Lesson 2-2 Standard Normal Calculations

If x is an observation from a distribution that has mean µ and standard deviation σ, the ***standardized value*** of x is



These are also called ***z scores***.

The **standard normal distribution** is the normal distribution N(0,1) with mean 0 and standard deviation 1.



If a variable x has a normal distribution N(µ, σ), then the standardized value

has the standard normal distribution.

# Finding Normal Proportions

1. State the problem in terms of the observed variable, x.
2. Check to see if the situation represented is normal or nearly normal.
3. Draw a picture to show the area under the standard normal curve. Label and shade.
4. Convert your cutoff value for x to a z-score.
5. Find the required area under the normal curve. Use table A and the fact that the total area under the curve is equal to 1.
6. Interpret your answer in the context of the problem.

# Finding the Value for a Given Proportion

1. State the problem and define your variable.
2. Check to see if the normal model is appropriate.
3. Make a sketch with the normal model centered at µ. Shade the region of interest.
4. Find the z-score for your area of interest. You may need to subtract from 1.
5. Solve for x.
6. Interpret your answer in the context of the problem.

# Assessing Normality

Many procedures in statistics rely on data that is normally distributed in order to ensure accuracy. There are two methods used to assess normality of a distribution:

# Method 1

Construct a frequency ***histogram or a stem plot***. See if the shape is roughly bell-shaped and symmetric about the mean. Mark



on the x-axis. Compare the count of observations in each interval with the 68-95-99.7 rule.

# Method 2

Construct a ***normal probability plot*** (using software). If the data is close to normal, the plotted points will lie close to a straight line at a 45 degree angle. Conversely, non-normal data will show a non-linear trend.

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# What Can Go Wrong?

* Don’t use the normal model if the distribution is not unimodal and symmetric.
* Don’t use the normal model if outliers are present.
* Don’t round your results in the middle of the calculation.
* Don’t worry about minor differences in results.