



AREA UNDER THE NORMAL CURVE

A. Area under the normal curve –

Refer to Table 5.6 in Spatz (1997, p. 120,)



B. Shows the unit normal curve, also called the standard normal curve

1. segmented by z-scores

2. for a population, $z = \frac{x - \mu}{\sigma}$, while for a sample

$$z = \frac{x - \bar{x}}{s}$$

3. area under the unit normal curve is defined as 1.0



Shows the unit normal curve (cont'd)

4. portions of the area are defined as >0 and <1 , usually to four (4) decimal places

5. 99.98% of the area under the curve is between $\mu - 3\sigma$ and $\mu + 3\sigma$, often written as $\mu \pm 3\sigma$
 - a. therefore, 99.98% of the area under the curve in ANY normal distribution lies between three standard deviations below the mean ($\mu - 3\sigma$) and three standard deviations above the mean ($\mu + 3\sigma$)



Shows the unit normal curve (cont'd)

b. there is the 68/95/99.9% rule

- 68% of the area under any normal curve lies within one standard deviation of the mean
- 95% of that area lies within two standard deviations of the mean
- 99.9% of that area lies within three standard deviations of the mean



C. Busha & Harter (1980, p. 249)

1. “The percentage of a normally distributed population falling between any two values is equal to the relative proportion of the area under the curve between these points.”
2. Recall that, for all normal distributions, $\mu = \text{median} = \text{mode}$
 - a. thus, 50% of the area under the curve lies to the right of μ , therefore, 50% of the values $> \mu$
 - b. same with the left part of the curve, 50% of the area under the curve lies to the left of μ , therefore, 50% of the values $< \mu$



D. Summary

1. For a useful, introductory review, see Rowntree's *Statistics Without Tears*, pp. 64-81
2. the reason that this set of concepts related to the area under the normal curve matters is that there is a stable relationship in every normal distribution between z-scores, percentile ranks, and area under the normal curve