NORMAL CURVE REFERENCE SHEET

Percentile Rank

Tells the percent under the value x

$$Percentile = \frac{number\ of\ scores < x}{total\ number\ of\ scores} \cdot 100$$

Z-Score

The z-score tells us how many standard deviations a particular piece of data is away from the mean of the distribution.
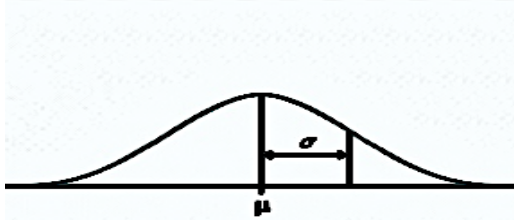
$$z = \frac{x - mean}{standard\ deviation}$$

Normal Distribution and Normal Curve

A density curve that is normally distributed has the following characteristics:

- Symmetric
- Single peak
- Bell shape
- Area under the curve is 1

The mean of a density curve (including the normal curve) is denoted by   (the Greek lowercase letter mu) and the standard deviation is denoted by   (the Greek lowercase letter sigma)

All Normal distributions have the same overall shape. Any differences can be explained by   and   .

Normal Distributions and the Empirical Rule (68-95-99.7 Rule)

All Normal distributions have the same overall shape. Any differences can be explained by   and   .
In a normal distribution with mean   and standard deviation   :

- 68% of the observations fall within 1 standard deviation of the mean.
- 95% of the observations fall within 2 standard deviations of the mean.
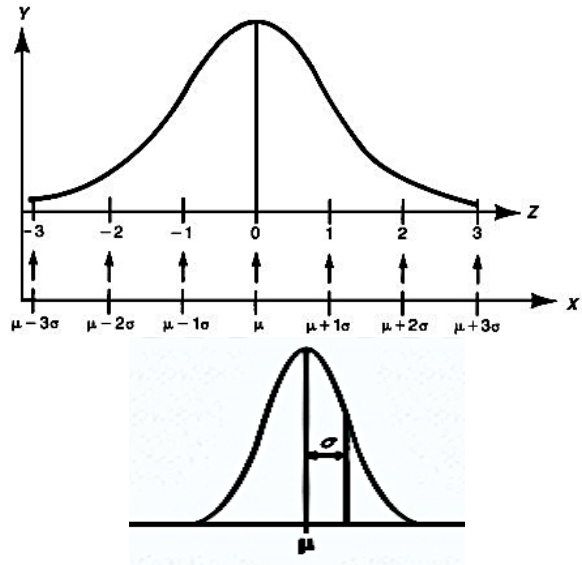- 99.7% of the observations fall within 3 standard deviations of the mean.
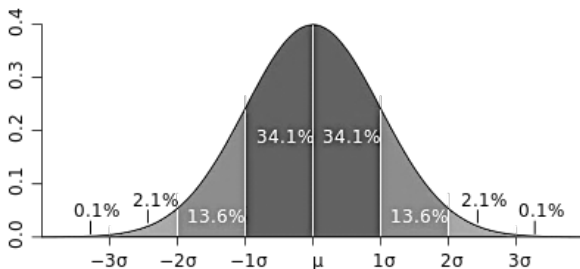
Cumulative Frequency (ogive graph)

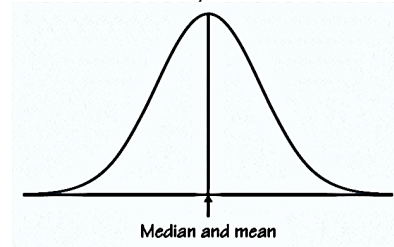The number of times a value occurs plus all the smaller values that have occurred.
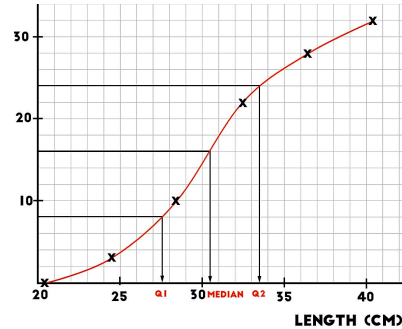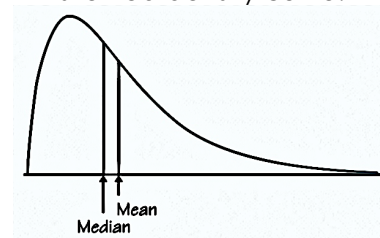

Standard Normal Curve

The normal curve with mean = 0 and standard deviation = 1 is called the **standard normal curve**.

The mean and the median are equal in a symmetric density curve.

Median and mean

The mean and the median are not equal in a skewed density curve.

Mean
Median

Operations on statistics:

	Addition of constant a	Subtraction of constant a	Multiplication of constant a	Division of constant a
Mean	Increase by a	Decrease by a	Multiply by a	Divides by a
Median	Increase by a	Decrease by a	Multiply by a	Divides by a
Standard Deviation	No change	No change	Multiply by $|a|$	Divides by $|a|$
Quartiles	Increase by a	Decrease by a	Multiply by a	Divides by a
IQR	No change	No change	Multiply by $|a|$	Divides by $|a|$
Min and Max	Increase by a	Decrease by a	Multiply by a	Divides by a
Range	No change	No change	Multiply by $|a|$	Divides by $|a|$
Percentiles	Increase by a	Decrease by a	Multiply by a	Divides by a

The following example shows what happens to a statistic when 2 is added, subtracted, multiplied, or divided by all data values.

	Starting Value	Add 2	Subtract 2	Multiply by 2	Divide by 2
Mean	5	7	3	10	2.5
Median	4	6	2	8	2
Standard Dev.	2	2	2	4	1
Quartiles	3 and 6	5 and 8	5 and 8	6 and 12	1.5 and 3
IQR	3	3	3	6	1.5
Min and Max	1 and 11	3 and 13	-1 and 9	2 and 22	.5 and 5.5
Range	10	10	10	20	5
Percentiles	3.5 is 40%	5.5 is 40%	1.5 is 40%	7 is 40%	1.75 is 40%

ASSESSING NORMALITY

Method 1: Construct a histogram, stem and leaf plot or box plot to determine if the shape is approximately bell shaped with symmetry about the mean. This is fairly easy because if you load the data into your calculator, you can check a histogram very quickly.

Method 2: Check the normal probability plot (on TI-83). This is an easy and quick way to check for normality. A normal distribution will have a normal probability plot that follows a straight linear trend.