

The Normal Curve and Percentile

Suppose 10 coins are tossed and the number of heads obtained is recorded. The table below shows the results after 100 trials of tossing 10 coins.

Number of Heads	0	1	2	3	4	5	6	7	8	9	10
Frequency	1	2	4	11	20	24	20	11	4	2	1

1. Enter the data values (Number of Heads) in list L₁.
2. Enter their frequencies in list L₂.
3. Press **[STAT]**, hit the right arrow to move to the **CALC** menu, and select item **[1]**: 1-Var Stats.
4. Now enter L₁, L₂ by pressing **[2nd] [1] [,] [2nd] [2]**. Then press **[ENTER]**.
5. Fill in the following values, rounded to *four decimal places*:

- a. mean, \bar{X} : _____
- b. standard deviation, σ : _____

6. Calculate each of the following, to the *nearest tenth*.

$$\bar{X} + \sigma = \underline{\hspace{2cm}}$$

$$\bar{X} - \sigma = \underline{\hspace{2cm}}$$

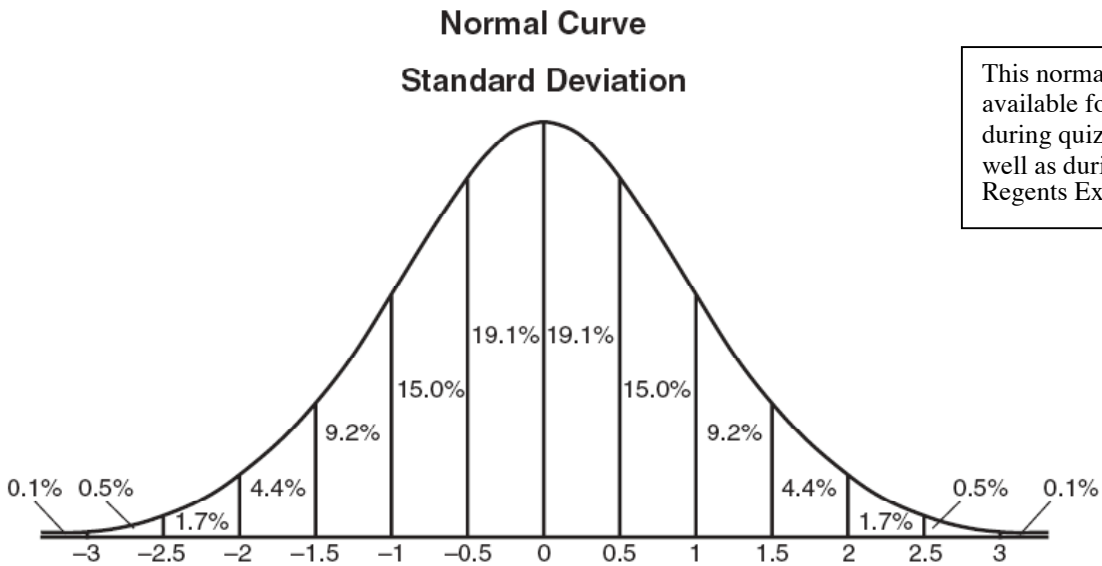
$$\bar{X} + 2\sigma = \underline{\hspace{2cm}}$$

$$\bar{X} - 2\sigma = \underline{\hspace{2cm}}$$

$$\bar{X} + 3\sigma = \underline{\hspace{2cm}}$$

$$\bar{X} - 3\sigma = \underline{\hspace{2cm}}$$

7. What percent of scores fall
 - a. within *one standard deviation* (1σ) of the mean? _____
 - b. within *two standard deviations* (2σ) of the mean? _____



This normal curve will be available for your reference during quizzes/exams, as well as during the Math B Regents Exam.

Percentile

A percentile indicates a point below which a percentage of scores falls. For example, if you are in the 75th percentile, 75% of the people have scores lower than your score, and 25% of the people have scores above your score. The normal curve below shows percentiles for each multiple of 0.5 standard deviation from the mean.

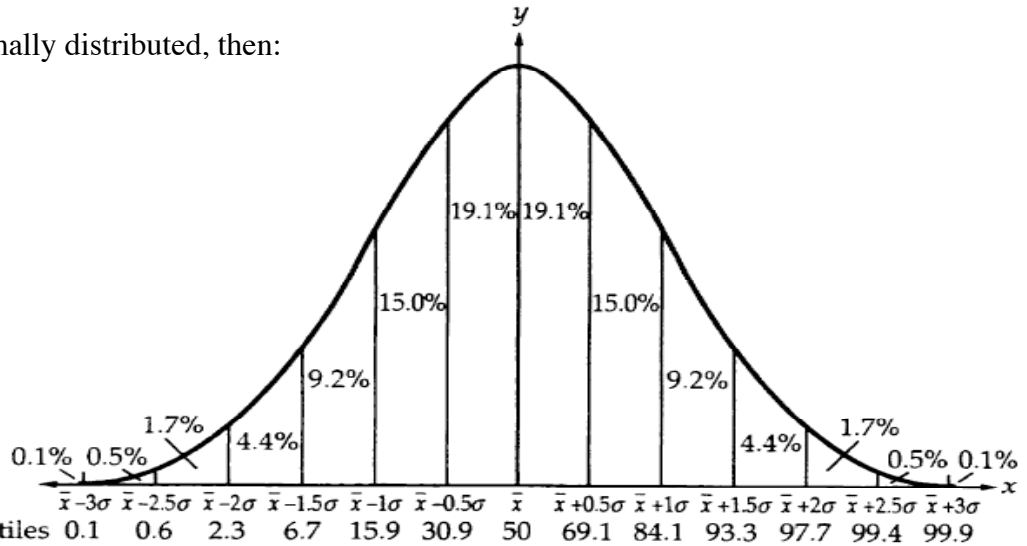
If a set of data values are normally distributed, then:

$$\bar{X} = 50\text{th percentile}$$

$$\bar{X} + 1\sigma \approx 84\text{th percentile}$$

$$\bar{X} + 2\sigma \approx 97\text{th percentile}$$

$$\bar{X} + 3\sigma \approx 99\text{th percentile}$$



Examples:

- The scores on a test approximate a normal distribution with a mean score of 72 and a standard deviation of 9. Approximately what percent of the students taking the test received a score greater than 90?
 (1) 2.5% (2) 5% (3) 10% (4) 16%
- A standardized test with a normal distribution of scores has a mean score of 43 and a standard deviation of 6.3. Which range would contain the score of a student in the 90th percentile?
 (1) 30.4 – 36.7 (2) 36.7 – 43.0 (3) 43.0 – 49.3 (4) 49.3 – 55.6
- Professor Bartrich has 184 students in her mathematics class. The scores on the final examination are normally distributed and have a mean of 72.3 and a standard deviation of 8.9. How many students in the class can be expected to receive a score between 82 and 90?
- The amount of time that a teenager plays video games in any given week is normally distributed. If a teenager plays video games and average of 15 hours per week, with a standard deviation of 3 hours, what is the probability of a teenager playing video games between 15 and 18 hours a week?
- Battery lifetime is normally distributed for large samples. The mean lifetime is 500 days and the standard deviation is 61 days. Approximately what percent of batteries have lifetimes *longer than* 561 days?
 (1) 34% (2) 84% (3) 16% (4) 68%