

# HW 11.5

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```
library(readxl)
```

- Increasing C increases the margin of error E.
- Increasing  $\sigma$  increases the margin of error E.
- Increasing n decreases the margin of error E.

## Problem 1

```
1.645 * (72.50/sqrt(55))
```

```
[1] 16.08135
```

## Problem 2

```
1.645 * (72.50/sqrt(85))
```

```
[1] 12.93583
```

The one with sample size  $n = 85$  is lower because the population size( $n$ ) and Margin of Error( $E$ ) are inversely proportional

### Problem 3

```
1.960 * (1.04/sqrt(282))
```

```
[1] 0.121385
```

### Problem 4

```
1.960 * (1.92/sqrt(282))
```

```
[1] 0.2240953
```

E is higher because  $\sigma$  and E are directly proportional

### Problem 5

```
mileage <- read_excel("mileage.xlsx")  
mean(mileage$mpg)
```

```
[1] 21.71111
```

```
1.960 * (3.5/sqrt(45))
```

```
[1] 1.022628
```

### Problem 6

```
2.576 * (3.5/sqrt(45))
```

```
[1] 1.344026
```

E is higher because C and E are directly proportional

## Problem 7

```
((1.960 * 25)/15)^2
```

```
[1] 10.67111
```

$n = 11$

## Problem 8

```
((1.960 * 25)/5)^2
```

```
[1] 96.04
```

$n = 97$

## Problem 9

Sample size always increases with larger  $z$ . If  $z$  increases, the required sample size increases in both problems to maintain the same confidence and margin of error.

## Problem 10

SIMILARITIES:

- Both are symmetric (bell-shaped curves)
- As the degrees of freedom increase (or as the sample size  $n$  grows large), the t-distribution approaches the standard normal distribution (z-distribution).
- Both are used for calculating confidence intervals.

DIFFERENCES:

- The t-distribution is more spread out than the standard normal.

- The shape of the t-distribution changes with degrees of freedom, while the standard normal is fixed.
- Use the (z-distribution) when  $\sigma$  is known and  $n$  is large while.
- Use the t-distribution when  $\sigma$  is unknown or when  $n$  is small.