

1. As individuals or a team of 2, you will construct a confidence interval for the mean class height based on a sample of size 4.

(a) Draw 4 slips of paper and write down the values here:

Answer:

This will differ depending on what numbers you drew. Numbers below are just an example.

- Number 1:

Answer:

72

- Number 2:

Answer:

75

- Number 3:

Answer:

67

- Number 4:

Answer:

56

(b) Calculate their sample mean:

Answer:

67.5

(c) Write down the population standard deviation:

Answer:

As reported in class, the population standard deviation is 4.3.

(d) Calculate a 95% confidence interval based on the Empirical Rule:

Answer:

$$67.5 \pm 2 \cdot 4.3 / \sqrt{4} = (63.2, 71.8)$$

2. For the following sample sizes and confidence levels, calculate the expected number of confidence intervals that will include the population mean and the expected number that will not.

(a) 99% CI with sample size of 1000

- i. Expected number that will include population mean

Answer:

Let Y be the number that will include the population mean. Then $Y \sim \text{Bin}(1000, 0.99)$ and $E[Y] = 1000 \cdot 0.99 = 990$

- ii. Expected number that will **not** include population mean

Answer:

The number that will not include the population mean is $1000 - Y$ and $E[1000 - Y] = 1000 - 990 = 10$.

(b) 68% CI with sample size of 10

- i. Expected number that will include population mean

Answer:

Let Y be the number that will include the population mean. Then $Y \sim \text{Bin}(10, 0.68)$ and $E[Y] = 10 \cdot 0.68 = 6.8$

- ii. Expected number that will **not** include population mean

Answer:

The number that will not include the population mean is $10 - Y$ and $E[10 - Y] = 10 - 6.8 = 3.2$.

(c) 85% CI with sample size of 32

- i. Expected number that will include population mean

Answer:

Let Y be the number that will include the population mean. Then $Y \sim \text{Bin}(32, 0.85)$ and $E[Y] = 32 \cdot 0.85 = 27.2$

- ii. Expected number that will **not** include population mean

Answer:

The number that will not include the population mean is $32 - Y$ and $E[32 - Y] = 32 - 27.2 = 4.8$.