

Basic Statistics 2

Soln a:

```
import numpy as np
from scipy.stats import t

# Sample data
data = np.array([1.13, 1.55, 1.43, 0.92, 1.25, 1.36, 1.32, 0.85, 1.07,
1.48, 1.20, 1.33, 1.18, 1.22, 1.29])
sample_mean = np.mean(data)
sample_std = np.std(data, ddof=1) # ddof=1 for sample standard deviation
n = len(data)
alpha = 0.01 # 99% confidence level
t_critical = t.ppf(1 - alpha/2, df=n-1) # two-tailed t-score

# Calculate standard error
standard_error = sample_std / np.sqrt(n)

# Calculate margin of error
margin_of_error = t_critical * standard_error

# Calculate confidence interval
confidence_interval = (sample_mean - margin_of_error, sample_mean + margin_of_error)

# Print results
print("Sample Mean:", sample_mean)
print("Sample Standard Deviation:", sample_std)
print("Standard Error:", standard_error)
print("Critical Value (t-score):", t_critical)
print("Margin of Error:", margin_of_error)
print("99% Confidence Interval:", confidence_interval)

Sample Mean: 1.2386666666666666
Sample Standard Deviation: 0.19316412956959936
Standard Error: 0.04987476379384733
Critical Value (t-score): 2.97684273411266
Margin of Error: 0.1484693282152996
99% Confidence Interval: (1.090197338451367, 1.3871359948819662)
```

Soln b:

```
from scipy.stats import norm

# Sample data
data = np.array([1.13, 1.55, 1.43, 0.92, 1.25, 1.36, 1.32, 0.85, 1.07,
```

```

1.48, 1.20, 1.33, 1.18, 1.22, 1.29])
sample_mean = np.mean(data)
n = len(data)
alpha = 0.01 # 99% confidence level
z_critical = norm.ppf(1 - alpha/2) # two-tailed z-score

# Known population standard deviation
population_std = 0.2

# Calculate margin of error
margin_of_error = z_critical * (population_std / np.sqrt(n))

# Calculate confidence interval
confidence_interval = (sample_mean - margin_of_error, sample_mean +
margin_of_error)

# Print results
print("Sample Mean:", sample_mean)
print("Population Standard Deviation:", population_std)
print("Margin of Error:", margin_of_error)
print("99% Confidence Interval:", confidence_interval)

Sample Mean: 1.2386666666666666
Population Standard Deviation: 0.2
Margin of Error: 0.13301525327090588
99% Confidence Interval: (1.1056514133957607, 1.3716819199375725)

```