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STAT401
Project 1

Question 1:

A)

```
mean = 37;
sigma = 5;
n = 15;
ME = 1.645*sigma/sqrt(n);
CI = {mean-ME,mean+ME}

Output:

CI =

   34.8763    39.1237
```

Ans: 90% confidence interval for μ = {34.8763 , 39.1237}

B)

```
mean = 37;
sigma = 5;
n = 15;
ME = 1.96*sigma/sqrt(n);
CI = [mean-ME,mean+ME]

Output:
CI =

   34.4697    39.5303
```

Ans: 95% confidence interval for μ = {34.4697, 39.5303}

C)

```
mean = 37;
sigma = 5;
n = 15;
ME = 2.576*sigma/sqrt(n);
CI = [mean-ME,mean+ME]

Output:
CI =

   33.6744    40.3256
```

Ans: 95% confidence interval for μ = {33.6744, 40.3256}

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D)

As you increase the level of confidence of the interval, the lower bound of the interval decreases, while the upper bound increases in value. In general, the bounds distance from the mean increases.

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Question 2:

A)

```
mean = 270;
sigma = 40;
n = 25;
ME = 1.96*sigma/sqrt(n);
CI = [mean-ME,mean+ME]
```

Output:

```
CI =

  254.3200  285.6800
```

Ans: 95% confidence interval for μ = {254.32, 285.68}

B)

```
mean = 270;
sigma = 40;
n = 50;
ME = 1.96*sigma/sqrt(n);
CI = [mean-ME,mean+ME]
```

Output:

```
CI =

  258.9126  281.0874
```

Ans: 95% confidence interval for μ = {258.9126, 281.0874}

C)

```
mean = 270;
sigma = 40;
n = 100;
ME = 1.96*sigma/sqrt(n);
CI = [mean-ME,mean+ME]
```

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Output:

```
CI =

  262.1600  277.8400
```

Ans: 95% confidence interval for μ = {262.16, 277.84}

D)

As the sample size increases with a constant confidence level, the confidence interval bounds become tighter in respect to the mean. The lower bound increases while the upper bound decreases, since the margin of error decreases.

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Question 3:

A)

```
mean = 850;
sigma = 50;
n = 100;
ME = 1.96*sigma/sqrt(n);
CI = [mean-ME,mean+ME]
```

Output:

```
CI =

  840.2000  859.8000
```

Ans: 95% confidence interval for μ = {840.2, 859.8}

B)

```
mean = 850;
sigma = 100;
n = 100;
ME = 1.96*sigma/sqrt(n);
CI = [mean-ME,mean+ME]
```

Output:

```
CI =

  830.4000  869.6000
```

Ans: 95% confidence interval for μ = {830.4, 869.6}

C)

```
mean = 850;
```

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```
sigma = 200;
n = 100;
ME = 1.96*sigma/sqrt(n);
CI = [mean-ME,mean+ME]
```

Output:

```
CI =

  810.8000  889.2000
```

Ans: 95% confidence interval for μ = {810.8, 889.2}

D)

As the population standard deviation increases with a constant confidence level, the confidence interval bounds spread further away with respect to the mean. The lower bound decreases while the upper bound increases, since the margin of error increases.

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Question 4:

A)

```
mean = 270;
s = 20;
n = 10;
ME = 2.262*s/sqrt(n);
CI = [mean-ME,mean+ME]
```

Output:

```
CI =

  255.6939  284.3061
```

Ans: 95% confidence interval for μ = {255.6939, 284.3061}

B)

```
mean = 270;
s = 20;
n = 10;
ME = 2.093*s/sqrt(n);
CI = [mean-ME,mean+ME]
```

Output:

```
CI =

  256.7627  283.2373
```

Ans: 95% confidence interval for μ = {256.7627, 283.2373}

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C)

```
mean = 270;
s = 20;
n = 10;
ME = 2.022*s/sqrt(n);
CI = [mean-ME,mean+ME]
```

Output:

```
CI =

  257.2117  282.7883
```

Ans: 95% confidence interval for μ = {257.2117, 282.7883}

D)

As the sample size increases, the bounds on the confidence interval get closer to the sample mean. The upper bound decreases while the lower bound increases.

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Question 5:

A)

```
mean = 850;
s = 15;
n = 25;
ME = 2.064*s/sqrt(n);
CI = [mean-ME,mean+ME]
```

Output:

```
CI =

  843.8080  856.1920
```

Ans: 95% confidence interval for μ = {843.8080, 856.1920}

B)

```
mean = 850;
s = 30;
n = 25;
ME = 2.064*s/sqrt(n);
CI = [mean-ME,mean+ME]
```

Output:

```
CI =

  837.6160  862.3840
```

Ans: 95% confidence interval for μ = {837.6160, 862.3840}

C)

```
mean = 850;
s = 60;
n = 25;
ME = 2.064*s/sqrt(n);
CI = [mean-ME,mean+ME]
```

Output:

```
CI =

  825.2320  874.7680
```

Ans: 95% confidence interval for μ = {825.2320, 874.7680}

D)

As s increases with a constant confidence level, the confidence interval bounds spread further away with respect to the mean. The lower bound decreases while the upper bound increases, since the margin of error increases.

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Question 6:

```
data = [21,20,22,24,22,9,17,22,21,16,17,21,23,22,20,21]
m = mean(data)
s = std(data)
n = 16
ME = 1.753*s/sqrt(n);
CI = [m-ME,m+ME]
```

Output:

```
CI =

   18.2757    21.4743
```

Ans: 90% confidence interval for μ = {18.2767, 21.4743}