

3. A sample of 60 shoe laces coming off of the assembly has a mean length of 42.08 inches and a standard deviation of 0.23 inches.

a) Find the z -score for a shoe lace that is 41.76 inches.

$$z = \frac{41.76 - 42.08}{.23} = -1.39$$

b) If a shoe lace has a z -score of 2.3 find the length of the shoe lace to the nearest hundredth.

$$x = 42.61 \quad 2.3 = \frac{x - 42.08}{.23}$$

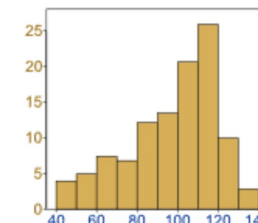
c) Find the range of lengths that are within 2 standard deviations of the mean.

$$\begin{aligned} \bar{x} + 2\sigma &= 42.08 + .46 && 41.62 \text{ to } 42.54 \\ \bar{x} - 2\sigma &= 42.08 - .46 \end{aligned}$$

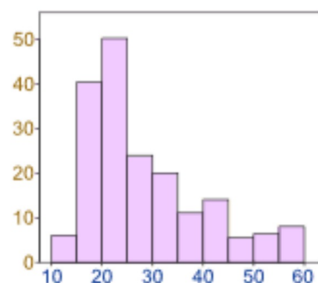
Sec 12-7: Normal Distributions

Data can be "distributed" (spread out) in different ways.

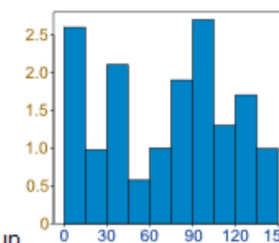
Data can be skewed to the right



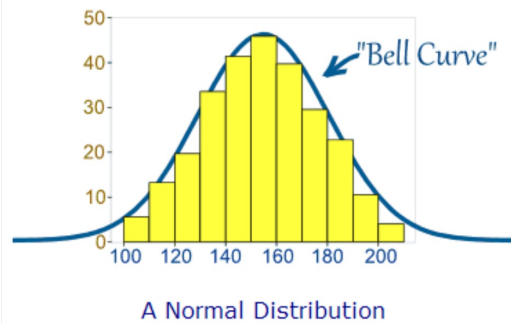
Data can be skewed to the left.



Or it can be all jumbled up



But there are many cases where the data tends to be around a central value with no bias left or right.



<http://www.mathsisfun.com/data/quincunx.html>

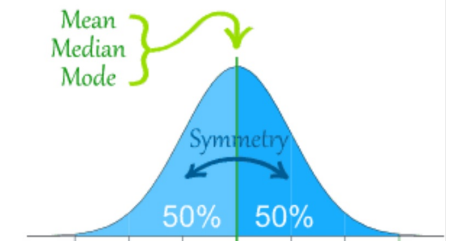
Many things closely follow a Normal Distribution:

- heights of people
- size of things produced by machines
- errors in measurements
- blood pressure
- marks on a test

We say the data is "normally distributed".

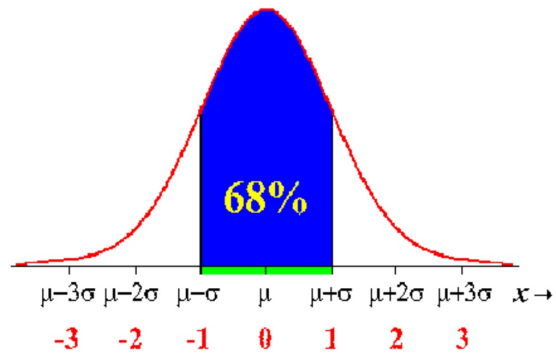
The Normal Distribution has:

- mean = median = mode
- symmetry about the center
- 50% of values less than the mean and 50% greater than the mean

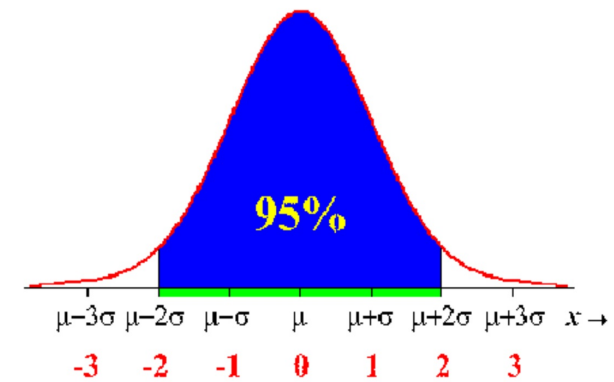


The 68-95 100 Rule For Normal Distributions

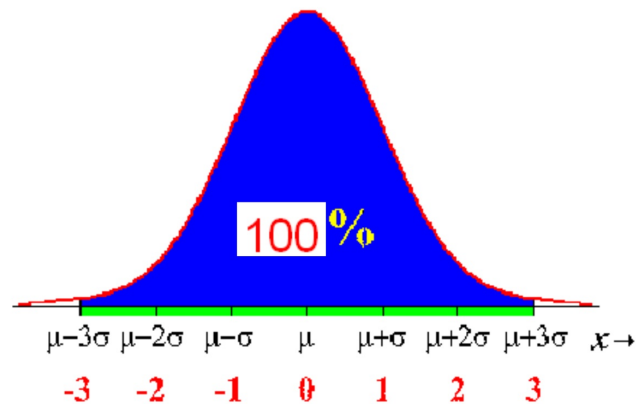
Approximately 68% of the observations fall within 1 standard deviation of the mean



Approximately 95% of the observations fall within 2 standard deviations of the mean

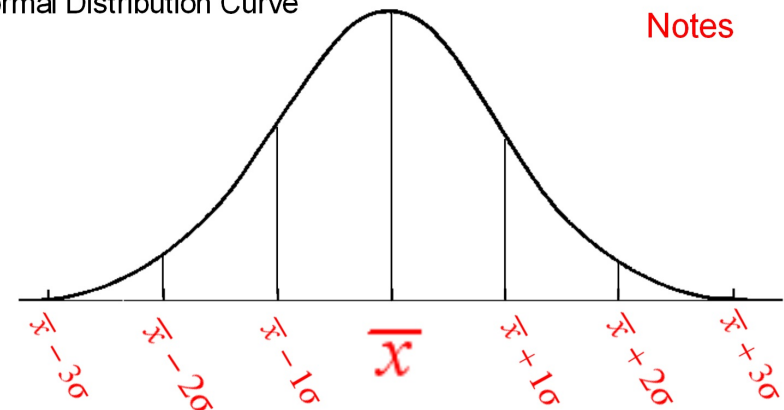


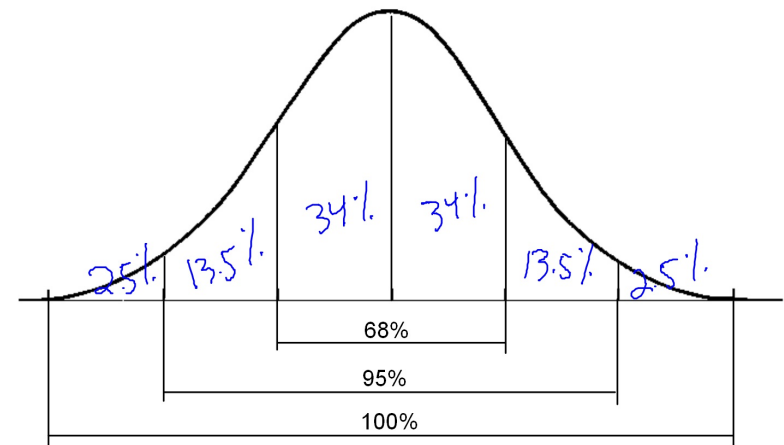
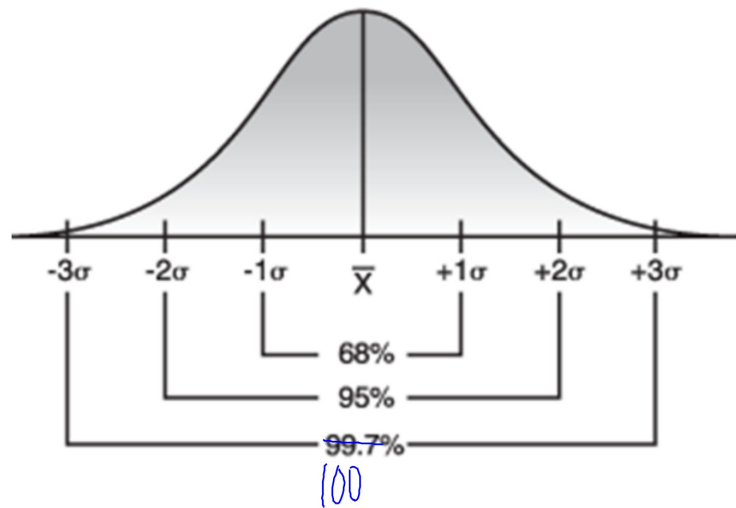
Approximately 100% of the observations fall within 3 standard deviations of the mean



Normal Distribution Curve

Notes

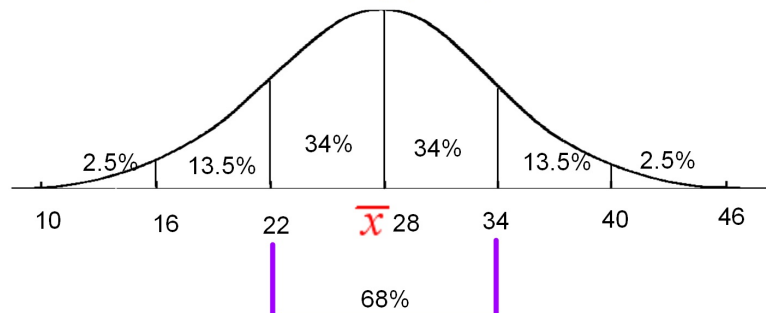




An employer surveyed its employees about commuting time to work. The mean commuting time was 28 minutes with a standard deviation of 6 minutes.

1. Within what range of times do 68% of the workers spend time commuting?

22 - 34 min



68% of the data is within 1 standard deviation of the mean

2. Within what range of times do 95% of the workers spend time commuting?

16 min to 40 min

3. What % of workers spend between 10 and 22 minutes commuting?

16%

4. What % of workers spend between 28 and 40 minutes commuting?

47.5%

6. What % of workers spend less than 40 minutes commuting?

97.5%

A standardized test had the following statistics:

Mean = 83

Std Dev = 3

1. Your score was 89.

a. Find your z-score.

$$\frac{89-83}{3} = \frac{6}{3} = 2$$

b. What % of the scores were less than yours? 97.5%

2. Your score was 80.

a. Find your z-score.

$$z = -1$$

b. What % of the scores were better than yours?

84%

A cereal manufacturer samples some boxes of cereal which are supposed to weight 16 ounces.

The mean weight of the boxes sampled was 15 with a standard deviation of 1

1. What % of the boxes weighed less than 17 ounces? 97.5%

2. What interval contained 95% of the boxes? 13 ounces - 17 ounces

3. What % of the boxes contained from 13 to 15 ounces? 47.5%

4. A box is rejected if it is more than 2 ounces from the advertised weight. What % of the boxes were rejected.

16%