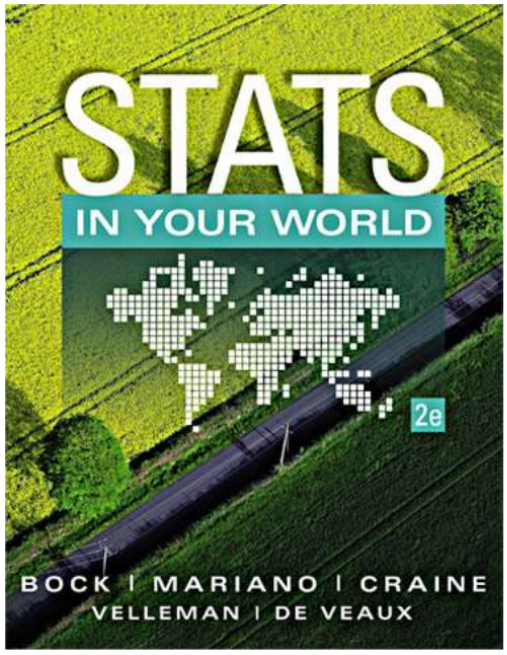
Chapter 5

What's Normal?



What is the Normal Curve?

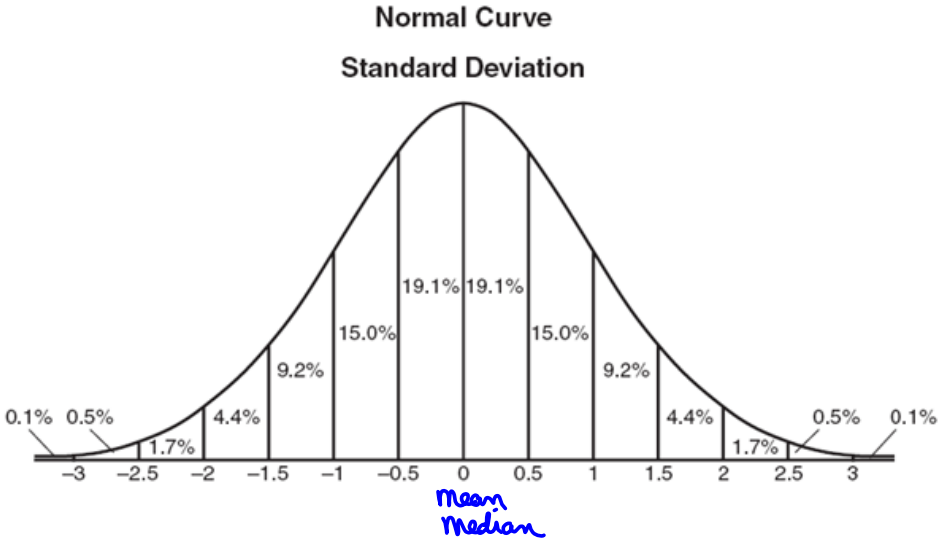
- https://www.youtube.com/watch?v=mtH1fmUVkfE

The First Three Rules for Working with Normal Models

- Make a picture.
- Make a picture.
- Make a picture.

- And, when we have data, make a histogram to check the Nearly Normal Condition to make sure we can use the Normal model to model the distribution.

The Normal Curve must be symmetrical and unimodal

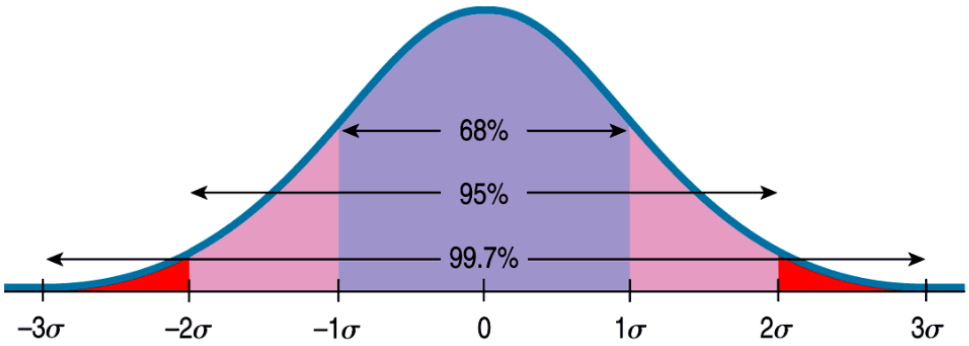


If a set of data conforms to a bell-shaped curve, the data are said to be **normally distributed**. The normal curve shown above is a **Standard Normal Curve**. The standard normal curve is centered on the y-axis so that the mean is at 0 and its standard deviation is 1. Since all normal curves have the same percent distribution of data values, the percentages shown are true for all normal curves. In a normal distribution, the median is the same as the mean value.

Because the curve is symmtrical, 50% of the data falls below the mean (median) and 50% falls above the mean (median).

The 68-95-99.7 Rule (cont.)

- The following shows what the 68-95-99.7 Rule tells us:



The 68-95-99.7 Rule

- Normal models give us an idea of how extreme a value is by telling us how likely it is to find one that far from the mean.
- We can find these numbers precisely, but it is useful to begin with a simple rule that tells us a lot about the Normal model…

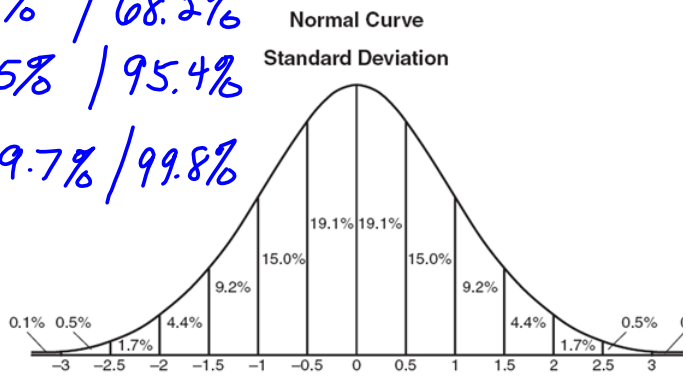
The 68-95-99.7 Rule (cont.)

- It turns out that in a Normal model:
  - about 68% of the values fall within one standard deviation of the mean;
  - about 95% of the values fall within two standard deviations of the mean; and,
  - about 99.7% (almost all!) of the values fall within three standard deviations of the mean.

Examples:

1. Approximately what percent of the values fall between the mean and .5 standard deviation from the mean? 19.1 + 19.1 = 38.2%

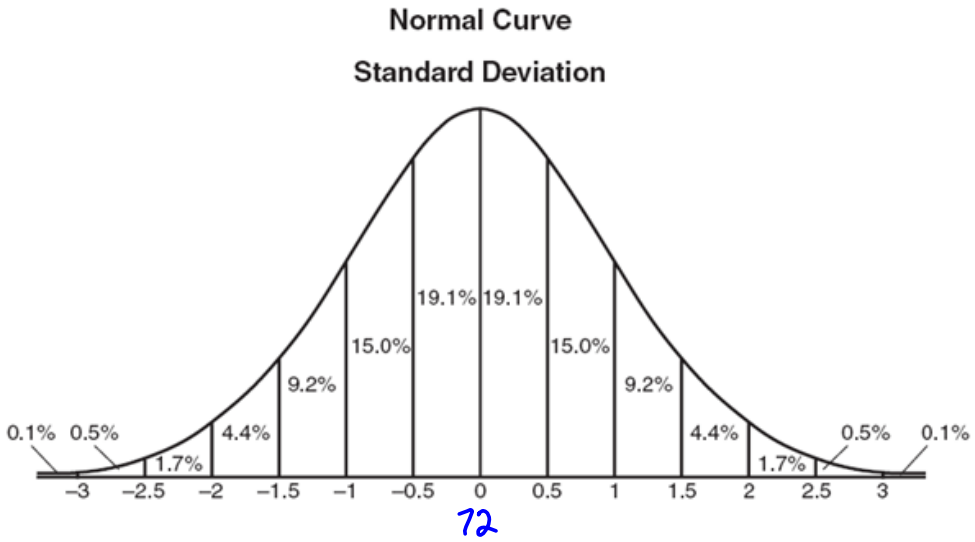
2. Approximately what percent of the values fall within
   a) one standard deviation of the mean? 68% / 68.2%
   b) two standard deviations of the mean? 95% / 95.4%
   c) three standard deviations of the mean? 99.7% / 99.8%



3. On a quiz, the mean score is 72 and the standard deviation is 3.4. Which score can be expected to occur 50% of the time?

at least

(1) 65 (2) 67 (3) 72 (4) 78

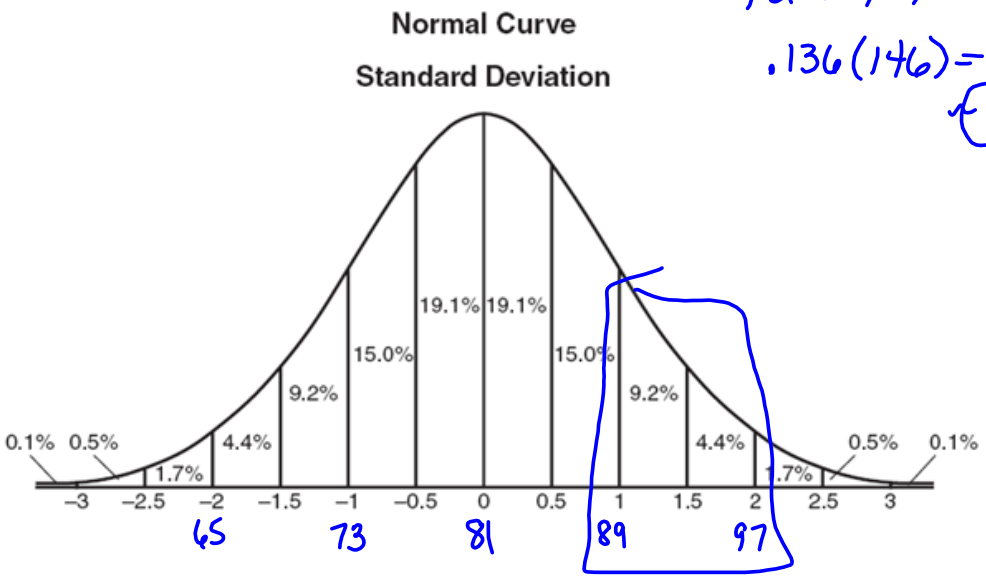


4. Ms Atkins has 146 students in her math class. The scores on the final exam are normally distributed and have a mean of 81 and a standard deviation of 8. How many students in the class can be expected to receive a score between 89 and 97?

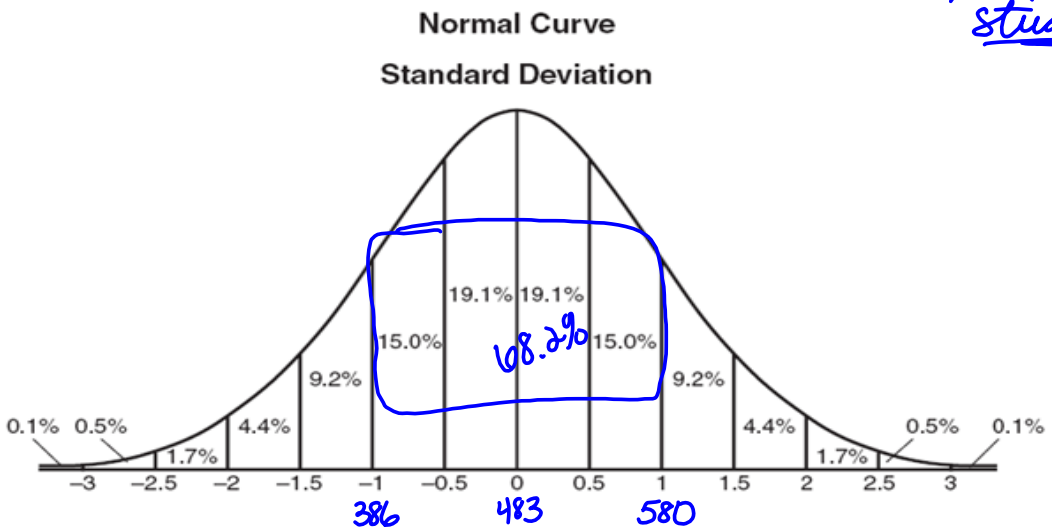
9.2 + 4.4 = 13.6%

.136(146) = 19.856..

≈ 20 students



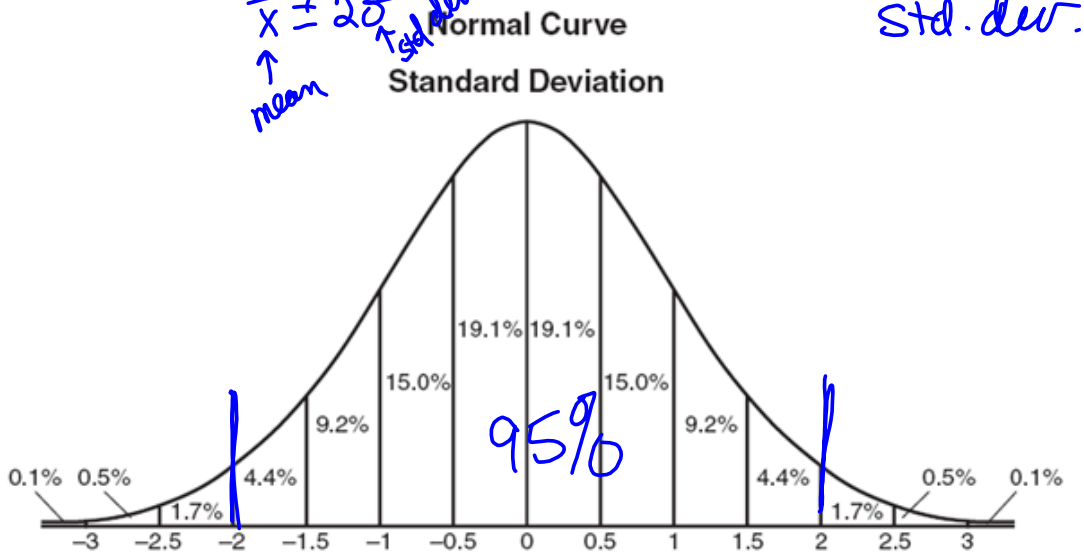
5. The mean score on the mathematics section of a standardized examination was 483 and the standard deviation was 97. If 10,000 students took the exam,
   a) Approximately what percent of the students had scores from 386 to 580? 68% or 68.2%
   b) Approximately how many students is this? .682(10,000) = 6,820 (or 6,800) students



6. On an exam approximately 95% of the scores ranged between 74 and 84. If the scores are approximately normally distributed and the mean is 79, find the standard deviation.

$\bar{x} \pm 2\sigma$ ← mean, ↑ std dev.

Std. dev. $= \sigma$



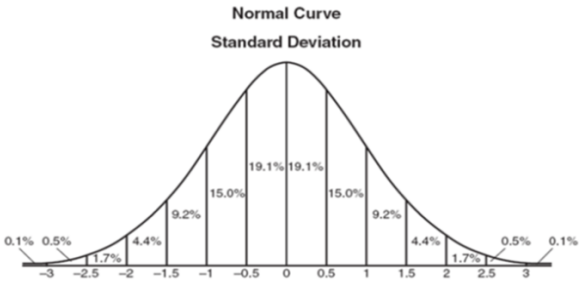
74 79 84

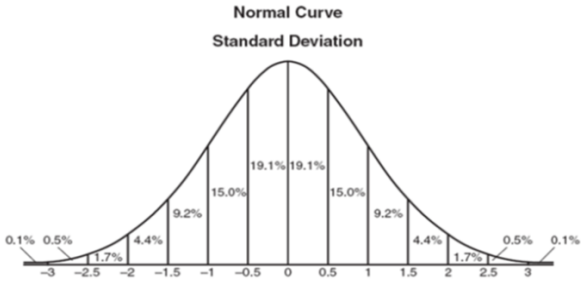
$\frac{4\sigma}{4} = \frac{10}{4}$ or $\frac{2\sigma}{2} = \frac{5}{2}$

$\sigma = 2.5$ $\sigma = 2.5$

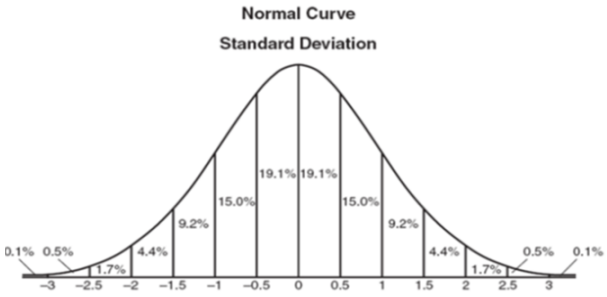
Homework: Read Pg. 118-121

Do Pg. 121 #3, 5





132 #21, 23, 25


Normal Curve
Standard Deviation
0.1%
0.5%
1.7%
4.4%
9.2%
15.0%
19.1%
19.1%
15.0%
9.2%
4.4%
1.7%
0.5%
0.1%
−3
−2.5
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2
2.5
3