Chapter 2.2 Standard Normal Distributions

**Review:**

* Last class we looked at a particular type of density curve called a Normal distribution.
  + All Normal distributions are described by two parameters: \_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_
  + Because of this, we can abbreviate a Normal distribution as \_\_\_\_(\_\_\_, \_\_\_)
  + Another important quality of Normal distributions is that the follow the \_\_\_\_\_\_\_\_\_\_ rule. This rule states that \_\_\_\_% of the data falls within 1 standard deviation of the mean, \_\_\_\_% falls within 2 standard deviations and \_\_\_\_\_% falls within 3 standard deviations.
* All normal distributions are the same if we measure in units of size \_\_\_about the \_\_\_\_\_ \_\_ as center.
  + Changing these units requires that we standardize (like we did in 2.1) using the formula:
  + If the variable we standardize has a normal distribution, then \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
  + The new distribution is called the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**

**The standard Normal Distribution:**

* The standard Normal distribution follows a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and has mean \_\_\_ and standard deviation \_\_\_\_
* Notice that the distribution is \_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_ about 0.
* Remember, the area under a density curve is a proportion of the observations in a distribution.
  + The area under the entire density curve is \_\_\_\_.
  + The proportion of observations to the left of the median is\_\_\_\_\_.
* We can find the proportion of observation that lie within any range of values simply by finding the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**The standard Normal Table:**

* Because standardizing Normal distributions makes them all the \_\_\_\_\_\_\_, we can use a single table to find the areas under a Normal distribution.
* This table is called the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
  + It’s inside the front cover of you textbook!
  + You will be given this table on the AP exam
* Example: Find the proportion of observations from the standard Normal distribution that are less than -2.15.
* Caution: the area that we found was to the \_\_\_\_\_\_\_ of z = -2.15. In this case, that is what we were looking for.
* HOWEVER if the problem had asked for the area lying to the RIGHT of -2.15. What would that answer be?
  + The total area under the curve is \_\_\_\_\_.
  + So if 0.0158 lies to the left of -2.15…
  + Then \_\_\_\_\_ - 0.0158= \_\_\_\_\_\_\_ lies to the \_\_\_\_\_\_ of -2.15
* **TO HELP YOU NOT MAKE THIS MISTAKE, ALWAYS:**

1. sketch \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. mark the \_\_\_\_\_\_\_\_
3. shade the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. THEN, when you get you answer, **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_!!**

**Solving Problems Involving Normal Distributions**

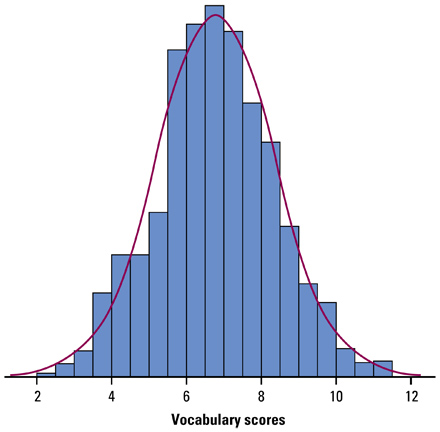
* **Step 1:** *\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*  in terms of the observed variable x. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the distribution and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* **Step 2:**  *\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.* We need to standardize \_\_\_\_ to restate the problem in terms of a standard Normal variable \_\_\_\_. Draw a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to show the area of interest under our now standard Normal curve.
* **Step 3:** *\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*. Find the \_\_\_\_\_\_\_\_\_ under the standard Normal curve using \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. (**careful** if the problem asks for the area to the right)
* **Step 4:**   *.* Write your conclusion in the \_\_\_\_\_\_\_\_\_ of the problem.

**Example: Cholesterol and Young Boys**

* For 14-year-old boys, the mean is μ = 170 milligrams of cholesterol per deciliter of blood (mg/dl) and the standard deviation σ = 30 mg/dl. Levels above 240 mg/dl may require medical attention. What percent of 14-year-old boys have more than 240 mg/dl of cholesterol?

**Finding a Value when Given a Proportion**

* What if you wanted to know what score you would have to get in order to place among the top 10% of your class on a test?
  + Sometimes, we may be asked to find the observed value with a given proportion of the observations above or below it.
  + To do this, we just read Table A going backwards. In other words, find \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in the \_\_\_\_\_\_\_\_\_of the table, figure out the corresponding \_\_\_\_\_\_\_, and then “\_\_\_\_\_\_\_\_\_\_\_\_\_\_” to get the \_\_\_\_\_\_\_\_\_\_ value.
* **Example:** Scores on the SAT Verbal test in recent years ollow approximately the N(505, 110) distribution. How high must a student score in order to place in the top 10% of all students taking the SAT.

**Assessing Normality**

**Method #1: Graph the data.**

Draw a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and look for “non-Normal” features of a distributions such as\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_, or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Method #2: Use the Empirical Rule.**



**Method #3:** Construct a **normal probability plot.** (calculator)

