Quiz Tomorrow

Standard Deviation (552 & 553)

Review (1 of 3)

The length of sardines caught in the ocean is normally distributed with a mean of 13 cm and a standard deviation of 2.15 cm. What percent of sardines …

Round your answer to five significant figures and include a zero at the beginning.

1. Are longer than 12 cm? 67.908%

2. Are shorter than 14.5 cm. 75.731%

3. Are between 10.5 and 11.25 cm long. 8.5378%

Review (2 of 3)

The length of sardines caught in the ocean is normally distributed with a mean of 13 cm and a standard deviation of 2.15 cm. You catch 25,500 sardines. How many would you expect to be …

Round your answer to the nearest sardine.

1. Longer than 13.25 cm? 11,570 sardines

2. Between 14.5 and 15.5 cm? 3,066 sardines

Review (3 of 4)

The length of sardines caught in the ocean is normally distributed with a mean of 13 cm and a standard deviation of 2.15 cm.

Round your answer to four significant figures.

1. 25% of all sardines are longer than what length?

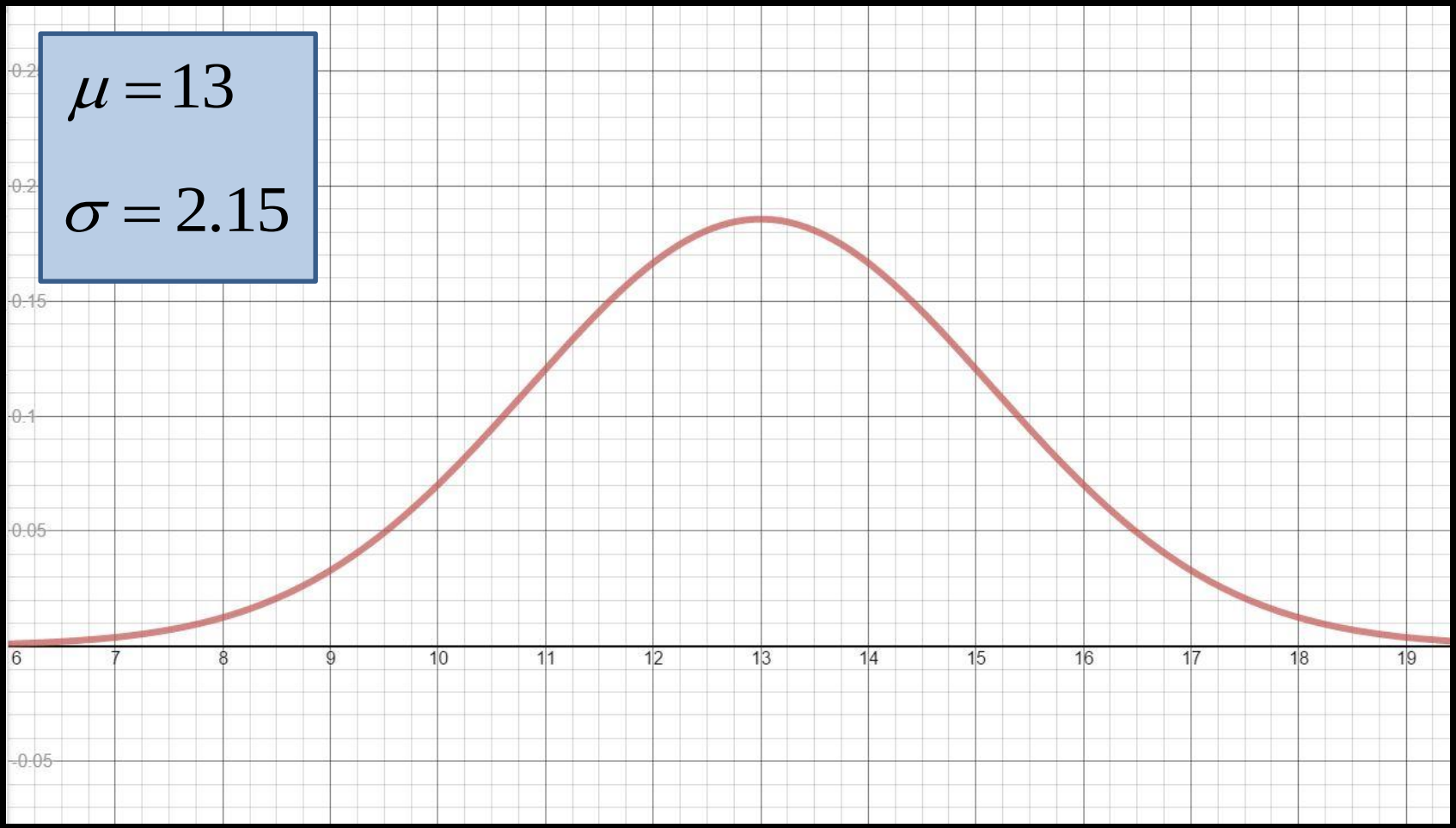
   14.45 cm

2. 15% of all sardines are shorter than what length?

   10.77 cm

3. Centered at the mean, 90% of all sardines are between what two lengths?

90%, Centered At The Mean



Review (3 of 4)

The length of sardines caught in the ocean is normally distributed with a mean of 13 cm and a standard deviation of 2.15 cm.

Round your answer to four significant figures.

1. 25% of all sardines are longer than what length?

   14.45 cm

2. 15% of all sardines are shorter than what length?

   10.77 cm

3. Centered at the mean, 90% of all sardines are between what two lengths?

   9.464 & 16.54 cm

Review (4 of 4)

The length of sardines caught in the ocean is normally distributed with a mean of 13 cm and a standard deviation of 2.15 cm.

Round your answer to four significant figures.

1. Centered at the mean, 95% of all sardines are between what two lengths?

   8.786 & 17.21 cm

2. Centered at the mean, 99% of all sardines are between what two lengths?

   7.462 & 18.54 cm

Lesson 16

Confidence Intervals (Part 1 of 3): Population Proportion

Word to the Wise:

Even if you normally don't, you'll want to take notes in these next few lectures.

Two Types of Data Sets

Population Data

The collection of all outcomes, responses, or counts that are of interest.

Population = big and hard to measure

Sample Data

A subset (or part) of a population.

Sample = used to describe population

When Discussing …

Population Data

A parameter is a numerical description of a *population* characteristic.

Parameter describes **P**opulation

Sample Data

A statistic is a numerical description of a *sample* characteristic.

Statistic describes **S**ample

Example

The average GPA of all 1,235 students at Salem High School during the 2012-2013 school year was 2.85.*

Parameter or Statistic

A survey of 100 random students at lunch found that 60 of them think Chicken Nugget Day is the best lunch day.

Parameter or Statistic

*Source: Just made it up. Could be true though!

Review

- A parameter is a numerical description of a **population** characteristic.

- A statistic is a numerical description of a **sample** characteristic.

Two Branches of Statistics

Involves the organization, summarization, and display of data.

Descriptive **Inferential**

Statistics

Involves using a sample to draw conclusions about a population.

Example

Descriptive Statistics

Involves the organization, summarization, and display of data.

Inferential Statistics

Involves using a sample to draw conclusions about a population.

A survey of 100 random students at lunch found that 60 of them think Chicken Nugget Day is the best lunch day.*

"60% of students in the sample thought CND was the best lunch day."

Descriptive Statistics

Chicken Nuggets should be served twice a week.

Inferential Statistics

* Totally made up as well.

Our Interest

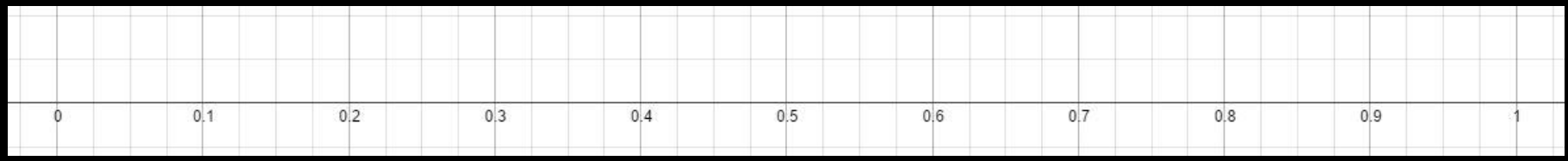
- We are always interested in the parameter of a population, and we estimate that with a statistic from a sample .

Three Parameters We Will Study

- Population Proportion
- Large Sample ($n \geq 30$) Mean
- Small Sample ($n < 30$) Mean

Parameter 1: Population Proportion

The proportion (or percent) of a given variable in a population.



Construct a 95% confidence interval for the proportion of all IBMS students that are currently taking Anatomy.

TASK

Step 1: Find a Point Estimate

- Get a random sample.
- Find the sample proportion. “p-hat” is the proportion of success.

$$\hat{p} = \frac{x}{n} \qquad \hat{q} = 1 - \hat{p}$$

- x is the # of successes, n is the sample size.
- “q-hat” is the proportion of failures.

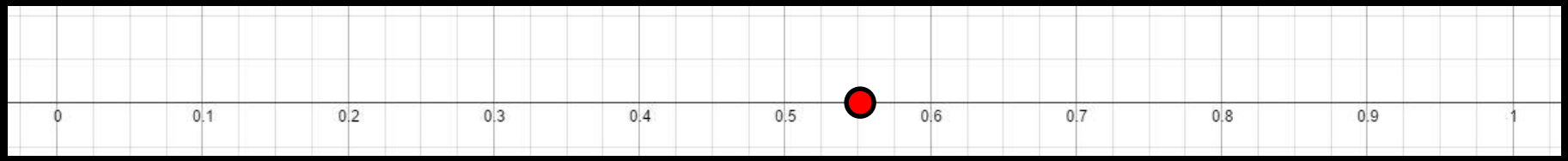
$n = 30$

$x = 17$

$$\hat{p} = \frac{x}{n} \qquad \hat{p} = \frac{17}{30} = 0.5667$$

$$\hat{q} = 1 - \hat{p} \qquad \hat{q} = 1 - 0.5667 = 0.4333$$

- Sample Statistic = 0.5667



Construct a 95% confidence interval for the proportion of all IBMS students that are currently taking Anatomy.

TASK

Step 2: Find the Margin of Error (E)

- Formula for E:

$$E = Z_c \sqrt{\frac{\hat{p}\hat{q}}{n}}$$

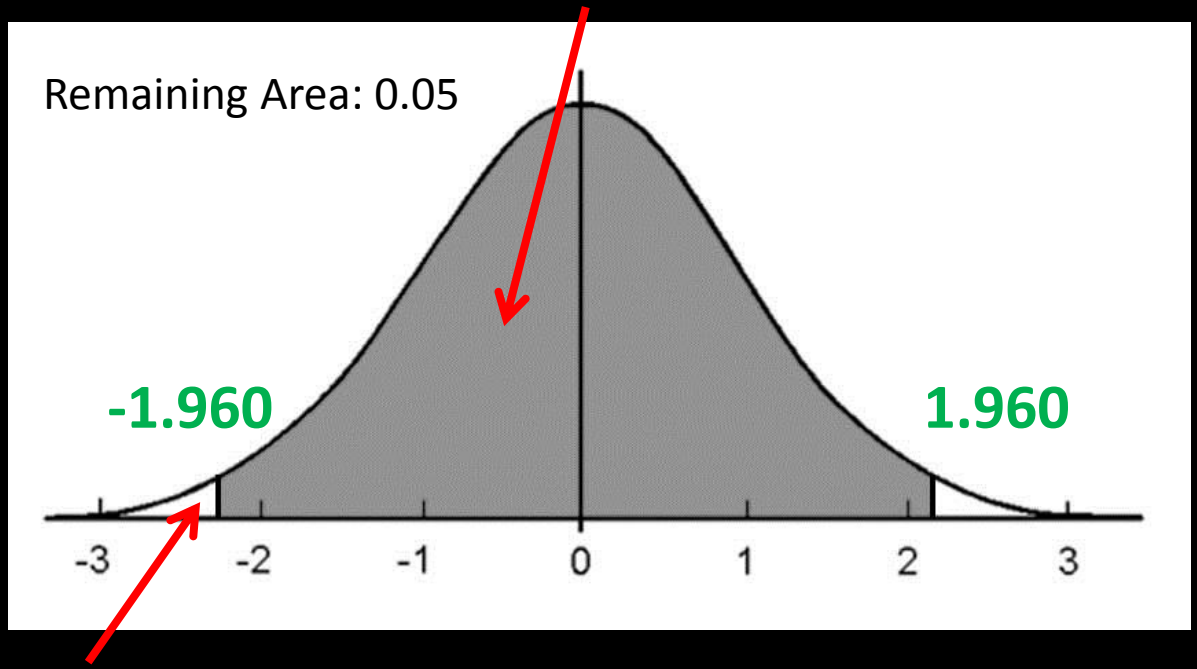
- Z_c is the critical value for the corresponding "c" level of confidence.

- We want 95% confidence so we'll need to find Z_{95}.

Finding the Critical Value Z_{95}

Round to four sig figs

We want this area to be 0.95.



This means that each tail has 0.05/2 = 0.025.

$$Z_c = 1.960$$

Step 2: Find the Margin of Error (E)

- Formula for E:

$$E = Z_c \sqrt{\frac{\hat{p}\hat{q}}{n}}$$

$$E = 1.96 \sqrt{\frac{(0.5667)(0.4333)}{30}}$$

$$E = 0.1773$$

$$n = 30$$

$$\hat{p} = 0.5667$$

$$\hat{q} = 0.4333$$

$$Z_c = 1.960$$

Step 3: Set up the Confidence Interval

- Looks like this:

$$\hat{p} - E < p < \hat{p} + E$$

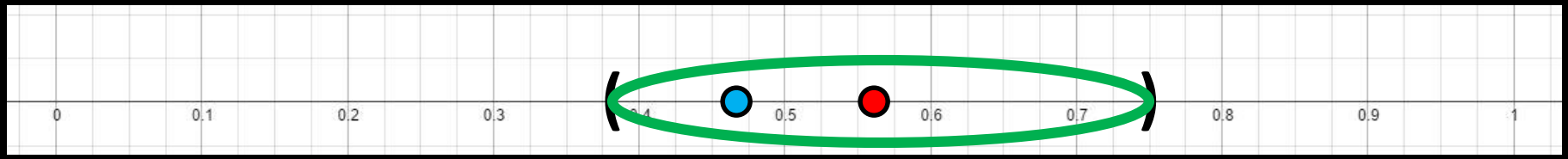
- Our confidence interval is essentially our sample proportion plus/minus the Margin of Error (E).

$$\hat{p} - E < p < \hat{p} + E$$

$$0.5667 - 0.1773 < p < 0.5667 + 0.1773$$

$$0.3894 < p < 0.7440$$

- Sample Statistic = 0.5667
- Population Parameter = 0.4714

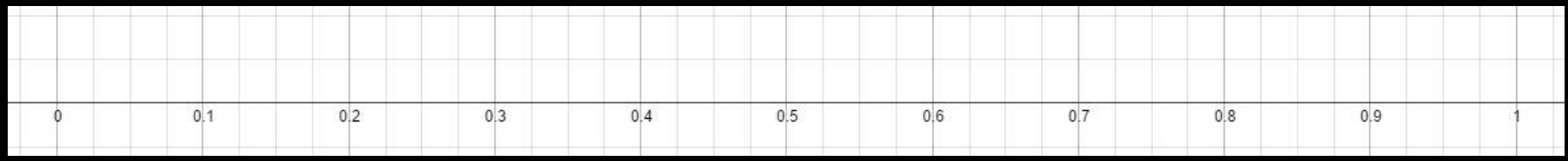


Construct a 95% confidence interval for the proportion of all IBMS students that are currently taking Anatomy.

TASK

WE GOT IT!!!

#MURICA



Construct an 80% confidence interval for the proportion of all IBMS students that are currently taking Anatomy.

TASK

Step 1: Find a Point Estimate

- Get a random sample.
- Find the sample proportion. “p-hat” is the proportion of success.

$$\hat{p} = \frac{x}{n} \qquad \hat{q} = 1 - \hat{p}$$

- x is the # of successes, n is the sample size.
- “q-hat” is the proportion of failures.

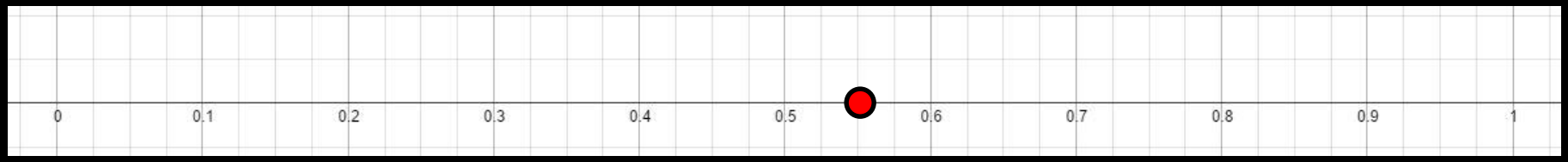
$n = 30$

$x = 17$

$$\hat{p} = \frac{x}{n} \qquad \hat{p} = \frac{17}{30} = 0.5667$$

$$\hat{q} = 1 - \hat{p} \qquad \hat{q} = 1 - 0.5667 = 0.4333$$

- Sample Statistic = 0.5667



Construct a 95% confidence interval for the proportion of all IBMS students that are currently taking Anatomy.

TASK

Step 3: Find the Margin of Error (E)

- Formula for E:

$$E = Z_c \sqrt{\frac{\hat{p}\hat{q}}{n}}$$

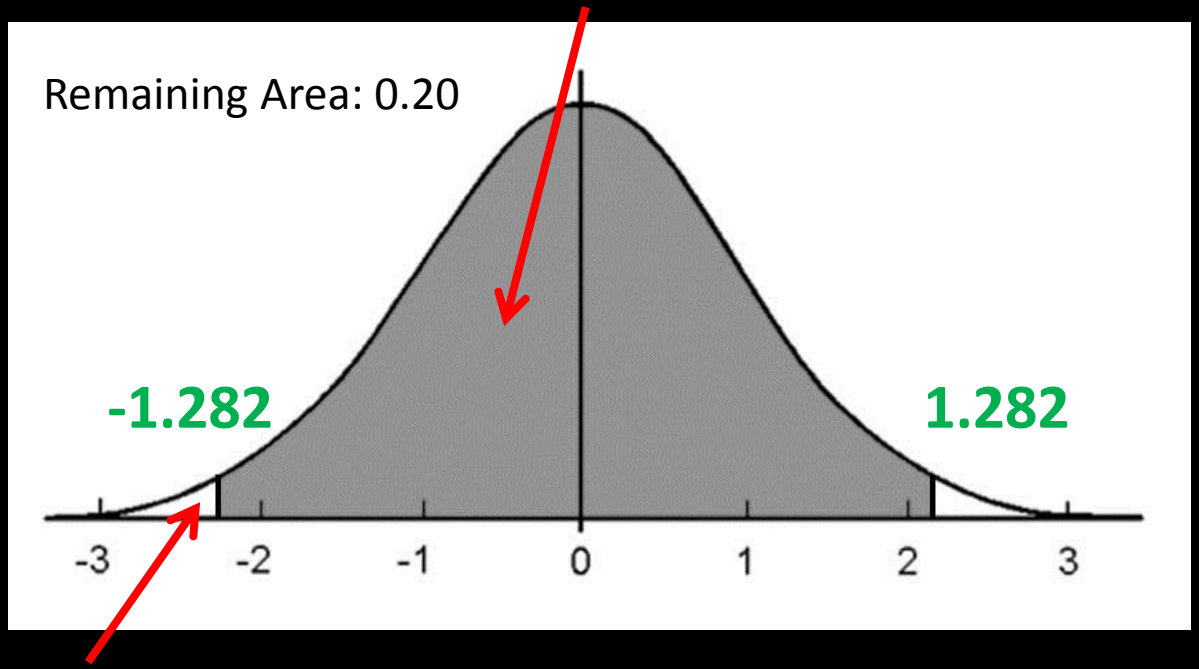
- Z_c is the critical value for the corresponding "c" level of confidence.

- We want 80% confidence so we'll need to find Z_{80}.

Finding the Critical Value Z_{80}

Round to four sig figs

We want this area to be 0.80.



This means that each tail has
0.2/2 = 0.1.

$$Z_{80} = 1.282$$

Step 3: Find the Margin of Error (E)

- Formula for E:

$$E = Z_c \sqrt{\frac{\hat{p}\hat{q}}{n}}$$

$$E = 1.282 \sqrt{\frac{(0.5667)(0.4333)}{30}}$$

$$E = 0.1160$$

$$n = 30$$

$$\hat{p} = 0.5667$$

$$\hat{q} = 0.4333$$

$$Z_c = 1.282$$

Step 4: Set up the Confidence Interval

- Looks like this:

$$\hat{p} - E < p < \hat{p} + E$$

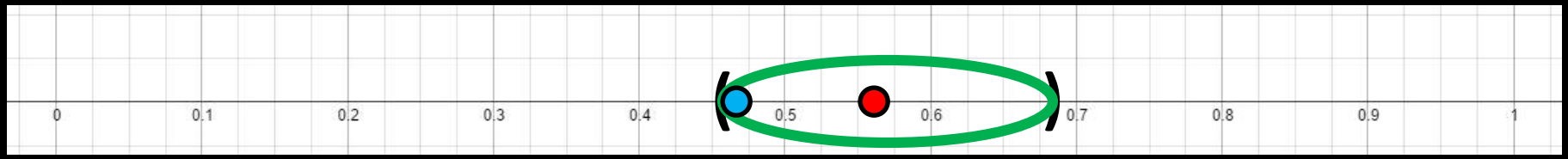
- Our confidence interval is essentially our sample proportion plus/minus the Margin of Error (E).

$$\hat{p} - E < p < \hat{p} + E$$

$$0.5667 - 0.1160 < p < 0.5667 + 0.1160$$

$$0.4507 < p < 0.6827$$

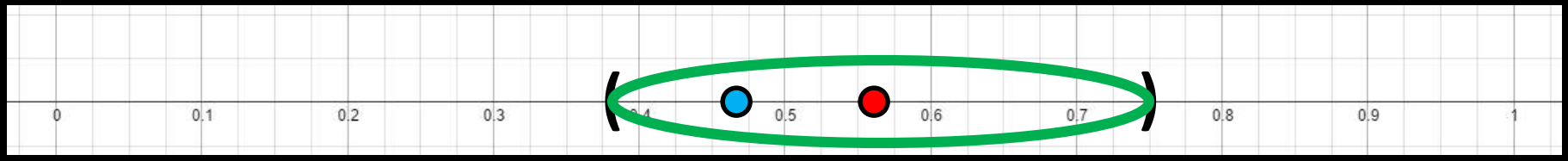
- Sample Statistic = 0.5667
- Population Parameter = 0.4714



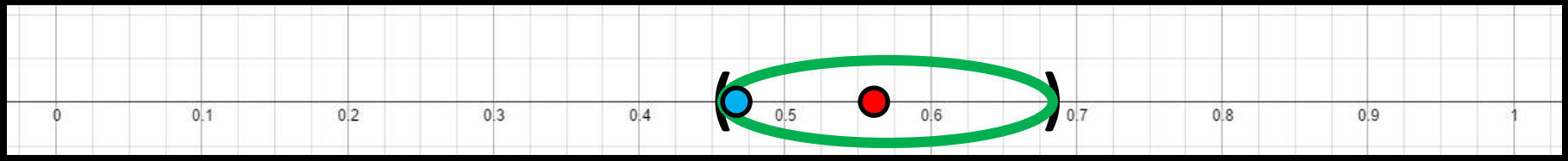
Construct a 80% confidence interval for the proportion of all IBMS students that are currently taking Anatomy.

TASK

- Sample Statistic = 0.5667
- Population Parameter = 0.4714



95% Confidence Interval



80% Confidence Interval

COMPARE

Key Takeaway: The higher the confidence, the wider the interval.


J