# Assignment 12 Solution

Submitted by: Yameen Ali

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## Import Dependencies

In [2]:

```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from scipy import stats
```

## Read Data

In [3]:

```
data = pd.read_csv('students data.csv')
df = pd.DataFrame(data)
df.head()
```

Out[3]:

| | id | Name | date_of_birth | gender | entry_academic_period | Math | Reading | Writing |
|---|---|---|---|---|---|---|---|---|
| **0** | 111111 | John | 01/2000 | M | Fall 2008 | 80 | 75 | 82 |
| **1** | 111112 | Jane | 05/2001 | F | Fall 2006 | 65 | 56 | 78 |
| **2** | 111113 | Sarah | 21/2002 | M | Fall 2006 | 92 | 90 | 81 |
| **3** | 111114 | Frank | 13/2002 | M | Fall 2006 | 53 | 62 | 60 |
| **4** | 111115 | Mike | 31/2001 | F | Fall 2007 | 42 | 54 | 50 |

## Gender Disparity in Academic Performance

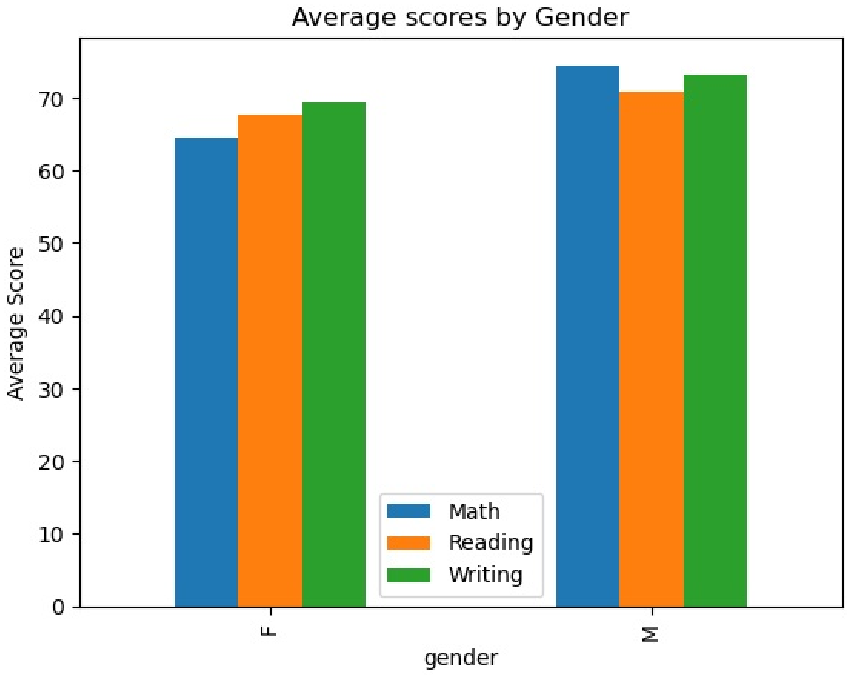
In [33]:

```
# Group by gender and calculate mean score
gender_means = data.groupby('gender')[['Math', 'Reading', 'Writing']].mean()
#print(gender_means)  # Display the results

# Perform t-tests for each subject
math_ttest = stats.ttest_ind(df[df['gender'] == 'M']['Math'], df[df['gender'] == 'F']['Math'])
reading_ttest = stats.ttest_ind(df[df['gender'] == 'M']['Reading'], df[df['gender'] == 'F']['Reading'])
writing_ttest = stats.ttest_ind(df[df['gender'] == 'M']['Writing'], df[df['gender'] == 'F']['Writing'])

print("Gender Performance:")
print(gender_means)
print("\nt-test results:")
print(f"Math: p-value = {math_ttest.pvalue:.4f}")
print(f"Reading: p-value = {reading_ttest.pvalue:.4f}")
print(f"Writing: p-value = {writing_ttest.pvalue:.4f}")
```

```
Gender Performance:
        Math  Reading  Writing
gender
F       64.4    67.60    69.40
M       74.5    70.75    73.25

t-test results:
Math: p-value = 0.5548
Reading: p-value = 0.7677
Writing: p-value = 0.6869
```

In [23]:

```
gender_means.plot(kind='bar')
plt.title('Average scores by Gender')
plt.ylabel('Average Score')
plt.show()
```

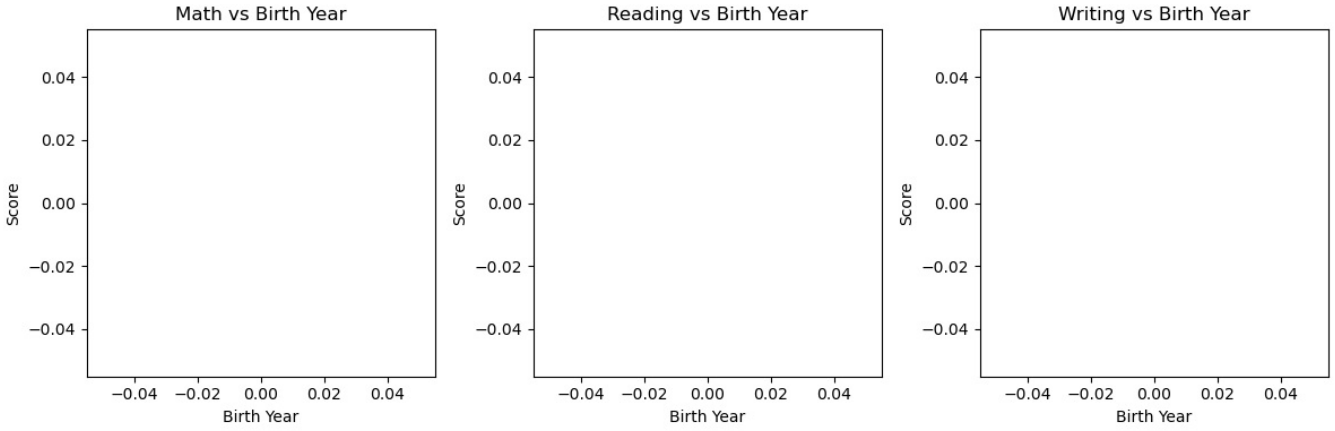


# Impact of Birth Year on Performance

In [20]:

```
# Calculate correlation between birth year and scores
correlations = df[['date_of_birth', 'Math', 'Reading', 'Writing']].corr()['date_of_birth'][1:]

print("Correlations with Birth Year:")
print(correlations)

# Scatter plot of birth year vs scores
plt.figure(figsize=(12, 4))
for i, subject in enumerate(['Math', 'Reading', 'Writing']):
    plt.subplot(1, 3, i+1)
    plt.scatter(df['date_of_birth'], df[subject])
    plt.title(f'{subject} vs Birth Year')
    plt.xlabel('Birth Year')
    plt.ylabel('Score')
plt.tight_layout()
plt.show()
```

```
Correlations with Birth Year:
Math      NaN
Reading   NaN
Writing   NaN
Name: date_of_birth, dtype: float64
```

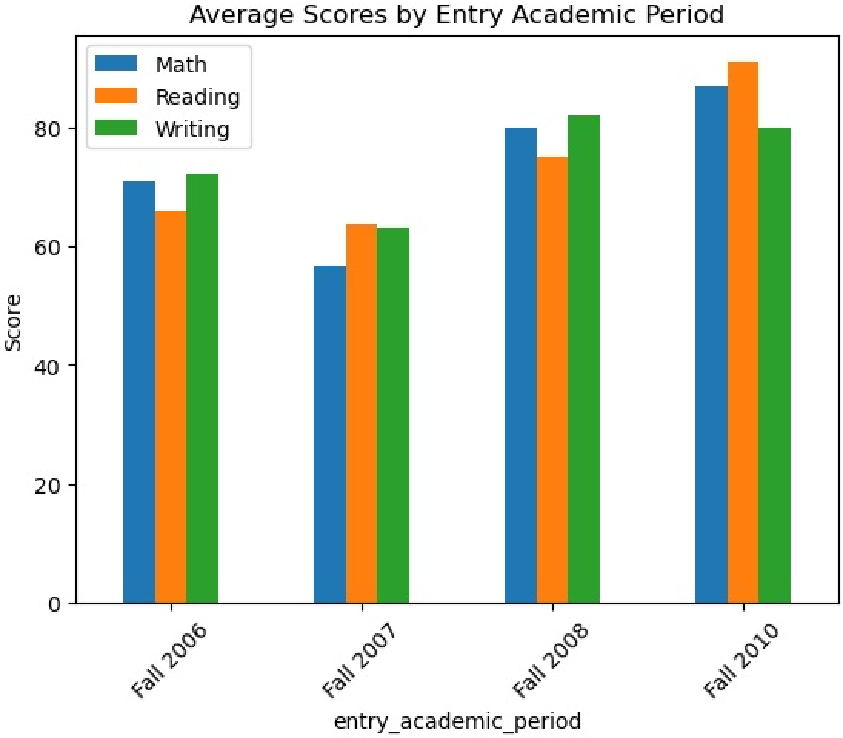


# Effect of Entry Academic Period on Performance

In [24]:

```
# Group by entry academic period and calculate mean scores
entry_performance = df.groupby('entry_academic_period')[['Math', 'Reading', 'Writing']].mean()

print("Performance by Entry Academic Period:")
print(entry_performance)

# Visualize entry period performance
entry_performance.plot(kind='bar')
plt.title('Average Scores by Entry Academic Period')
plt.ylabel('Score')
plt.xticks(rotation=45)
plt.show()
```

```
Performance by Entry Academic Period:
                            Math    Reading  Writing
entry_academic_period
Fall 2006              70.750000  66.000000    72.25
Fall 2007              56.666667  63.666667    63.00
Fall 2008              80.000000  75.000000    82.00
Fall 2010              87.000000  91.000000    80.00
```

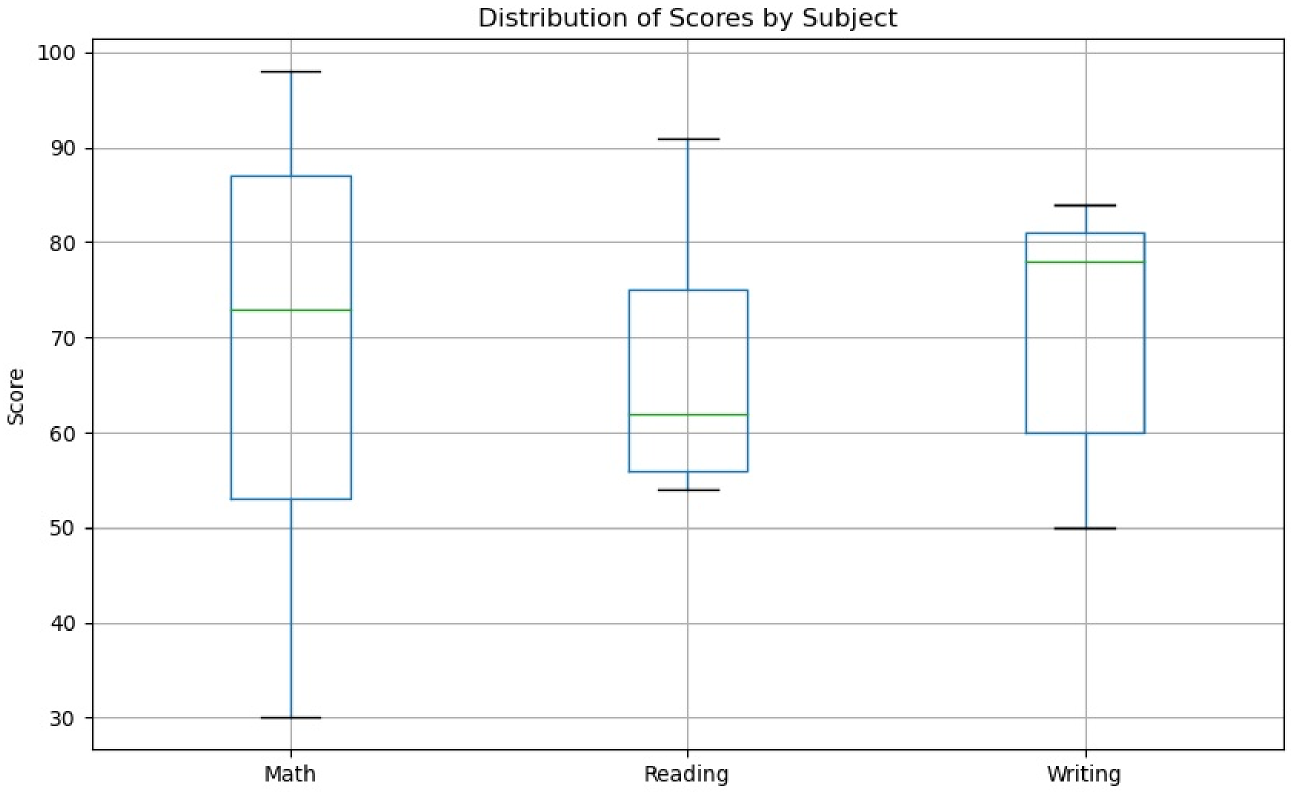


# Subject-specific Performance Analysis

In [29]:

```
# Calculate overall mean scores for each subject
subject_means = df[['Math', 'Reading', 'Writing']].mean()  # Calculate mean for Math, Reading, Writing columns

print("Overall Mean Scores:")
print(subject_means)  # Print the calculated means

# Boxplot of scores for each subject
plt.figure(figsize=(10, 6))  # Set figure size for boxplot
df[['Math', 'Reading', 'Writing']].boxplot()  # Create boxplot for Math, Reading, Writing columns
plt.title('Distribution of Scores by Subject')  # Set boxplot title
plt.ylabel('Score')  # Label the y-axis
plt.show()  # Display the boxplot
```

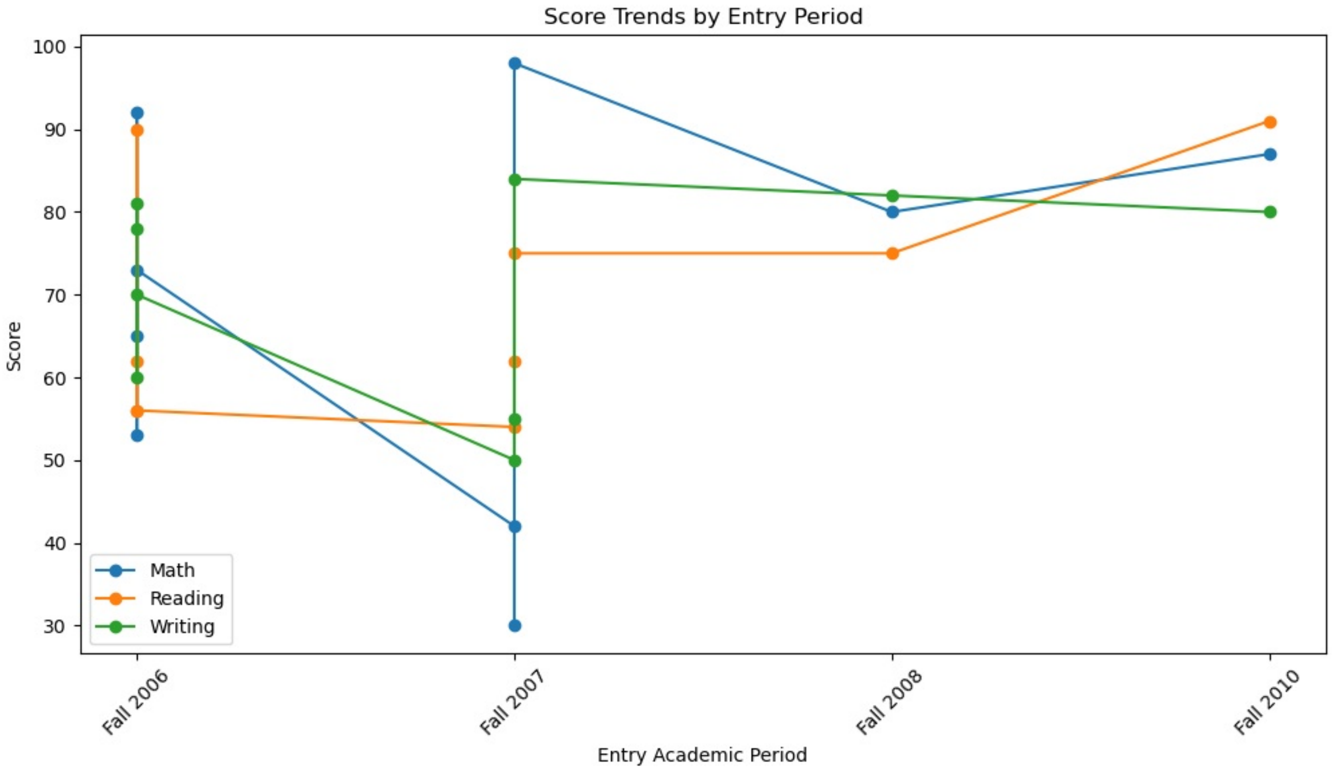
```
Overall Mean Scores:
Math       68.888889
Reading    69.000000
Writing    71.111111
dtype: float64
```



# Longitudinal Analysis of Performance

In [28]:

```python
# Sort by entry period (ascending)
df_sorted = df.sort_values('entry_academic_period')

# Line plot: scores vs. entry period (separate lines for subjects)
plt.figure(figsize=(12, 6))
for subject in ['Math', 'Reading', 'Writing']:
    plt.plot(df_sorted['entry_academic_period'], df_sorted[subject], marker='o', label=subject)
plt.title('Score Trends by Entry Period')  # Shorter title
plt.xlabel('Entry Academic Period')
plt.ylabel('Score')
plt.legend()
plt.xticks(rotation=45)  # Rotate x-axis labels if needed
plt.show()
```



In [ ]:

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