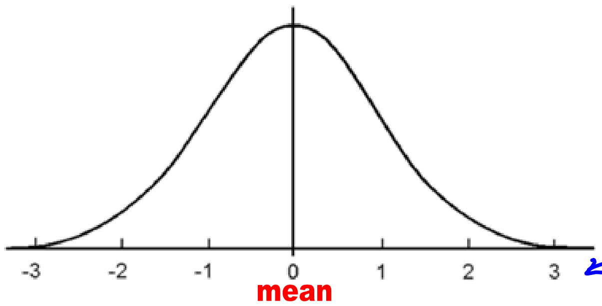
Standard Normal Curve:



z-scores
# of S.D. from the mean

mean
median

If a set of data conforms to a bell-shaped (mound) curve, the data are said to be **normally distributed**. The normal curve shown above is a **Standard Normal Curve**. The standard normal curve is centered on the x-axis so that the mean is at 0 and its standard deviation is 1.

In a normal distribution, the median is the same as the mean value. So 50 % of the data lies below the mean (0) and 50 % of the data lies above the mean (0).

68.2% 1
Most of the data (99.7%) is within 3 standard deviations of the mean.
95% 2

When calculating probabilities associated with normal distributions use z-scores.

Z-scores measure number of standard deviations away from the mean.

Z represents a variable that has a standard normal distribution with mean of 0 and standard deviation of 1.

Positive z-score→ corresponds to a value that's above the mean

Negative z-score→ corresponds to a value that's below the mean

memorize!

$$z = \frac{\text{value-mean}}{\text{standard deviation}}$$

1. The prices of the printers in a store have a mean of \$240 and a standard deviation of \$50. The printer that you eventually choose costs \$340.
   a. What is the z score for the price of your printer?

   $$z = \frac{340-240}{50} = \frac{100}{50} = 2$$

   b. How many standard deviations above the mean was the price of your printer?

   2

2. Adam's height is 63 inches. The mean height for boys at his school is 68.1 inches, and the standard deviation of the boys' heights is 2.8 inches.
   a. What is the z score for Adam's height? (Round your answer to the nearest hundredth.)

   $$z = \frac{63-68.1}{2.8} = \frac{-5.1}{2.8} = -1.82$$

   b. What is the meaning of this value?

   Adam is 1.82 SD. below the average height of boys in his school

3. Explain how a z score is useful in describing data.

   It tells how far a particular piece of data is from the mean (above or below), and we can then determine how unusual it is to happen.

4. A town's January high temperatures average 36° F with a standard deviation of 10°, while in July the mean high temperature is 74° and the standard deviation is 8°. In which month is it more unusual to have a day with a high temperature of 55°? Explain.

$$Z_{Jan} = \frac{55-36}{10} = 1.9$$

$$Z_{July} = \frac{55-74}{8} = -2.375$$

It is more unusual to have a 55 degree day in July than in January because the July Z-score is further from the mean.

To find the probability on the normal curve between two z-scores we can use the Graphing Calculator's Normal Cumulative Density Function (Normalcdf):

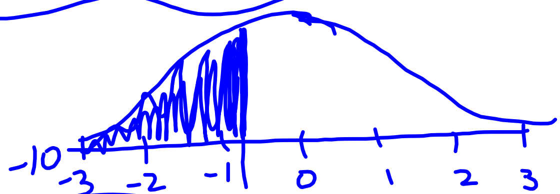
2nd Vars – 2: Normalcdf (lower, upper)

Normalcdf([left/lower z bound], [right/upper z bound])   ↓   2nd→VARS→2:normalcdf(

*ALWAYS DRAW A PICTURE!!!

5. Find

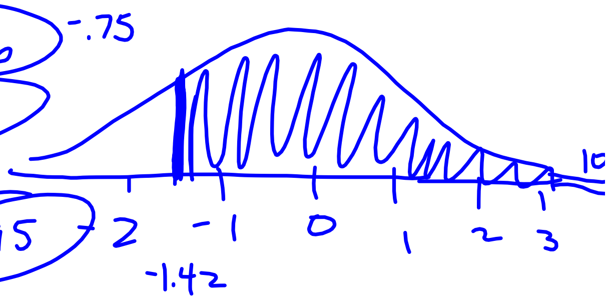
a. the area to the left of z = -0.75.



normalcdf(-10, -.75) = .2266

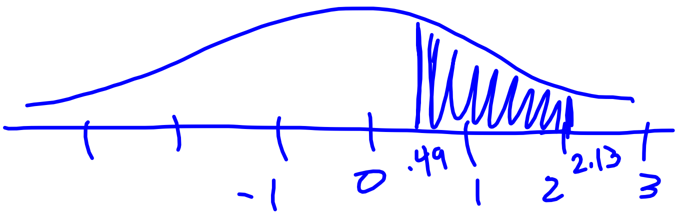
b. the area to the right of z = -1.42.

normalcdf(-1.42, 10) = .922



c. the area between z = 0.49 and z = 2.13.

normalcdf(.49, 2.13) = .295



6. A swimmer named Amy specializes in the 50-meter backstroke. In competition her mean time for the event is 39.7 seconds, and the standard deviation of her times is 2.3 seconds. Assume that Amy's times are approximately normally distributed.

   a. Using z scores and a graphing calculator and rounding your answers to the nearest thousandth, find the probability that Amy's time in her next race is between 37 and 44 seconds.

$$z_{37} = \frac{37-39.7}{2.3} = -1.174$$

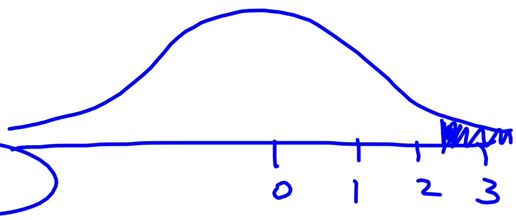
$$z_{44} = \frac{44-39.7}{2.3} = 1.870$$

normalcdf(-1.174, 1.870) = .849

   b. What is the probability that Amy's time would be at least 45 seconds?

$$z_{45} = \frac{45-39.7}{2.3} = 2.304$$

normalcdf(2.304, 10) = .011

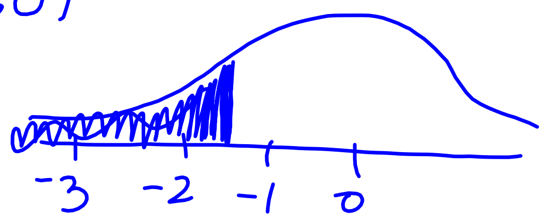


   c. Using z scores and a graphing calculator and rounding your answers to the nearest thousandth, find the probability that Amy's time in her next race is less than 36 seconds.

$$z_{36} = \frac{36-39.7}{2.3} = -1.609$$

normalcdf(-10, -1.609)

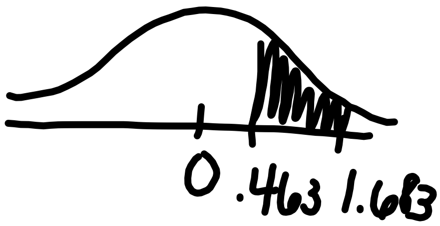
.054



7. The distribution of lifetimes of a particular brand of car tires has a mean of 51,200 miles and a standard deviation of 8,200 miles.
   a. Assuming that the distribution of lifetimes is approximately normally distributed and rounding your answers to the nearest thousandth, find the probability that a randomly selected tire lasts
      i. between 55,000 and 65,000 miles.

$$z = \frac{55{,}000 - 51{,}200}{8{,}200} = .463$$

$$z = \frac{65{,}000 - 51{,}200}{8{,}200} = 1.683$$



Prob = .275

      ii. less than 48,000 miles.

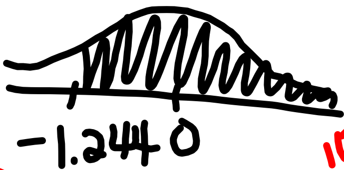
$$z = \frac{48{,}000 - 51{,}200}{8{,}200} = -.390$$

-10

Prob = .348

      iii. at least 41,000 miles.

$$z = \frac{41{,}000 - 51{,}200}{8{,}200} = -1.244$$



10

Prob = .893

Quiz moved to
tomorrow
(on Day 1)