.Can you calculate the percentage contribution of each grain to the total sales revenue?
percentage_contribution = (data.groupby('GrainName')['Sales'].sum() / data['Sales'].sum()) * 100
print("Percentage contribution of each grain to total sales revenue:")
print(percentage_contribution)
```

```
Percentage contribution of each grain to total sales revenue:
GrainName
Bajra      8.275862
Brown rice 19.310345
Corn      18.620690
Oats       5.517241
```

```
Ragi          6.896552
Sattu         6.896552
Sooji         12.413793
Wheat         22.068966
Name: Sales, dtype: float64
```

#15.Is there any difference in sales revenue between different years?

```
yearly_sales_comparison = data.groupby('Year')['Sales'].sum()
print("Difference in sales revenue between different years:")
print(yearly_sales_comparison)
```

```
Difference in sales revenue between different years:
Year
2023    72500000
Name: Sales, dtype: int64
```

#16.What is the average sales revenue per grain across all cities?

```
average_sales_grain_city = data.groupby(['GrainName', 'City'])['Sales'].mean()
print("Average sales revenue per grain across all cities:")
print(average_sales_grain_city)
```

```
Average sales revenue per grain across all cities:
GrainName  City
Bajra      Amritsar    1500000.0
Brown rice Hyderabad    3500000.0
Corn       Kanpur      4500000.0
Oats       Gurugram    2000000.0
Ragi       Nagpur      1000000.0
Sattu      Surat      2500000.0
Sooji      Madurai     3000000.0
Wheat      Asansole     4000000.0
Name: Sales, dtype: float64
```

#17.Which month had the highest sales revenue for each city?

```
highest_month_city = data.groupby(['City'])['Sales'].idxmax()
highest_month_sales_city = data.loc[highest_month_city, ['City', 'Months', 'Sales']]
print("Month with the highest sales revenue for each city:")
print(highest_month_sales_city)
```

```
Month with the highest sales revenue for each city:
   City Months  Sales
1  Amritsar  FEB  1500000
10 Asansole  JULY  4000000
6  Gurugram  MARCH  2000000
9  Hyderabad  JUNE  3500000
11 Kanpur    AUG  4500000
8  Madurai   MAY  3000000
0  Nagpur    JAN  1000000
7  Surat     APRIL  2500000
```

#18.Are there any seasonal differences in sales revenue between different states?

```
seasonal_sales_state = data.groupby(['State', 'Months'])['Sales'].sum()
print("Seasonal differences in sales revenue between different states:")
print(seasonal_sales_state)
```

```
Seasonal differences in sales revenue between different states:
State  Months
Gujarat  APRIL    5000000
Hariyana  MARCH    4000000
Maharashtra  JAN    5000000
Panjab    FEB     6000000
Tamil Nadu  MAY     9000000
Telangana  JUNE    14000000
UP         AUG    13500000
West Bengal  JULY   16000000
Name: Sales, dtype: int64
```

#19.What is the total sales revenue for each year?

```
total_sales_year = data.groupby('Year')['Sales'].sum()
print("Total sales revenue for each year:")
print(total_sales_year)
```

```
Total sales revenue for each year:
Year
2023    72500000
Name: Sales, dtype: int64
```

#20.Which grain has the highest sales revenue in each state?

```
highest_sales_grain_state = data.groupby(['State', 'GrainName'])['Sales'].sum().reset_index()
idx = highest_sales_grain_state.groupby('State')['Sales'].transform(max) == highest_sales_grain_state['Sales']
highest_sales_grain_state = highest_sales_grain_state[idx]
print("Grain with the highest sales revenue in each state:")
print(highest_sales_grain_state)
```

```
Grain with the highest sales revenue in each state:
   State  GrainName  Sales
0  Gujarat      Sattu  5000000
1  Hariyana      Oats  4000000
2  Maharashtra    Ragi  5000000
3    Panjab     Bajra  6000000
4  Tamil Nadu   Sooji  9000000
5  Telangana Brown rice 14000000
6      UP        Corn 13500000
7 West Bengal   Wheat 16000000
```

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