PROGRAMME: M.ED (I SEMESTER)
PROGRAMME CODE: 2PAEDU
COURSE: INTRODUCTION TO EDUCATIONAL RESEARCH

COURSE CODE: CC-3
UNIT : V
TOPIC: NORMAL PROBABILITY CURVE

NORMAL PROBABILITY CURVE

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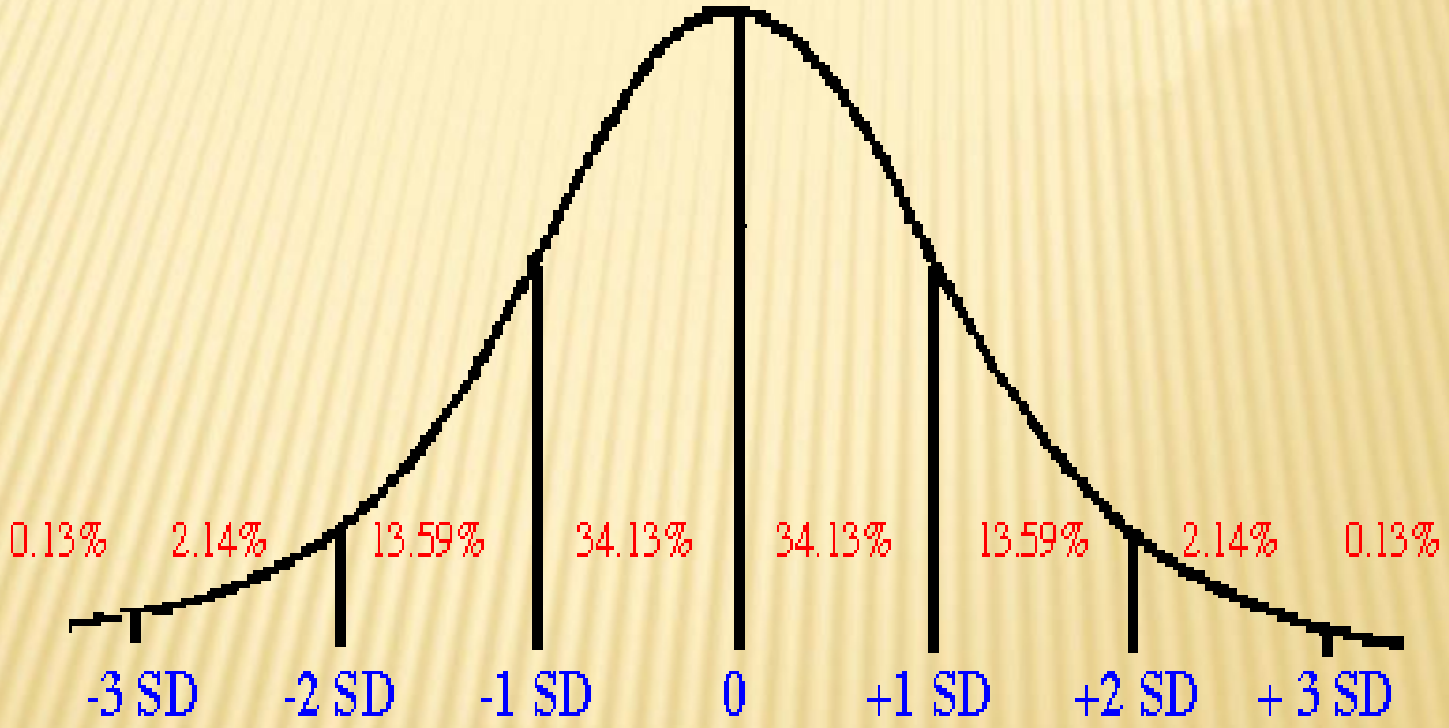
NPC



Carl Gauss

- The normal probability distribution or the “normal curve” is often called the Gaussian distribution,

BELL SHAPED CURVE

The shape of the curve is like that of a bell.

MEAN = MEDIAN = MODE

- Mean, median and mode carry the equal value. / same numerical value mean, median and mode
- Therefore they fall at the same point on the curve

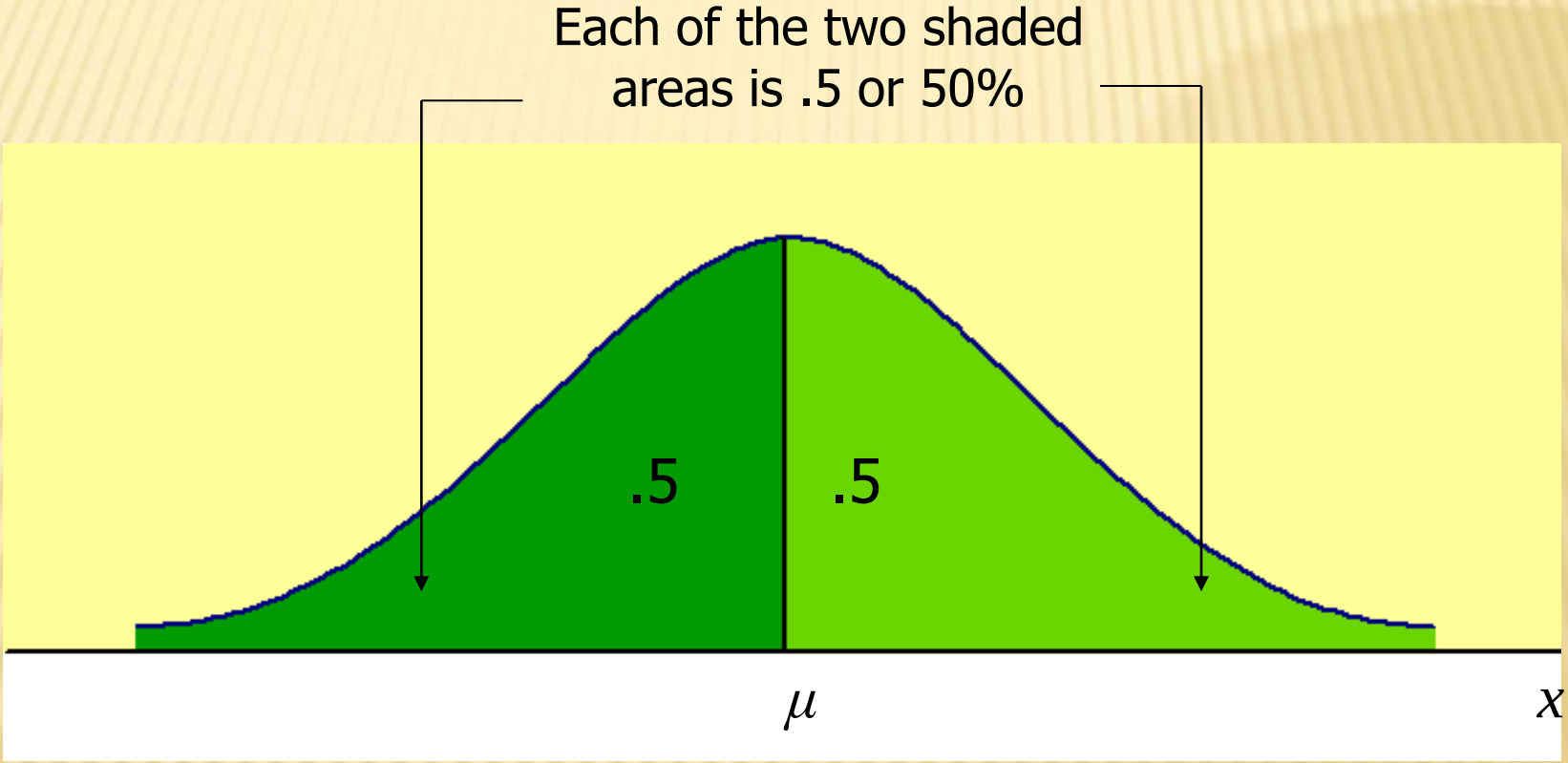
UNIMODAL

- Since the mean , median and mode lye at one point of the curve it is unimodal in nature.

PERFECTLY SYMMETRICALITY

- It means the curve inclines towards both sides equally from the centre of the curve.
- Thus we get equal halves on both sides from the central point.
- The curve is not skewed. Therefore the values of the measure of skewness is zero

A normal curve is symmetric about the mean.



ASYMPTOTIC

- The curve does not touch the base or OX axis on both sides.
- Thus it extends from negative infinity to positive infinitive.

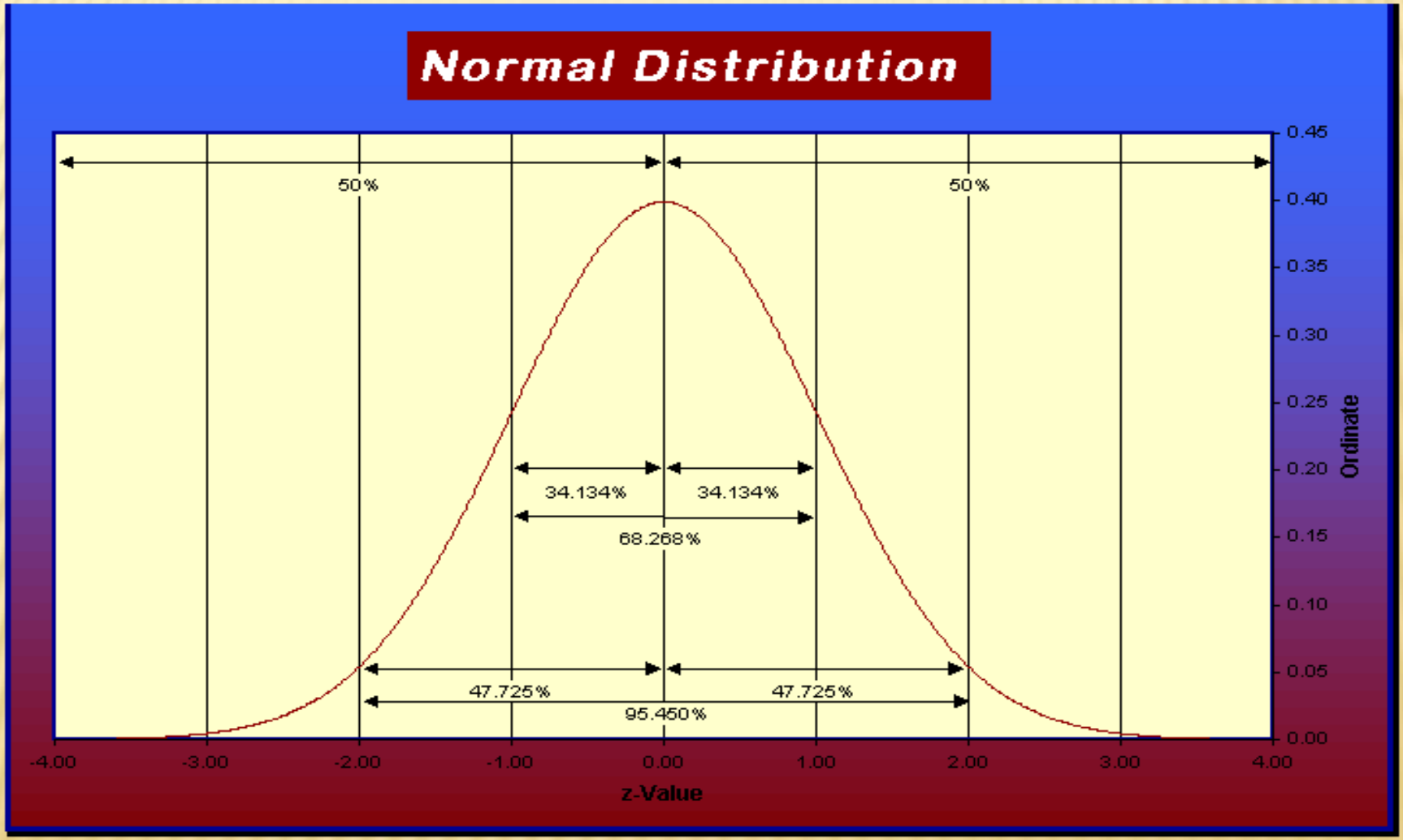
DISTANCE OF THE CURVE

- For practical purpose the base line of the curve is divided into six sigma distance from . Most of the cases I.e.99.73% are covered within such distance

MAXIMUM ORDINATE

- Maximum ordinate of the curve occurs at the mean. I.e. where Z1=0 and the value of the highest ordinate is 0.3989.
- The height of the ordinate at 1sigma is 0.2420
- 2 sigma = 0.0540
- 3 sigma = 0.0044

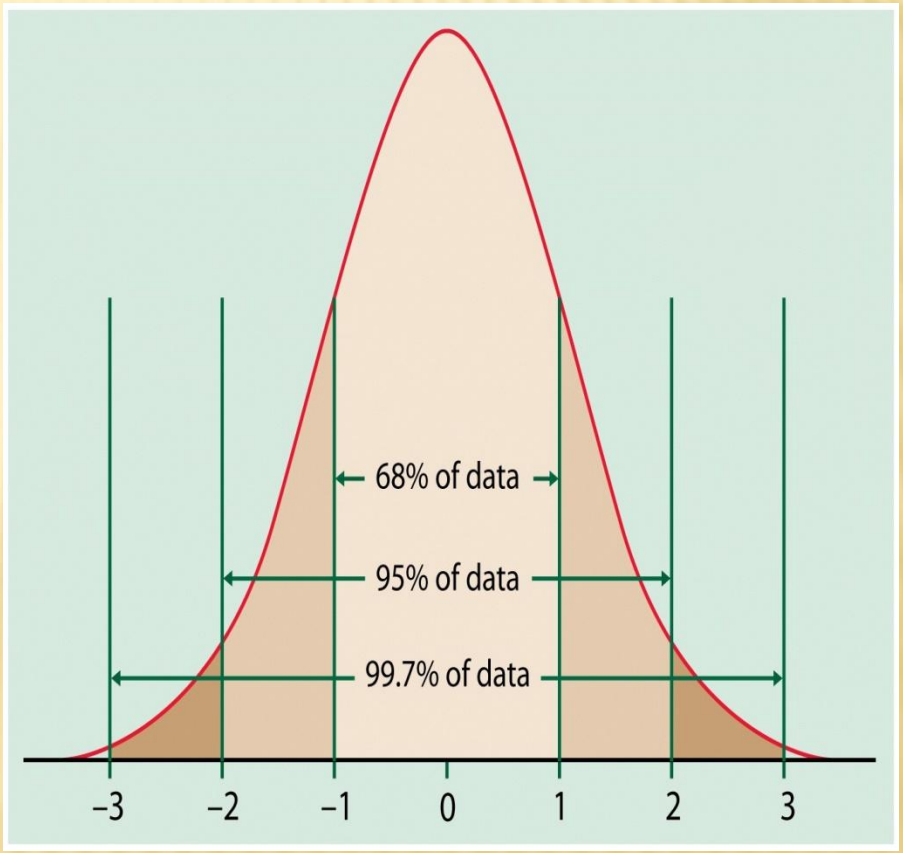
The Theoretical Normal Curve



(from http://www.music.miami.edu/research/statistics/normalcurve/images/normalCurve1.gif

68-95-99.7 Rule

- For any normal curve with mean mu and standard deviation sigma:
- 68 percent of the observations fall within one standard deviation sigma of the mean.
- 95 percent of observation fall within 2 standard deviations.
- 99.7 percent of observations fall within 3 standard deviations of the mean.

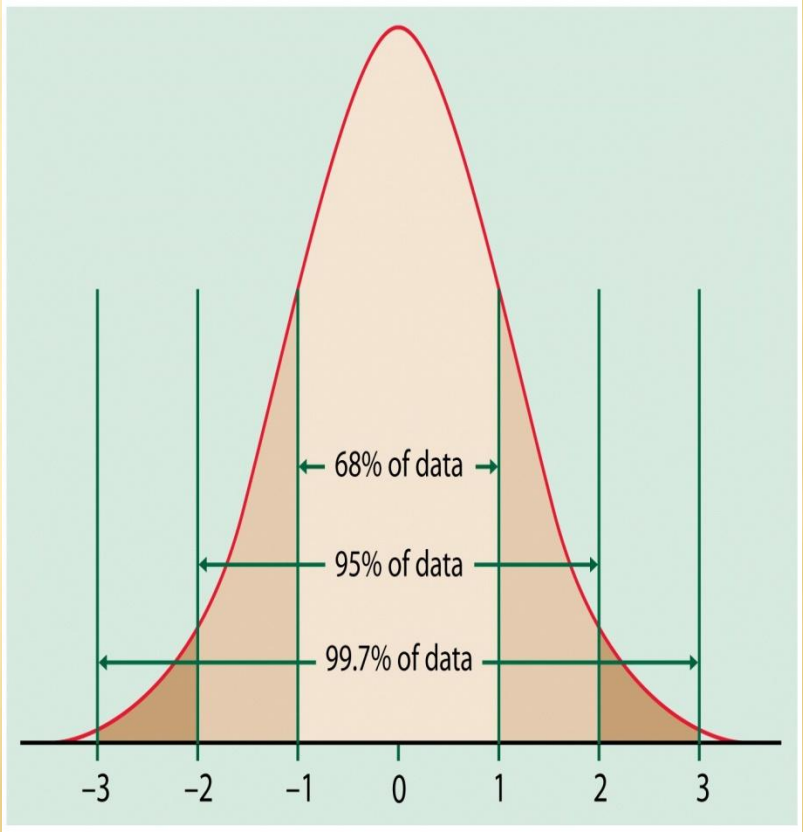


68-95-99.7 Rule

$$\int_{\mu-\sigma}^{\mu+\sigma} \frac{1}{\sigma\sqrt{2\pi}} \bullet e^{-\frac{1}{2}(\frac{x-\mu}{\sigma})^2}\, dx = .68$$

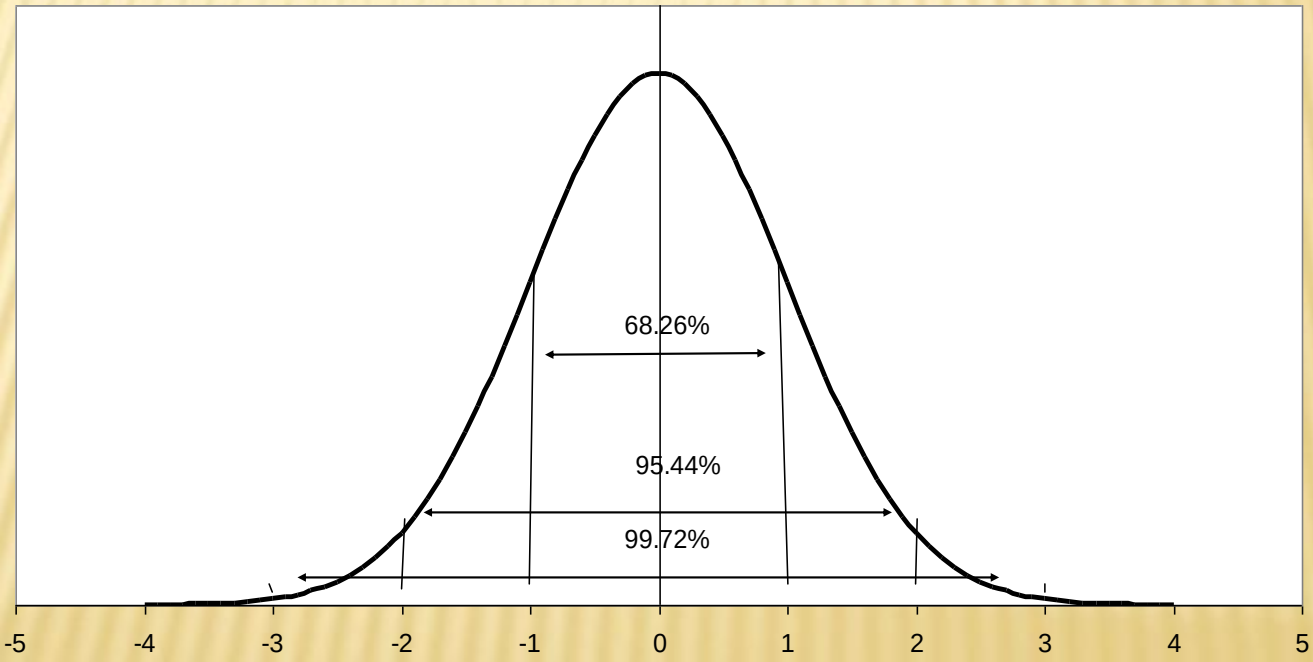
$$\int_{\mu-2\sigma}^{\mu+2\sigma} \frac{1}{\sigma\sqrt{2\pi}} \bullet e^{-\frac{1}{2}(\frac{x-\mu}{\sigma})^2}\, dx = .95$$

$$\int_{\mu-3\sigma}^{\mu+3\sigma} \frac{1}{\sigma\sqrt{2\pi}} \bullet e^{-\frac{1}{2}(\frac{x-\mu}{\sigma})^2}\, dx = .997$$



Properties (cont.)

- Has a mean = 0 and standard deviation = 1.
- General relationships: ±1 s = about 68.26%
  ±2 s = about 95.44%
  ±3 s = about 99.72%



ANALYSIS OF SCALE VALUE

- The scale values are analysed as

  Z1=(X-M)/sigma

  Where z1 = 0 and range of mean plus or minus Z is equal to mean plus or minus sigma

POINTS OF INFECTION

- The points of infection are each plus or minus one sigma from above and below the mean.
- The curve changes from convex to concave at these points with the baseline.

Various measures

In the normal curve

- Quartile deviation Q = Proper error = 0.6745a
- Mean deviation, AD = 0.7979a
- Skewness = 0
- Kurtosis = 0.263

Properties of the Normal Curve

- **Bell-shaped**
- **Unimodal**
  - **mean = median = mode**
- **Symmetrical**
- **Tails are asymptotic**
- **68,95 & 99.7 Rule**
- **Maximum ordinate of the curve:**
- **Points of infection**

APPLICATIONS OF THE NORMAL PROBABILITY CURVE

To normalize a frequency distribution. It is an important step in standardizing a psychological test or inventory.

To test the significance of observations in experiments, findings them relationships with the chance fluctuations or errors that are result of sampling procedures.

To generalize about population from which the samples are drawn by calculating the standard error of mean and other statistics.

To compare two distributions. The NPC is used to compare two distributions.

To determine the difficulty values. The Z scores are used to determine the difficulty values of test items.

To classify the groups. The Normal Probability Curve (NPC) is used for classifying the groups and assigning grades to individuals.

To determine the level of significance. The levels of significance of statistics results are determined in terms of NPC limits.

To scale responses to opinionnaires, judgement, ratings or rankings by transforming them numerical values.

DIVERGENCE FROM NORMALITY:

SKEWNESS AND KURTOSIS

SKEWNESS

- Skewness means asymmetrial nature.
- When the curve on clones towards right or left we cannot take it as a normal curve but as a skewed curve.
- The degree of departure from symmetry is called symmetry.

Skewness

- **Positive Skewness: Mean ≥ Median**
- **Negative Skewness: Median ≥ Mean**
- **Pearson's Coefficient of Skewness[3]:**

$$= \frac{3\,(\text{Mean} - \text{Median})}{\text{Standard deviation}}$$

NEGATIVE

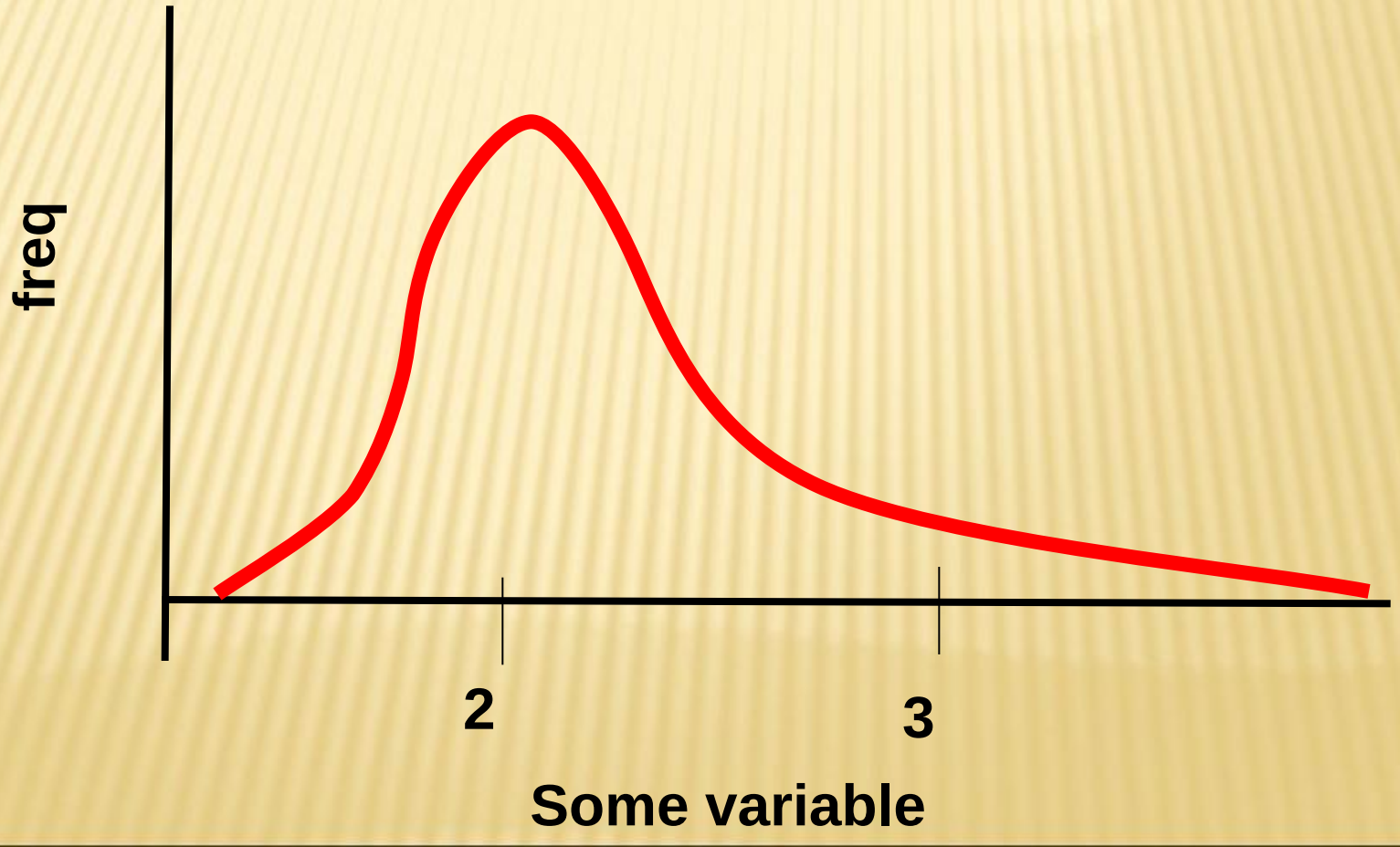
- When the curve inclines more to the left skewness becomes negative

POSITIVE

- When the curve inclines more towards right

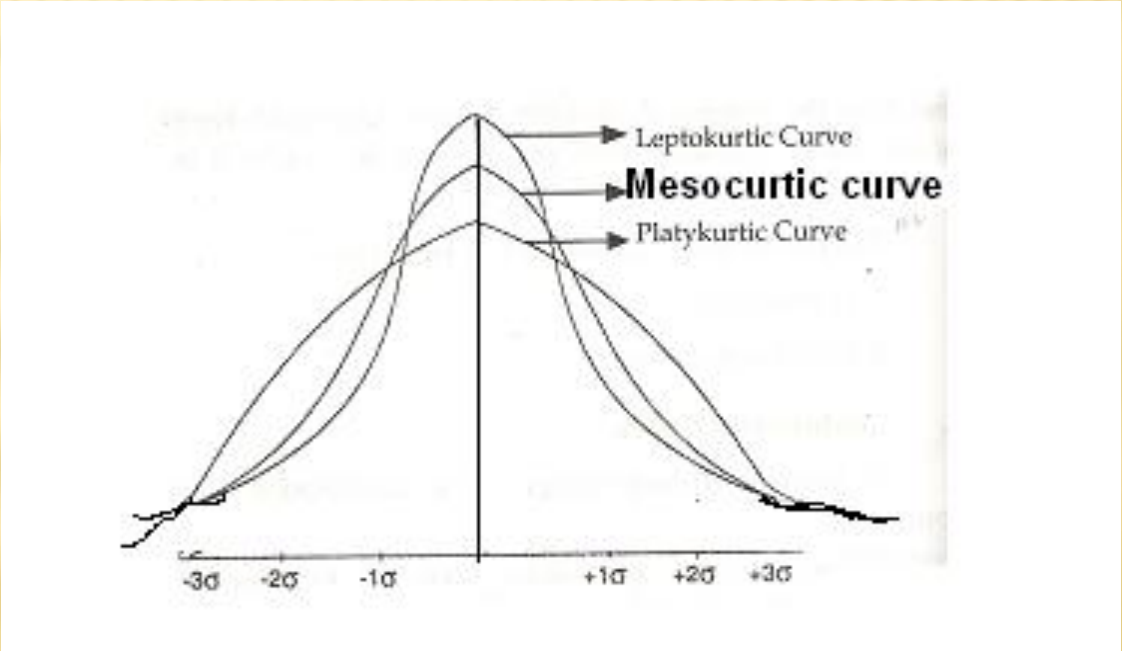
Skewness: asymmetry, one tail is drawn out

Mean not equal to median



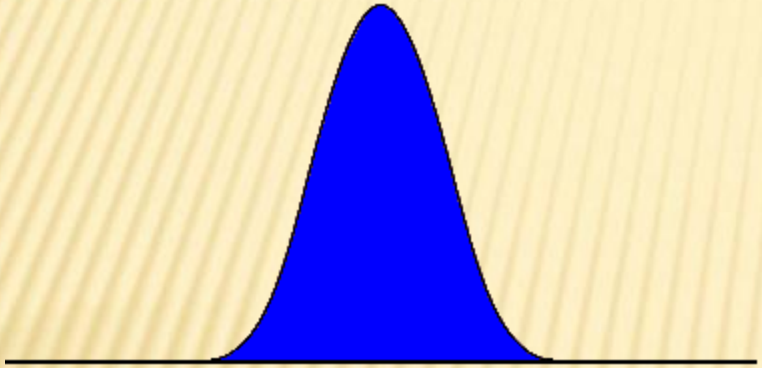
KURTOSIS

- Literally kurtosis means tendency of ‘flatness’ or ‘peakedness’.
- The normal curve is moderately peaked.



kurtosis: the proportion of a curve located in the center, shoulders and tails

How fat or thin the tails are



leptokurtic
no shoulders

platykurtic
wide shoulders

PLATY KURTOC

- When the curve is more flattened the distribution will be called as platy kurtoc

LEPTO KURTOC

- When the curve is more peaked than normal one it is called as lepto kurtoc curve

KURTOSIS FORMULA

$$Ku = \frac{Q}{P_{90} - P_{10}}$$

Where Q = quartile deviation,
P_{90} = 90^{th} percentile
P_{10} = 10^{th} percentile

REASONS FOR DIVERGENCE FROM NORMALITY

- Biased selection of sample
- Scoring errors
- Improper construction of a test
- Improper administration of a test
- Abnormality in the traits of the items.

Thank you...!