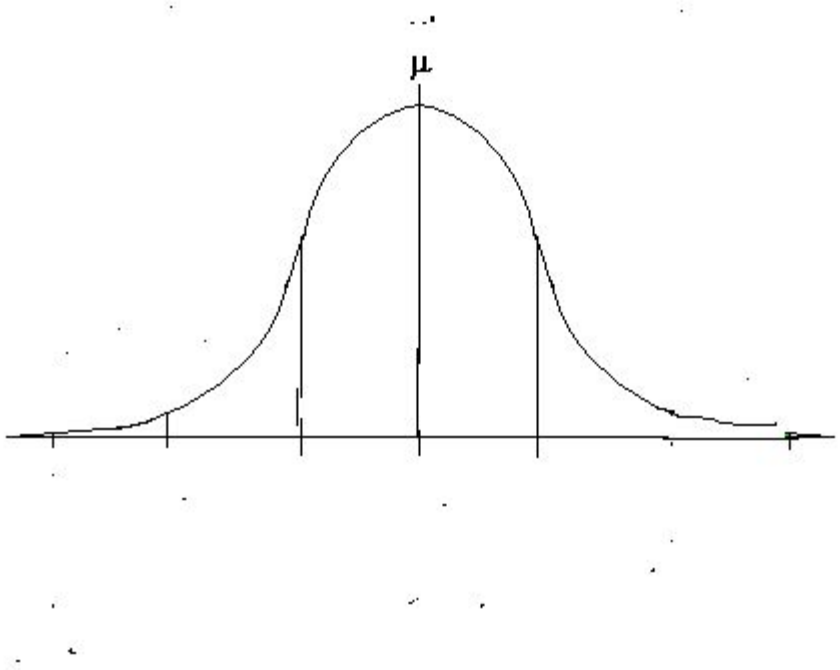
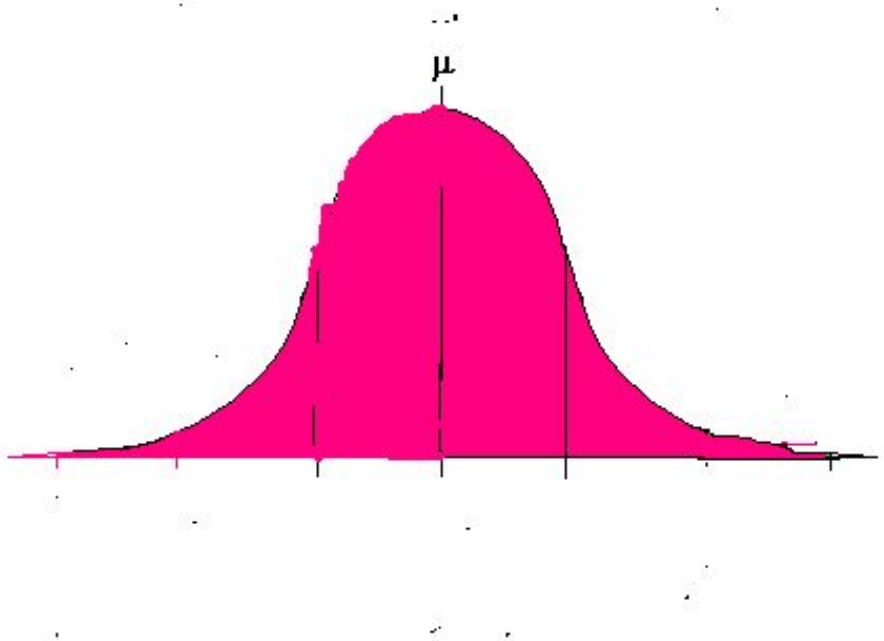
The Normal Distribution

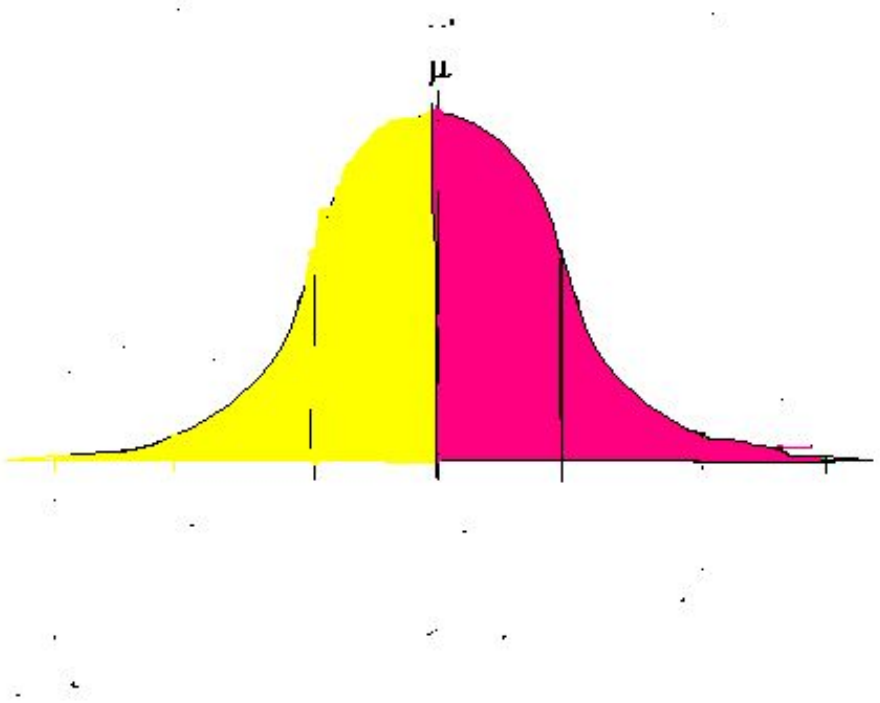


The Area under the curve



The area under the curve represents everything: 100%.

The mean is in the middle.

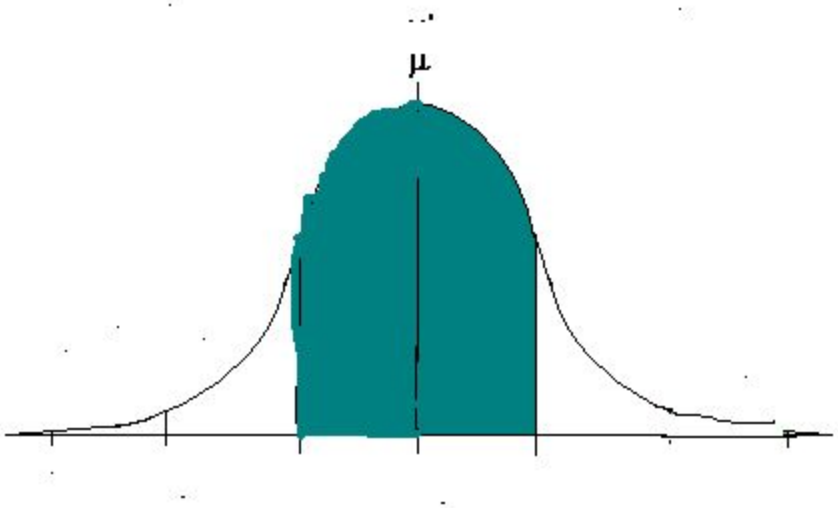


50% of the data is below the mean.

50% of the data is above the mean.

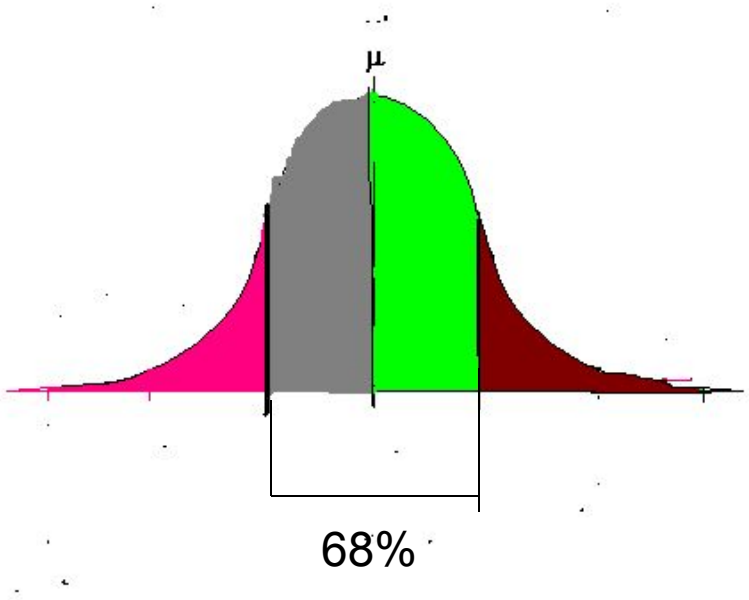
Remember that the mean=median=mode!

Within one standard deviation



$P(-1<Z<1) = 68\%$

What percent of the data is between 0 and 1?

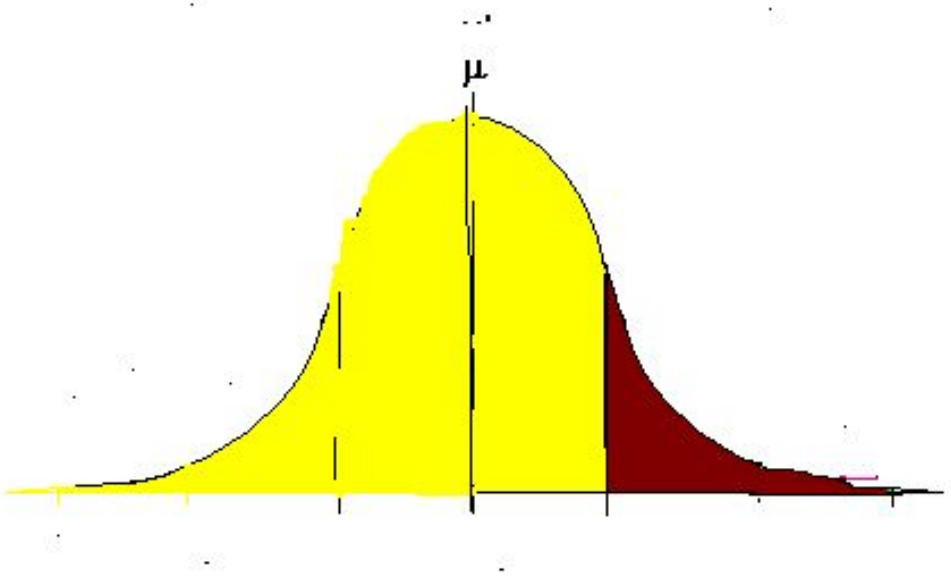


P(0<Z<1)

P(z<1)

P(z>1)

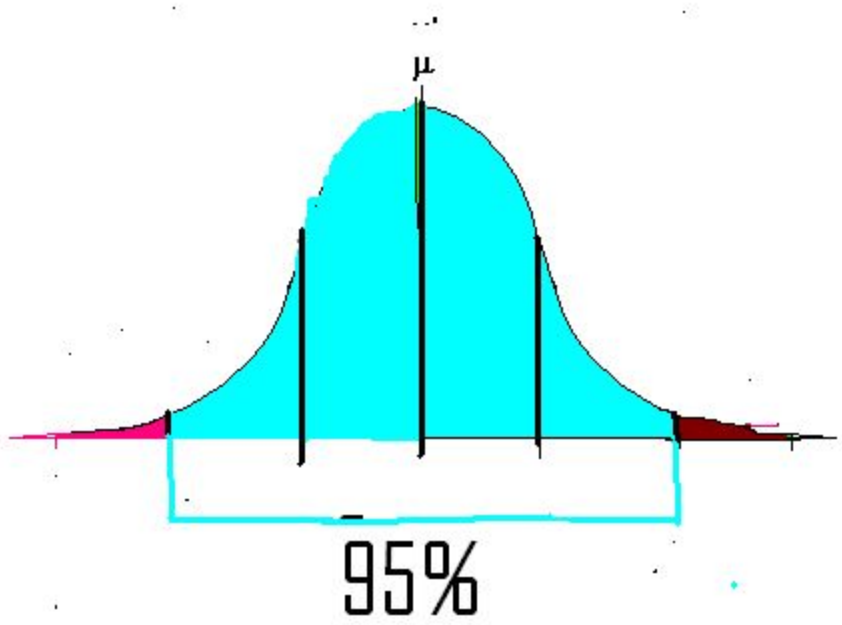
Part (Yellow) + Part (Brown) =100



100 - Part (Yellow) = Part (Brown)

100 – 84 = 16

Within two standard deviations



P(-2<Z<2)

P(1 < Z < 2)

P(Z < 2)

The Normal Distribution

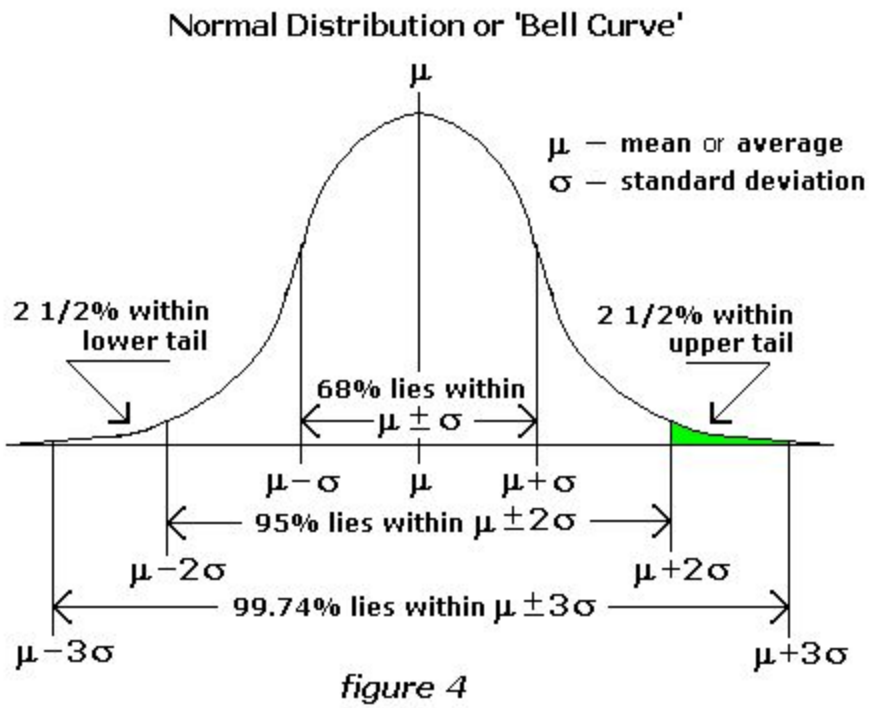


figure 4

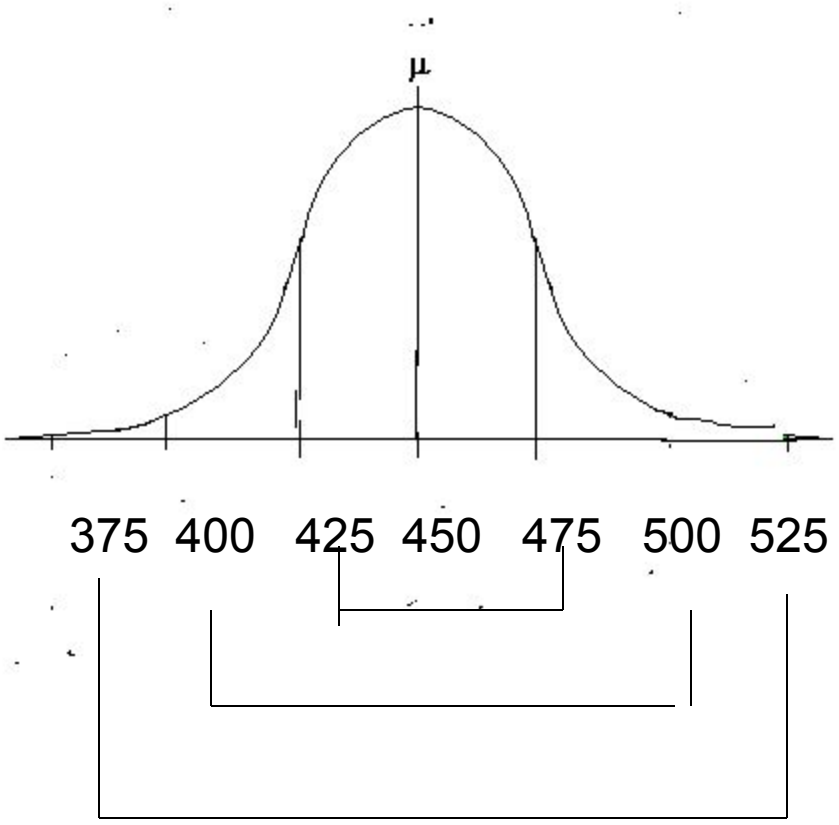
- A normal curve is bell shaped.
- The highest point on the curve is the mean of the distribution.
- The mean, median and mode are the same.
- The curve is symmetric with respect to its mean.
- The total area under the curve is one.
- Roughly 68% of the data is within one standard deviation from the mean, 95% of the data are within two standard deviations and 99.7% are within three standard deviations.

Example 1

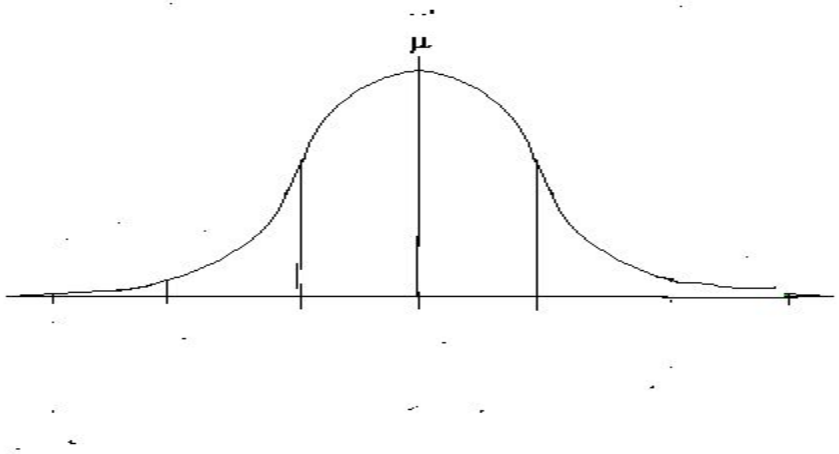
- 1,000 students take an intelligence test
- The mean is 450 and the standard deviation is 25.
- Label the horizontal axis.
- Show the Rule for the intervals for within 1 standard deviation, within 2 and within 3.

What percent of the data would be between 425 and 475?

How many scores would be between 425 and 475?

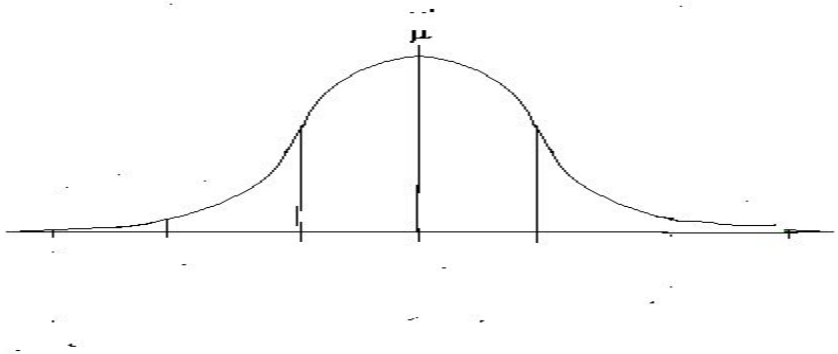


Label the bell!



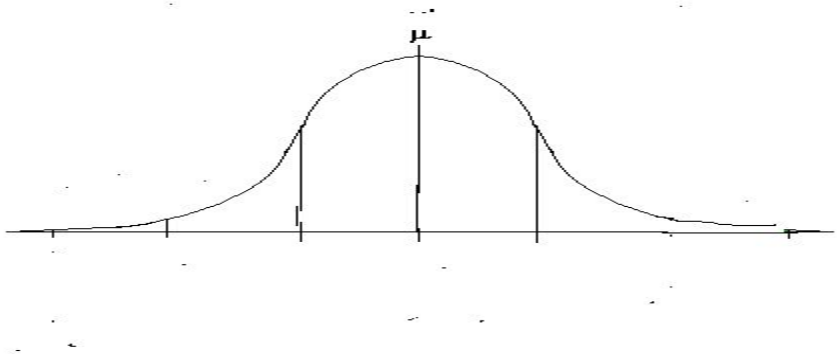
The mean value of land and buildings per acre from a sample of farms is $1000 with a standard deviation of $200. The data distribution has a bell shape. Estimate the percent of farms whose land and building values per acre are between $800 and $1200.

Label the bell!



- The mean value of land and buildings per acre from a sample of farms is $1200 with a standard deviation of $350. Between what two values does about 95% of the data lie?

Label the bell!



- The mean price of new homes from a sample of houses is $155,000 with a standard deviation of $15,000. The data has a bell shaped distribution.
- Between what two prices do 95% of the houses fall?
- What is the median price?
- What percent is less than $110,000?

Convert x to z

- Z is the standardized value
- Z= $\dfrac{(x-\mu)}{\sigma}$
- Convert x = 55 with a mean of 50 and the standard deviation of 10.

The Calculator
Finding P(a<x<b)

- 2nd VARS DISTR Normalcdf

❖ In words:

(lower limit, upper limit, mean, standard deviation)

❖ In variables:

(a, b, μ, σ)

❖ For example with an x:

Find the probability that x is between 40 and 60 in a distribution with a mean of 50 and a standard deviation of 10.

P(40<x<60) = normalcdf(40, 60, 50,10)

Write the normalcdf for each μ=50 and σ=10

- P(20<x<60)= normalcdf(___,___,___,___)
- P(20<x<50)= normalcdf(___,___,___,___)
- P(70<x<80)= normalcdf(___,___,___,___)
- P(14<x<43)= normalcdf(___,___,___,___)

$\infty = 1E99$ $-\infty = -1E99$

- P(50<x<∞)= normalcdf(___,___,___,___)
- P(55<x< ∞)= normalcdf(___,___,___,___)
- P(-∞ <x<30)= normalcdf(___,___,___,___)
- P(-∞ < x< 60)= normalcdf(___,___,___,___)

Let’s Do A Graph

- Normal curves are graphed by normalpdf