# untitled2

November 21, 2024

[1]:
```
from scipy.stats import norm
import math

# Given values
mean = 60
std_dev = 6
sample_size = 40
sample_mean = 58

# Standard error
std_error = std_dev / math.sqrt(sample_size)

# Z-score
z = (sample_mean - mean) / std_error

# Probability
probability = norm.cdf(z)
print(f"Probability that the mean lifetime is less than 58 months: {probability:
  ↪.4f}")
```

```
Probability that the mean lifetime is less than 58 months: 0.0175
```

[2]:
```
# Given values
sample_mean = 310
std_dev = 89
sample_size = 40
z_value = 1.96  # for 95% confidence

# Standard error
std_error = std_dev / math.sqrt(sample_size)

# Confidence interval
margin_of_error = z_value * std_error
lower_limit = sample_mean - margin_of_error
upper_limit = sample_mean + margin_of_error

print(f"95% Confidence Interval: ({lower_limit:.2f}, {upper_limit:.2f})")
```

```
95% Confidence Interval: (282.42, 337.58)
```

Q3: Hypotheses for Waiting Time

To test if the mean waiting time has changed, the null and alternative hypotheses are:

**Null hypothesis** ( 0 ): =4.5 (mean waiting time is still 4.5 minutes)

**Alternative hypothesis**( ): 4.5 (mean waiting time has changed) This is a two-tailed test.

[3]:
```
# Given values
z_stat = 2.00

# Calculate p-value for a two-tailed test
p_value = 2 * (1 - norm.cdf(z_stat))
print(f"Two-tailed p-value: {p_value:.4f}")
```

```
Two-tailed p-value: 0.0455
```

[4]:
```
# Given values
sample_mean = 30000
pop_mean = 29000
std_dev = 8000
sample_size = 400
alpha = 0.05

# Standard error
std_error = std_dev / math.sqrt(sample_size)

# Test statistic
z = (sample_mean - pop_mean) / std_error

# Critical z-value for one-tailed test
z_critical = norm.ppf(1 - alpha)

# Decision
if z > z_critical:
    print(f"Reject the null hypothesis (z = {z:.2f}). The mean income is␣
 ↪significantly greater than 29000.")
else:
    print(f"Fail to reject the null hypothesis (z = {z:.2f}). The mean income␣
 ↪is not significantly greater than 29000.")
```

```
Reject the null hypothesis (z = 2.50). The mean income is significantly greater
than 29000.
```