

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from scipy.stats import pearsonr, spearmanr
```

```
# Problem 1: Compute Variance
print("Problem 1: Compute Variance")
data = [10, 20, 30, 40, 50]
variance = np.var(data, ddof=1) # Sample variance
print(f"Variance: {variance:.2f}\n")
```

↔ Problem 1: Compute Variance
Variance: 250.00

```
# Problem 2: Compute Standard Deviation
print("Problem 2: Compute Standard Deviation")
std_dev = np.std(data, ddof=1)
print(f"Standard Deviation: {std_dev:.2f}\n")
```

↔ Problem 2: Compute Standard Deviation
Standard Deviation: 15.81

+ Code

+ Text

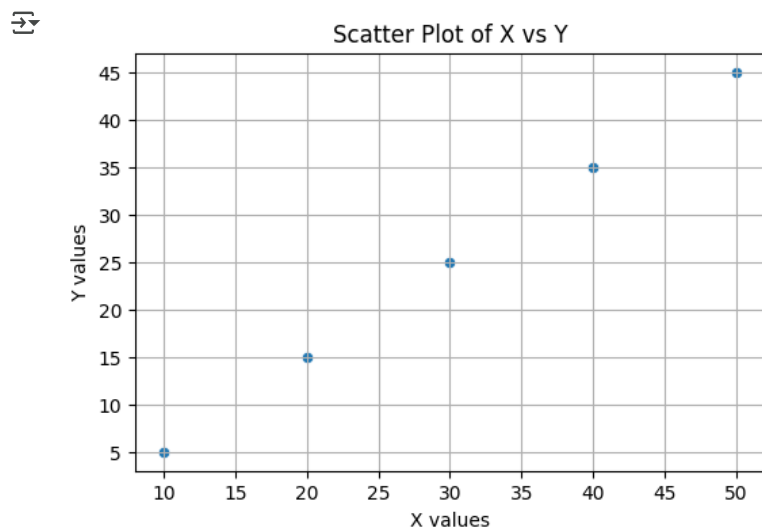
```
# Problem 3: Compute Pearson Correlation Coefficient
print("Problem 3: Pearson Correlation")
x = [10, 20, 30, 40, 50]
y = [5, 35, 65, 35, 95]
pearson_corr, _ = pearsonr(x, y)
print(f"Pearson Correlation: {pearson_corr:.2f}\n")
```

↔ Problem 3: Pearson Correlation
Pearson Correlation: 0.83

```
# Problem 4: Compute Spearman Correlation Coefficient
print("Problem 4: Spearman Correlation")
spearman_corr, _ = spearmanr(x, y)
print(f"Spearman Correlation: {spearman_corr:.2f}\n")
```

↔ Problem 4: Spearman Correlation
Spearman Correlation: 1.00

```
# Problem 5: Scatter Plot Visualization
df = pd.DataFrame({'X': x, 'Y': y})
plt.figure(figsize=(6, 4))
sns.scatterplot(data=df, x='X', y='Y')
plt.title("Scatter Plot of X vs Y")
plt.xlabel("X values")
plt.ylabel("Y values")
plt.grid()
plt.show()
```



```
# Problem 6: Correlation Heatmap
df['Z'] = [2, 18, 28, 38, 52]
plt.figure(figsize=(6, 4))
sns.heatmap(df.corr(), annot=True, cmap='coolwarm', fmt='.2f')
plt.title("Correlation Heatmap")
plt.show()
```

