

Mth 142: Group Activity - Sampling Distribution; Intro to Chapter 8

- Work together in groups of 3 or 4 to complete the first two pages.

Your Name: _____
Names in your group: _____

PART 1:

1. Let X be a random variable representing the height (in inches) of a randomly selected student at College of Lake County. Assume heights are **normally distributed** with a **mean of 67 inches** and a **standard deviation of 3 inches**.
2. Using the normal distribution from question 1 (normalcdf in your calculator):
 - a) Find the probability that a randomly selected student has a height greater than 71 inches.

$$P(X > 71) = 0.091$$

9.1%

normalized $(71, 1599, 67, 3)$

- b) Find the probability that a randomly selected student has a height between 65 and 71 inches.

$P(64 < X < 71) = .75$

normalcdf (65, 71, 67, 3)

- c) Use invNorm function to find what height corresponds to the top 10%? _____

$$\text{invNorm}(0.9, 67, 3)$$

Part 2:

1. Collect the heights of 9 students in our classroom and compute the mean (average) of that sample. Place the heights and mean in the first row of the table below.
2. For the rest of the samples, we will use your calculator's random normal generator (randNorm with $\mu = 67$ and $\sigma = 3$), to generate 9 random heights.

Go to **Math, Prob** and choose **randNorm**(mean, standard deviation, number of trials (aka n=9 in our case)).

randNorm

μ :

σ :

trials:

Paste

We will store the randomly generated heights in List 1 so we can find the mean each time.

randNorm(67,3,9)→L1

{68.55816469 69.03030547 ...}

Calculate the average of these 9 heights (1VarStats on List 1). Do this 9 times. Round each mean to two decimal places.

Calculator instructions: Use randNorm(67,3,9) to generate 9 random heights from this distribution

1st Sample mean: __, __, __, __, __, __, __, __, __ $\bar{x}_1 =$ _____

2nd Sample mean: $\bar{x}_2 =$ _____

3rd Sample mean: $\bar{x}_3 =$ _____

4th Sample mean: $\bar{x}_4 =$ _____

5th Sample mean: $\bar{x}_5 =$ _____

6th Sample mean: $\bar{x}_6 =$ _____

7th Sample mean: $\bar{x}_7 =$ _____

8th Sample mean: $\bar{x}_8 =$ _____

9th Sample mean: $\bar{x}_9 =$ _____

10th Sample mean: $\bar{x}_{10} =$ _____

3. Type all of the sample means you calculated in the Excel file at front.

The rest of the worksheet we will do together.

4. Once we have all the sample means we will find the mean and standard deviation of these sample means.

Mean of the sample means, is denoted $\mu_{\bar{x}}$:

$$66.9 \approx 67$$

$\downarrow$ $\downarrow$
 $\mu_{\bar{x}}$ μ

$$\mu_{\bar{x}} = \mu$$

Standard deviation of the sample means, is denoted $\sigma_{\bar{x}}$:

$$\sigma_{\bar{x}} = 1.2$$

$$1.2 \sim 1$$

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$$

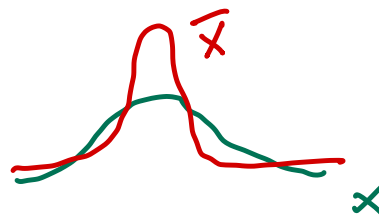
$$\frac{3}{\sqrt{9}} = 1$$

How does your actual $\sigma_{\bar{x}}$ compare to the σ ? _____

$\sigma_{\bar{x}}$ is almost 3 times smaller!

5. Lets draw the distribution of the sample means, which is called a **sampling distribution**.

see picture



Does this distribution appear to be approximately normal?

yes

$$X \sim N(\mu, \sigma)$$

6. For your sample means:

We say that $\bar{X} \sim N(\mu_{\bar{x}}, \sigma_{\bar{x}})$

$$\mu_{\bar{x}} = \mu$$

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{3}{\sqrt{9}} = 1$$

(a) What percent of your sample means fell above 71 inches?

$$P(\bar{x} > 71) = \text{normalcdf}(71, 1E99, 67, 1) = .00003$$

(What is the probability that a randomly selected sample of 9 students has an average height greater than 71).

(b) What percent of your sample means fell between 65 and 71 inches?

$$P(65 < \bar{x} < 71) = \text{normalcdf}(65, 71, 67, 1) = .977$$

(c) How do these answers compare to your answers from Part 1 question 2, a) b).

$$P(X > 71) = .091$$

$$P(\bar{x} > 71) = .00003$$

$$P(65 < X < 71) = .75$$

$$P(65 < \bar{x} < 71) = .977$$