```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt

from scipy.stats import ttest_1samp

sample_masses = np.array([8.8, 6.6, 9.5, 11.2, 10.2, 7.4, 8.0, 9.6,
9.9, 9.0,
                          7.6, 7.4, 10.4, 11.1, 8.5, 10.0, 11.6, 10.7,
10.3, 7.0])
population_mean = 10  # Population mean to compare against


# Perform one-sample t-test
t_stat, p_value = ttest_1samp(sample_masses, population_mean)

# Display results
print("One-Sample t-Test Results:")
print(f"t-statistic: {t_stat:.4f}")
print(f"p-value: {p_value:.4f}")
```

```
One-Sample t-Test Results:
t-statistic: -2.2492
p-value: 0.0366
```

```
# Decision based on significance level alpha = 0.05
alpha = 0.05
if p_value < alpha:
    print("Reject the null hypothesis: The average mass of all acorns
is different from 10 g.")
else:
    print("Fail to reject the null hypothesis: Not enough evidence to
conclude the average mass is different from 10 g.")
```

```
Reject the null hypothesis: The average mass of all acorns is
different from 10 g.
```

```
from scipy.stats import ttest_ind

sample_upwind = np.array([10.8, 10, 8.2, 9.9, 11.6, 10.1, 11.3, 10.3,
10.7, 9,
                          7, 8, 9, 6, 9, 7, 11.6, 10.3, 9, 12.3, 11,
10, 4, 10.4])
sample_downwind = np.array([7.8, 7.5, 9.5, 11.7, 8.1, 8.8, 8.8, 7.7,
9.7, 7.0,
                            9.0, 9.7, 11.3, 8.7, 8.8, 10.9, 10.3, 9.6,
8.4, 6.6,
                            7.2, 7.6, 11.5, 6.6, 8.6, 10.5, 8.4, 8.5,
10.2, 9.2])
```

```
# Perform independent two-sample t-test (equal variances assumed)
t_stat, p_value = ttest_ind(sample_upwind, sample_downwind,
equal_var=True)


# Display results
print("Independent Two-Sample t-Test Results:")
print(f"t-statistic: {t_stat:.4f}")
print(f"p-value: {p_value:.4f}")
```

```
Independent Two-Sample t-Test Results:
t-statistic: 1.0848
p-value: 0.2830
```

```
# Decision based on significance level alpha = 0.05
alpha = 0.05
if p_value < alpha:
    print("Reject the null hypothesis: The mass of acorns downwind is
significantly different from upwind.")
else:
    print("Fail to reject the null hypothesis: No significant
difference in mass between upwind and downwind acorns.")
```

```
Fail to reject the null hypothesis: No significant difference in mass
between upwind and downwind acorns.
```

```
from scipy.stats import f_oneway

# Data
section_A = np.array([51, 45, 33, 45, 67])
section_B = np.array([23, 43, 23, 43, 45])
section_C = np.array([56, 76, 74, 87, 56])


# Perform one-way ANOVA
f_stat, p_value = f_oneway(section_A, section_B, section_C)


# Display results
print("One-Way ANOVA Test Results:")
print(f"F-statistic: {f_stat:.4f}")
print(f"p-value: {p_value:.4f}")
```

```
One-Way ANOVA Test Results:
F-statistic: 9.7472
p-value: 0.0031
```

```
# Decision based on significance level alpha = 0.05
alpha = 0.05
if p_value < alpha:
```

```
    print("Reject the null hypothesis: There is a significant
difference in mean marks between the sections.")
else:
    print("Fail to reject the null hypothesis: No significant
difference in mean marks between the sections.")
```

```
Reject the null hypothesis: There is a significant difference in mean
marks between the sections.
```