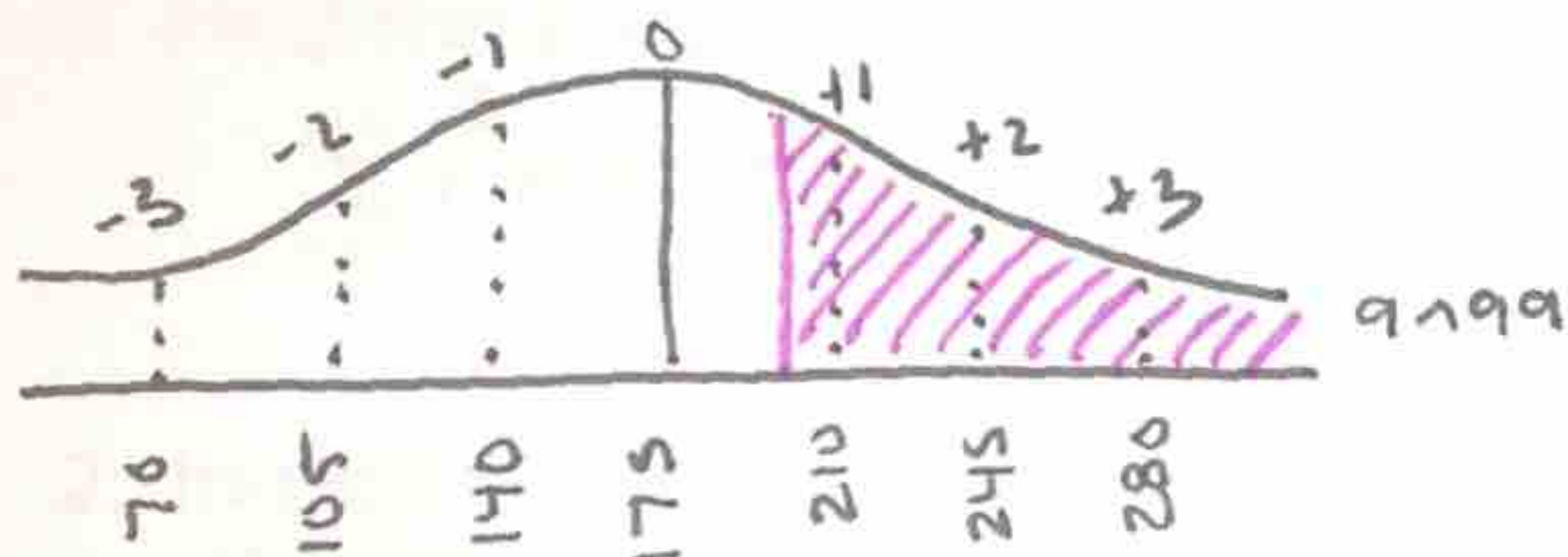# STATION #1:
Normal Distribution

1.

The mean cholesterol level in children is 175 mg/dl with standard deviation 35 mg/dl. Assume this level varies from child to child according to an approximate normal distribution. What percentage of children have a cholesterol level above 200 mg/dl?
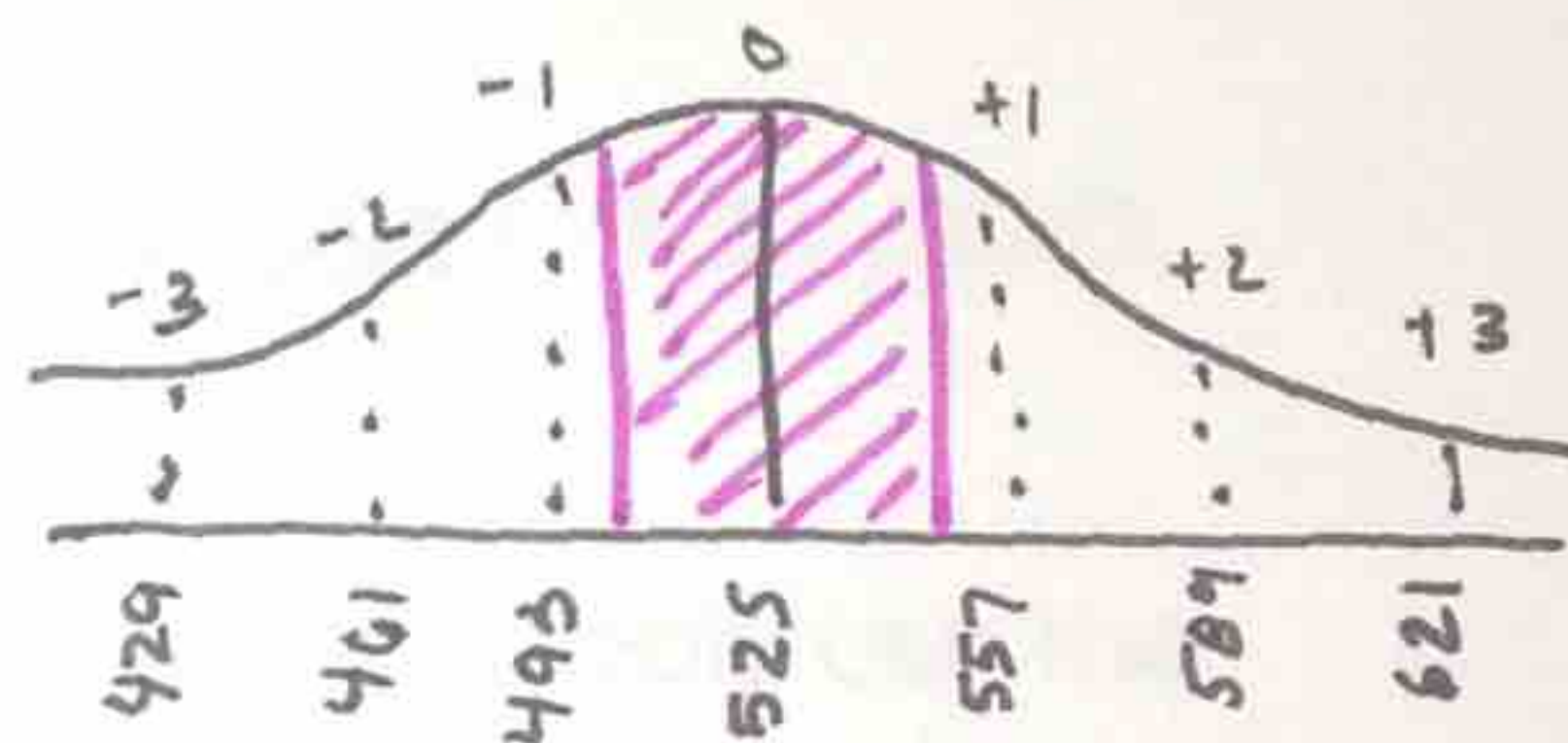

Normal cdf (200, 9∧99, 175, 35)

23.75%

2.

The length of the elephant pregnancies from conception to birth varies according to a distribution that is approximately normal with mean 525 days and standard deviation 32 days. What percent of pregnancies last between 510 and 540 days (that's between 17 and 18 months)?
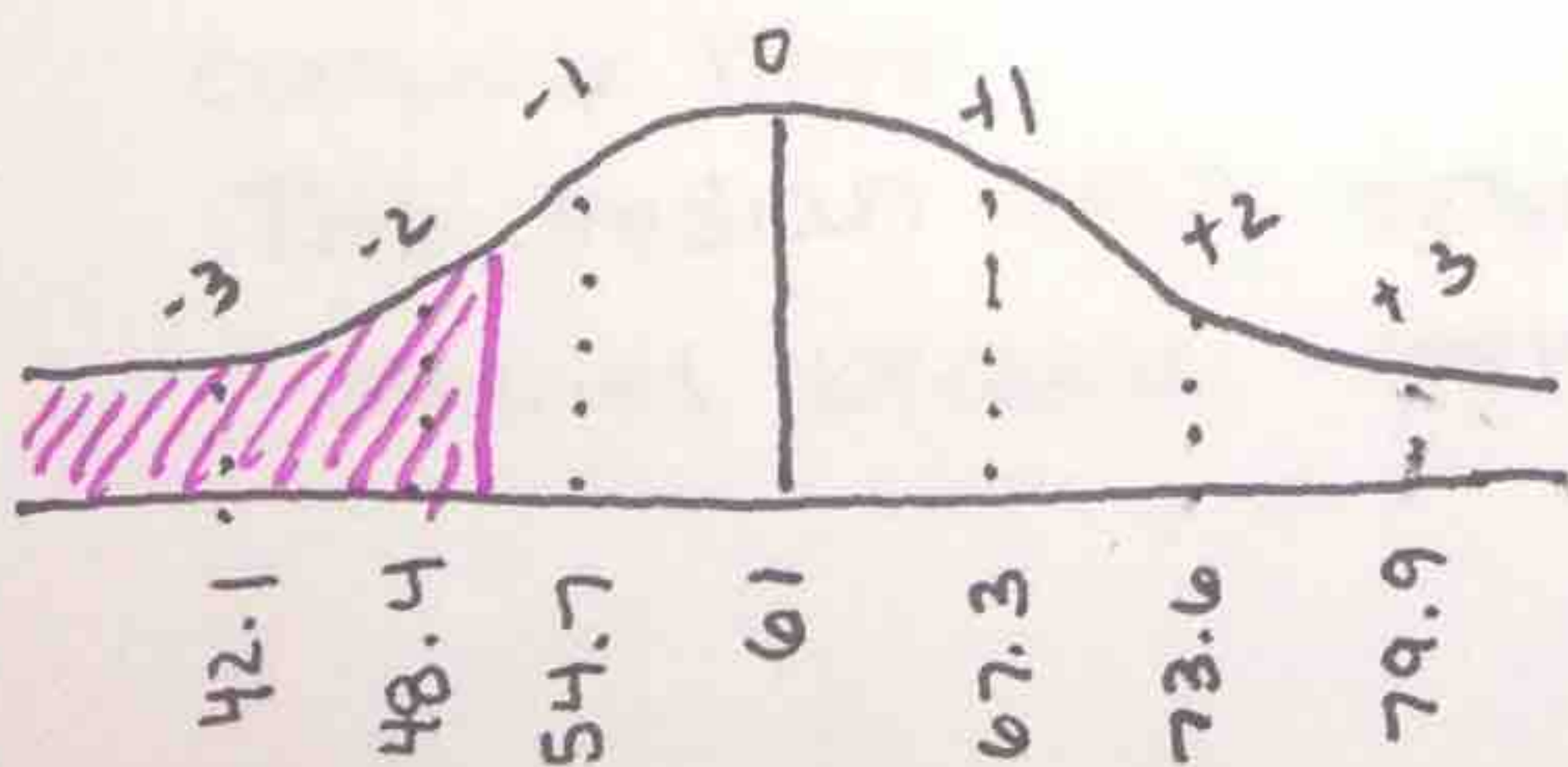

Normal cdf (510, 540) 525, 32)

36.08%

3.

A manufacturer of bulbs for movie projectors advertises a life of 50 hours. A study of these bulbs indicates that their lives are normally distributed with a mean of 61 hours and a standard deviation of 6.3 hours. What is the percentage of bulbs that fail to last as long as the manufacturer claims?
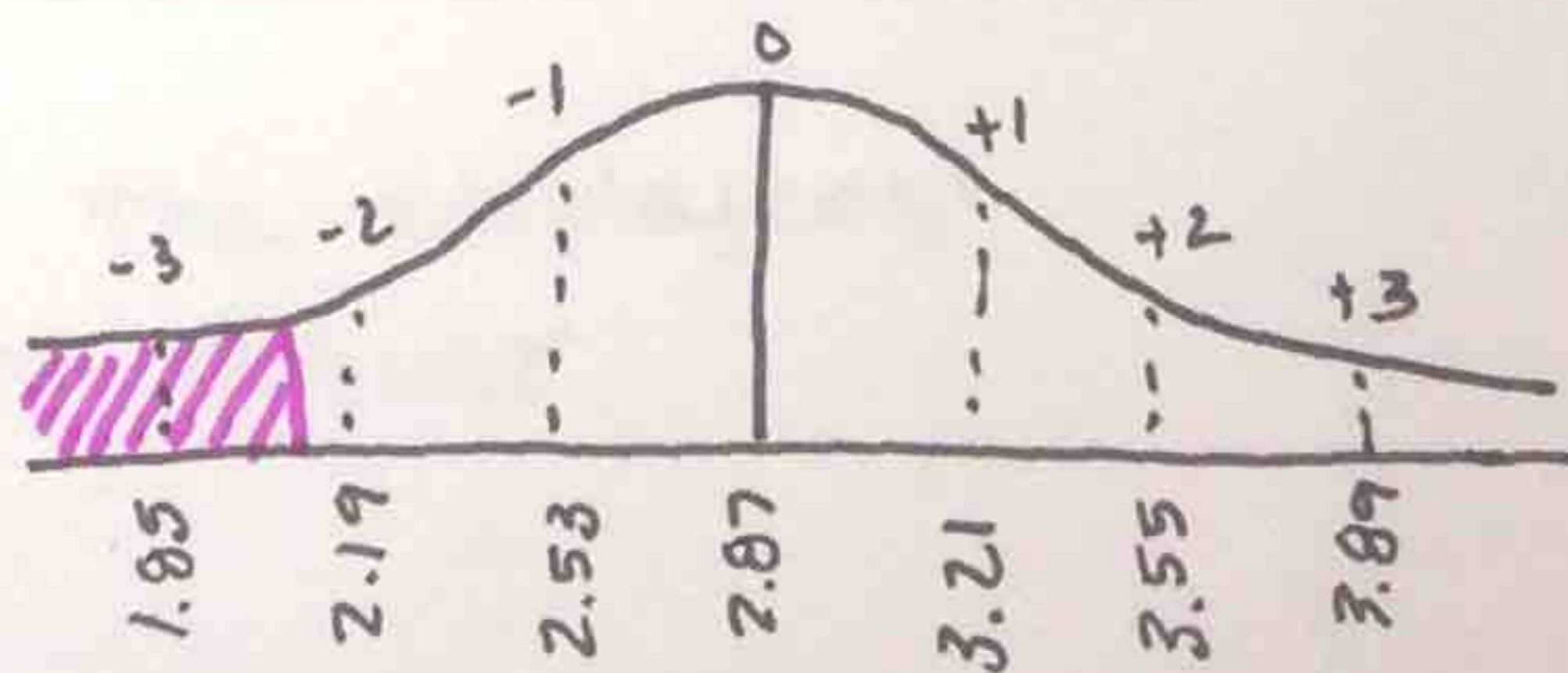

Normal cdf (-9∧99, 50, 61, 6.3)

4.04%

4.

GPAs of freshman biology majors at a certain university have approximately the normal distribution with the mean 2.87 and the standard deviation is 0.34. Students are thrown out of school if their GPA falls below 2.00. What proportion of all freshman biology majors are thrown out?

Normal cdf (-9∧99, 2, 2.87, 0.34)

0.53%

STATION #2:
Measures of Central Tendency

Annual Income	Number of Employees
$105,000	1
60,000	3
30,000	1
28,000	5
21,000	10

1. Find the mean, median, mode, and range.

$\overline{X}$: $33,250   Med: $24,500   Mode: $21,000

Range: $84,000

2. In negotiations, the owner of the company will probably use the ___mean___ to describe the company. Why?

    It is a more attractive number when trying to recruit employees.

3. The union leader (person negotiating for the workers) will probably use the ___Mode___ to describe the company. Why?

    They want to increase salaries for all employees, but especially the workers who make the least.

4. A statistician would probably use the ___Median___ to describe the company. Why?

    The median best describes the employees' salaries because there is an outlier.

STATION #3:
Interpreting Data

1. 2000 sophomores at UNC Charlotte took a physics test. The scores were distributed normally with a mean of 78 and standard deviation of 5. Label the following curve and answer corresponding questions.

2.35%.   13.5%.   34%.   34%.   13.5%.   2.35%.

63   68   73   78   83   88   93
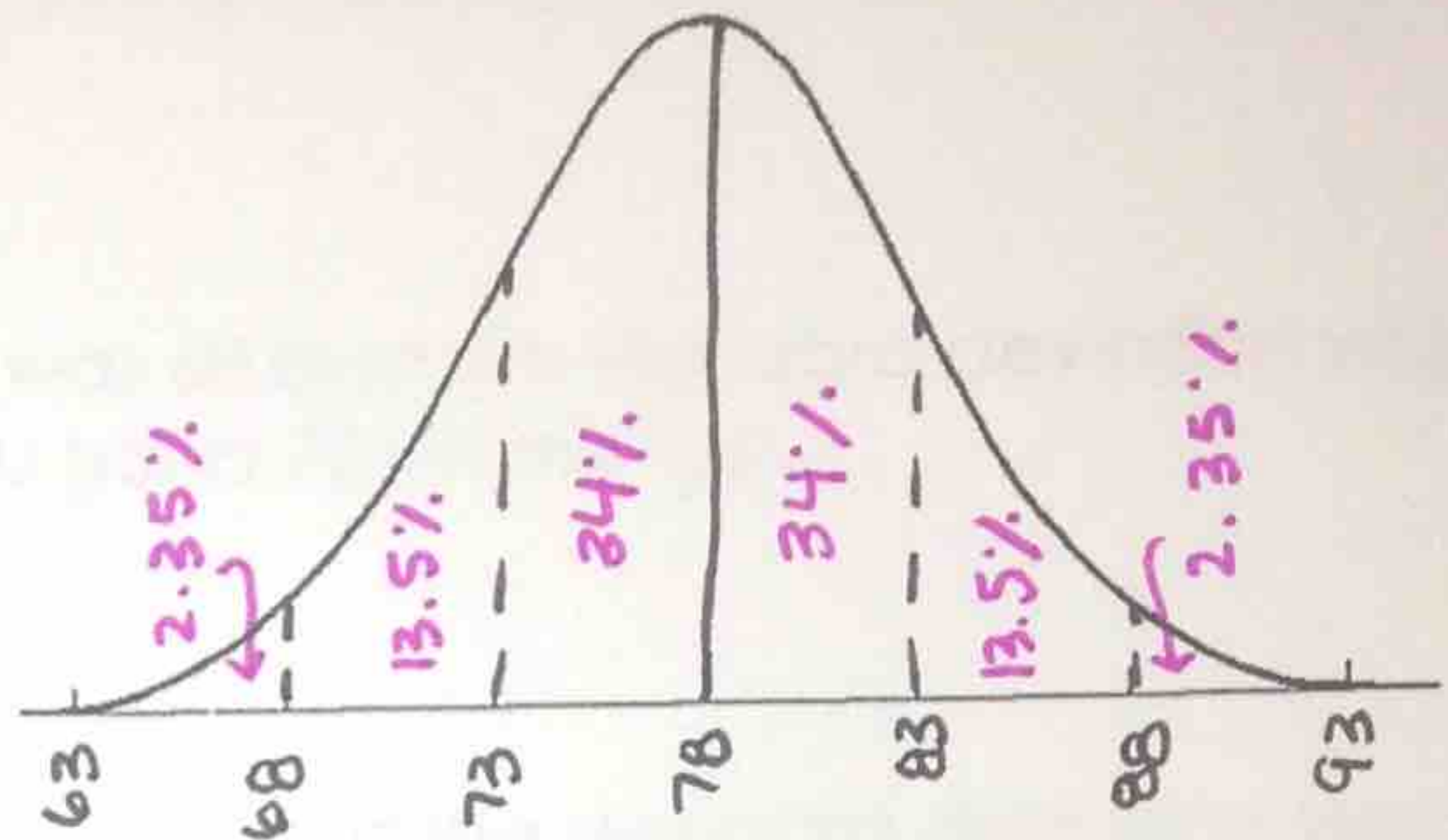
a) What percentage of scores are between 73 and 83?   __68%.__

b) What percentage of scores are less than 68?   __2.5%.__
     $50 - 34 - 13.5 = 2.5$

c) What percentage of scores are between 70 and 77?   __36.6%.__
     Normal cdf $(70, 77, 78, 5)$

d) What percentage of scores are greater than 82?   __21.2%.__
     Normal cdf $(82, 9 \wedge 99, 78, 5)$

e) Approximately how many physics students scored between 78 and 84?

   Normal cdf $(78, 84, 78, 5) = 38.5\%.$

                 $2000 (0.385) = 770$ __38.5%.__
                                           770 students

f) Approximately how many physics students scored less than 67?

   Normal cdf $(-9 \wedge 99, 67, 78, 5) = 1.4\%.$ __28 students__

     $2000 (0.014) = 28$

STATION #4:
Z-Scores

1. On a Statistics test, the class mean was 63 and the standard deviation was 7. Calculate the z-score if you got a 72 on the test.

$$z = \frac{72-63}{7} = \boxed{1.29}$$

2. For the Biology test, the mean was 68 and the standard deviation was 10. Calculate the z-score if you got a 72 on the test.

$$z = \frac{72-68}{10} = \boxed{0.4}$$

3. For the English test, the mean was 76 and the standard deviation was 8.5. Calculate the z-score if you got a 72 on the test.

$$z = \frac{72-76}{8.5} = \boxed{-0.47}$$

4. Compare the results between the 3 tests in Question 1.

   The mean on the stats test was the lowest, but relatively speaking you did the best compared to the other 2.

5. Describe in words what a z-score actually means.

   It is the number of standard deviations away from the mean in a specific direction.

6. The scores on a recent test are normally distributed. John's test score of 65 was 1 standard deviation below the mean. Kristin's test score of 89 was 2 standard deviations above the mean. What are the mean and standard deviation for the test score distribution?

$$-1 = \frac{65-\bar{x}}{\sigma_x} \qquad \sigma_x = \frac{65-\bar{x}}{-1}$$

$$2 = \frac{89-\bar{x}}{\sigma_y} \qquad \sigma_x = \frac{89-\bar{x}}{2}$$

same
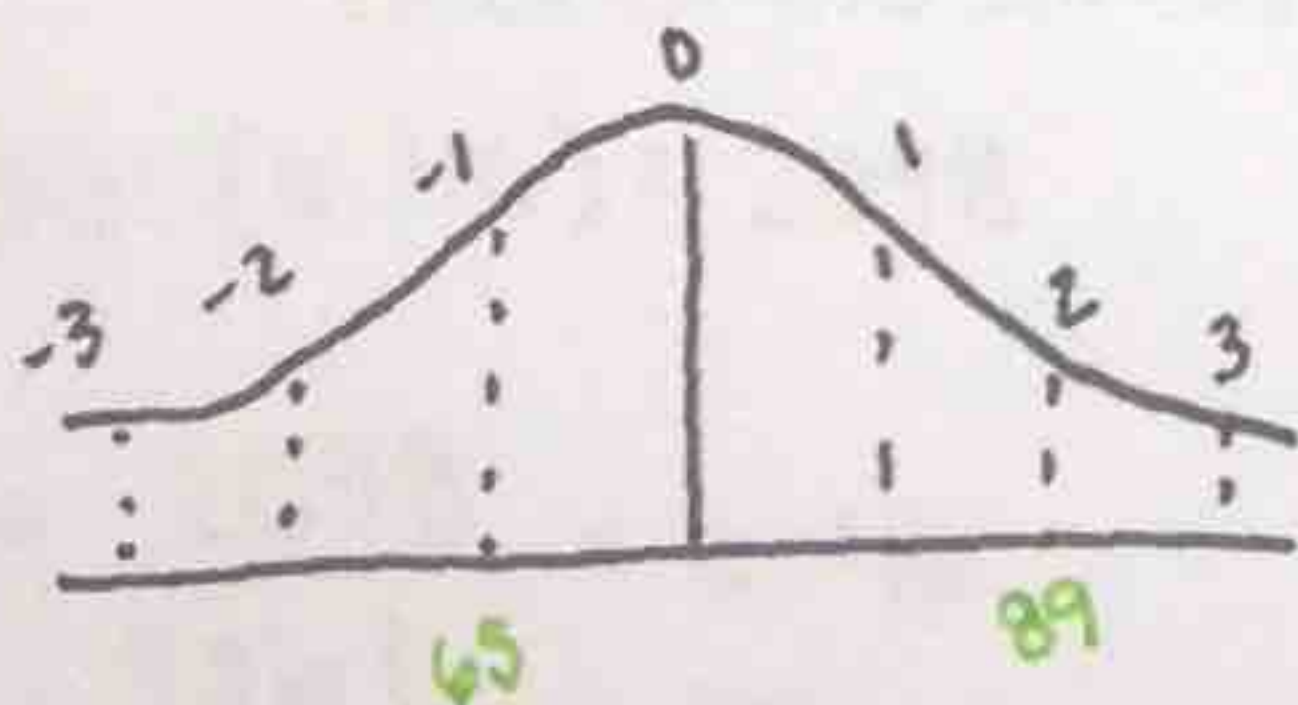
$$-65+\bar{x} = \frac{89-\bar{x}}{2}$$

$$2(-65+\bar{x}) = 89-\bar{x}$$

$$-130+2\bar{x} = 89-\bar{x}$$

$$3\bar{x} = 219$$

$$\boxed{\bar{x} = 73}$$

$$z = \frac{x-\bar{x}}{\sigma_x}$$

$$\sigma_x = 73-65 = 8$$

$$\boxed{\sigma_x = 8}$$

STATION #5:
Margin of Error & Confidence Interval

1. The students in Ms. Smith's class have obtained the following scores on the state test:

    71 70 69 76 68 73 76 72 68 76 68 70

    What is the 95% confidence interval for the data?

    95% CI:

    $\bar{X} = 71.42$

    $S_x = 3.18$

    $ME = 1.96 \left(\dfrac{3.18}{\sqrt{12}} \right) = \pm 1.8$

    $71.42 + -1.8 = \boxed{69.62}$ to

    $71.42 + 1.8 = \boxed{73.22}$

2. In a survey of 2500 high school students, 1952 said they had to purchase some of their own clothes from their allowance. What is the margin of error?

    $\hat{p} = \dfrac{1952}{2500} = 0.7808$

    $ME = 1.96 \sqrt{\dfrac{0.7808(1-0.7808)}{2500}}$

    $ME = 0.016$

3. In a survey of U.S. citizens aged 65 and over, an average of 52% said that they participated in activities at their local Senior Citizen Center at least twice a year. The margin of error was 5%. What does the 5% indicate about the results?

    Since the survey didn't ask every senior citizen, it is considered a sample of the population. We can apply this average to the entire population, but must give some wiggle room (M.o.E) for differing opinions.

4. In an international survey with 4,561 respondents, 46% said that 'coaching or mentoring' has a great impact on career success. Find the margin of error of the survey and the 95% confidence interval.

    95% CI:

    $4561(0.46) = 2098$

    $\hat{p} = \dfrac{2098}{4561} = 0.46$

    DUH

    $ME = 1.96 \sqrt{\dfrac{0.46(1-0.46)}{4561}}$

    $ME = \boxed{\pm 0.01}$

    $\boxed{0.45 \text{ to } 0.47}$

STATION #6:
Sampling and Randomization

1. A politician wants to know what issues are most important to the voters in his district. Identify the sampling method and state any bias in the method.

Convenience Sample	Self-Selected Sample	Systematic Sample

    a. The politician spends 9:00 am to 4:00 pm on Tuesday talking to people as they enter a grocery store.
Convienience Sample. Bias: only people who don't work on Tuesdays during the day will be able to respond.

    b. The politician sets up a questionnaire on his website.
Self-selected/volunteer. Bias: only people who visit his website can give their opinion.

    c. The politician uses the phone book and selects every 50th citizen to call. Systematic Sample. Bias: only people who own property will be in the phone book!

2. State whether each method would produce a random sample. Explain your reasoning.

    a. Surveying people coming out of a movie theater to find out people's favorite entertainment.
NO blc they are more likely to respond w/movies or TV.

    b. Placing a survey in the local newspaper to determine how people voted in the last election.
NO blc not everyone who voted may read the newspaper.

    c. Selecting students at a school to answer questions by randomly drawing their student identification numbers from a hat.
yes, assuming the questions asked pertain to only school-aged students.