

1. Suppose that, at a certain community college, the population distribution of the ages of the students x is approximately normal with a mean of 33 years and a standard deviation of 5 years.

$$\mu = 33 \quad \sigma = 5$$

- a. What is the mean of the sampling distribution of sample means \bar{x} when the samples are of size $n = 100$? Use the correct notation (the appropriate letter) and include units in your answer.

$$\mu_{\bar{x}} = 33 \text{ years}$$

- b. What is the standard deviation of the sampling distribution of sample means when the samples are of size 100? Use the correct notation (the appropriate letter) and include units in your answer.

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{5}{\sqrt{100}} = 0.5 \text{ years}$$

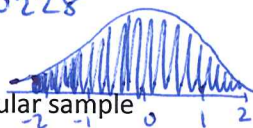
- c. Suppose that you take a SRS of 100 students. What is the probability that the sample mean of this particular sample is between 32 and 34? Shade a region under a labeled normal curve to represent your answer.

$$z = \frac{32 - 33}{0.5} = -2$$

$$z = \frac{34 - 33}{0.5} = 2$$

Between: Large - Small
.9772 - .0228

$$= .9544$$



- d. Suppose that you take a SRS of 100 students. What is the probability the sample mean of this particular sample is greater than 34.5 years? Shade a region under a labeled normal curve to represent your answer.

$$z = \frac{34.5 - 33}{.5} = 3$$

Greater: $1 - .9987$

$$= .0013$$



- e. Suppose that you take a SRS of 100 students. Approximately what is the probability that the sample mean of this particular sample is greater than 38?

$$z = \frac{38 - 33}{.5} = 10$$

Greater: $1 - 1 = 0$

Off the chart z-score

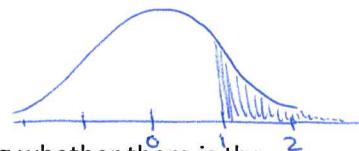


- f. Pick one individual student at random. Find the probability that this one particular student is older than 38. Shade a region under a labeled normal curve to represent your answer.

$$z = \frac{38 - 33}{5} = 1$$

Greater/older: $1 - .8413$

$$= .1587$$



- g. Are your answers in part (e) and part (f) the same? Explain why or why not by describing whether there is the same variability, more variability, or less variability in the distribution of sample means compared to the distribution of the original population of students.

Not even close. The Central Limit Theorem says that sample means have less variation than individuals.

- h. Find $P(32.5 < \bar{x} < 34)$ and $P(32.5 < x < 34)$. Which is higher and why?

$$z = \frac{32.5 - 33}{.5} = -1$$

$$.1587$$

$$z = \frac{32.5 - 33}{5} = -0.1$$

$$.4602$$

Much higher because most sample means are close to 33. Less variability

$$z = \frac{34 - 33}{.5} = 2$$

$$.9772$$

$$\text{VS. } z = \frac{34 - 33}{5} = 0.2$$

$$.5793$$

$$.9772 - .1587 = .8185$$

$$.5793 - .4602 = .1191$$