Exam Review Normal Distribution and Z-score
Algebra 2

Name Key 2013-14
Hour ______ Date ____________

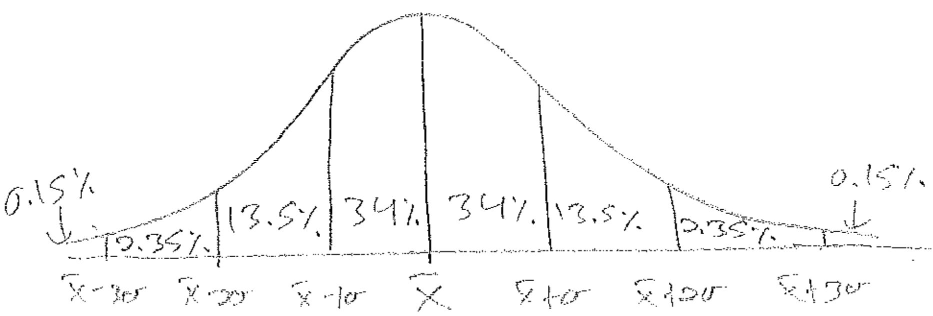
A **normal curve** is used to describe a **normal distribution**. It is symmetric, single-peaked, and bell-shaped.

Outliers in a normal curve occur if x > $\bar{x} + 2\sigma$ or if x < $\bar{x} - 2\sigma$ (beyond 2σ)

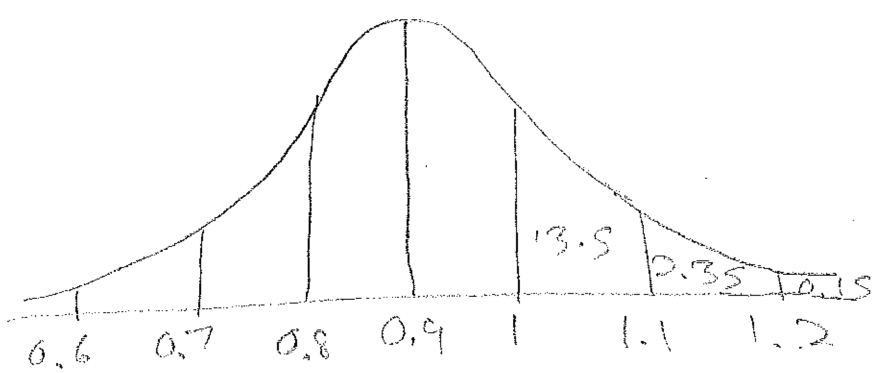
Empirical Rule (68 – 95 – 99.7 Rule)

- 68% of the observations fall within 1 σ of μ.
- 95% of the observations fall within 2 σ of μ.
- 99.7% of the observations fall within 3 σ of μ.

Draw the 68-95-99.7 rule on a normal curve.



Example 1: The amount of mustard dispensed from a machine at *The Hotdog Emporium* is *normally distributed* with a mean of 0.9 ounce and a standard deviation of 0.1 ounce. If the machine is used 500 times, *approximately* how many times will it be expected to dispense 1 or more ounces of mustard. (Hint: Draw and Label the normal curve)



16%

$0.16 \cdot 500 = \boxed{80}$

Z-Score Formula:

$z = \frac{x - \bar{x}}{s}$ x - data value given, $\bar{x}$ - mean, s – standard deviation

Example 2: The mean of a population is 30 with a standard deviation of 2.8. What is the z-score for x = 27.1? What does it mean in terms of standard deviations?

$z = \frac{(27.1 - 30)}{2.8} = -1.04$

The value 27.1 falls 1.04 σ below the $\bar{x}$.

When finding probabilities for normal distribution there are three scenarios:

- To find probability **<u>below</u>** a certain data value:
  1. Get the z-score
  2. Find the probability on the z-table
- To find the probability **<u>above</u>** a certain data value:
  1. Get the z-score
  2. Take: 1 - the probability you get on the z-table
- To find the probability **<u>in between</u>** two data values:
  1. Find both z-scores
  2. Get the probability for both on the z-table
  3. Take: big probability – small probability

Example 3: In the United States, the average IQ is 100, with a standard deviation of 15.

a. What percentage of the population would you expect to have an IQ lower than 85?

$z = \frac{(85-100)}{15} = -1$ $P(x<100) = 15.87\%$

b. What percentage of the population would you expect to have an IQ between 90 and 120?

$z = \frac{(90-100)}{15} = -0.7$ $z = \frac{(120-100)}{15} = 1.3$ $P(90<x<120) = 90.32 - 24.20 = 66.12\%$

c. What percentage of the population would you expect to have an IQ higher than 110?

$z = \frac{(110-100)}{15} = 0.7$ $P(x>110) = 100 - 75.80 = 24.2\%$