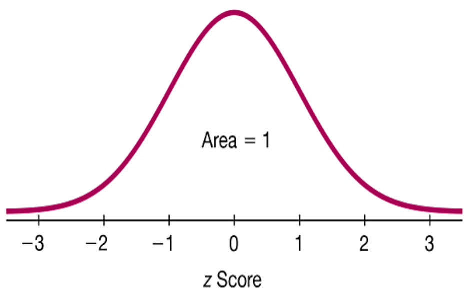
Chapter 6 Notes

In this section we present the **standard normal distribution,** which is a specific normal distribution having the following three properties:

1. Bell-shaped: The graph of the standard normal distribution is bell-shaped.
2. μ = 0: The standard normal distribution has a mean equal to 0.
3. σ = 1: The standard normal distribution has a standard deviation equal to 1.

   Summary: The **standard normal distribution** is a normal distribution with the parameters of μ = 0 and σ = 1. The total area under its density curve is equal to 1.



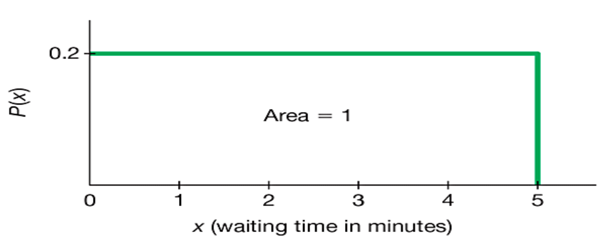
Uniform Distribution

Properties of uniform distribution:

1. The area under the graph of a continuous probability distribution is equal to 1.
2. There is a correspondence between area and probability, so probabilities can be found by identifying the corresponding areas in the graph using this formula for the area of a rectangle: Area = height × width

   A continuous random variable has a **uniform distribution** if its values are spread **evenly** over the range of possibilities. The graph of a uniform distribution results in a rectangular shape.

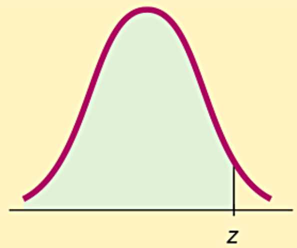
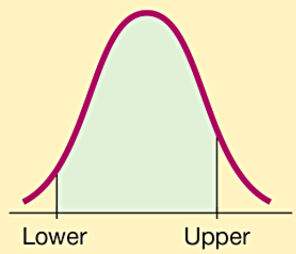
- Example: All of the different possible waiting times are **equally likely.**



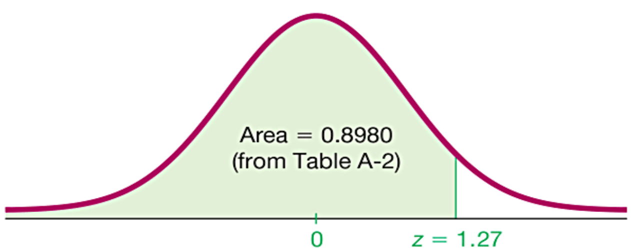
Normal distribution: **Finding Probabilities When Given z Scores**

- We can find areas (probabilities) for different regions under a normal model using technology or Table s
- Technology is strongly recommended.

Because calculators and software generally give more accurate results than Tables, we **strongly** recommend using technology.

Cumulative Area from the Left The following provide the *cumulative area from the left* up to a vertical line above a specific value of *z*: • **Table A-2** • **Statdisk** • **Minitab** • **Excel** • **StatCrunch**	 **Cumulative Left Region**
Area Between Two Boundaries The following provide the area bounded on the left and bounded on the right by vertical lines above specific values. • **TI-83/84 Plus calculator** • **StatCrunch**	 **Area Between Two Boundaries**

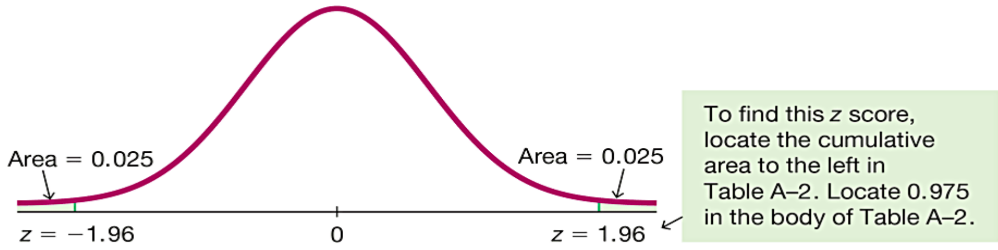
Example: p(z<1.27) = 0.8980



Critical Value:

For the standard normal distribution, a **critical value** is a *z* score on the borderline separating those *z* scores that are **significantly low** or **significantly high.**

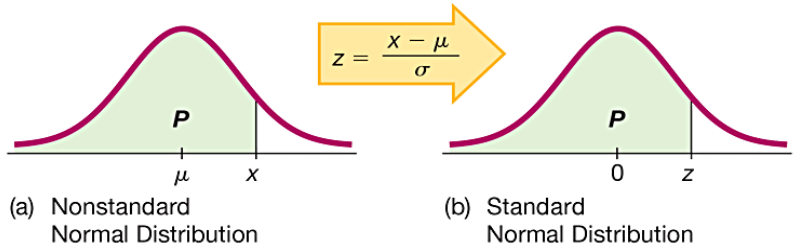
The expression z_α denotes the *z* score with an area of α to its right.



When working with normal distributions that are not standard. That is, the mean is not 0 or the standard deviation is not 1, or both.

The key is that we can use a simple conversion that allows us to "standardize" any normal distribution so that the same methods of the previous section can be used.

$$z = \frac{x - \mu}{\sigma}$$



If you know z and must convert to the equivalent *x* value, use the conversion formula by entering the values for μ, σ, and the *z* score found in step 2, and then solve for *x*. We can solve for *x* as follows:

$$x = \mu + (z \cdot \sigma)$$

The **central limit theorem:**

The central limit theorem states that given a distribution with a mean μ and variance σ^2, the sampling distribution of the mean approaches a normal distribution with a mean (μ) and a variance σ^2/n as n, the sample size, increases.

Consider n>30 a sufficiently large sample. Therefore, the r**equirements: is: The population has a normal distribution or *n* > 30:**

Then,

Mean of all values of $\bar{x}$: $\mu_{\bar{x}} = \mu$

Standard deviation of all values of $\bar{x}$: $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$

z score conversion of $\bar{x}$: $z = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}}$

Check Requirements: When working with the mean from a sample, verify that the normal distribution can be used by confirming that the original population has a normal distribution or the sample size is *n* > 30.

Intro to t- distribution.

Intro to Non-parametric statistics.