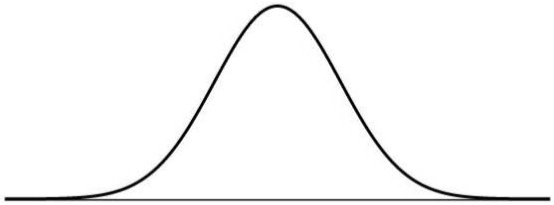
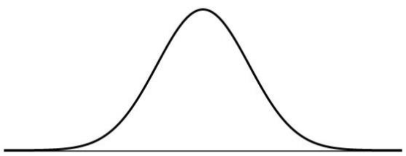
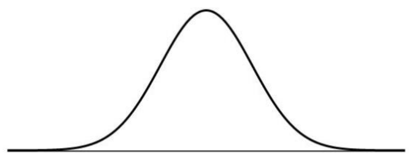
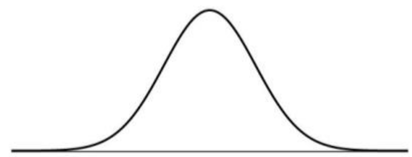
Stat 150 – Area Under Curves   Name:______________________________

Recall that the total area underneath the entire normal curve is ___________ or ________.



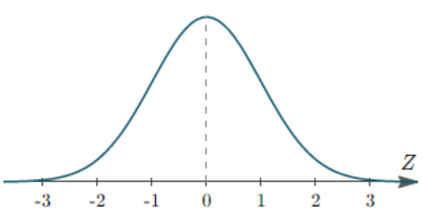
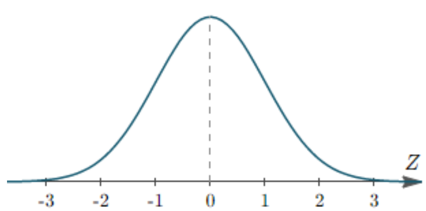
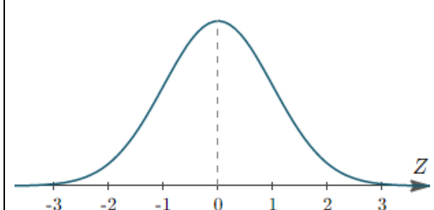
1. Shade the area requested.

a) Center 75%	b) Middle 20%	c) The bottom 5% and the top 5%
		

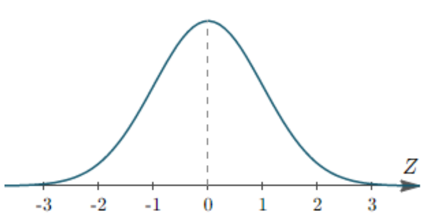
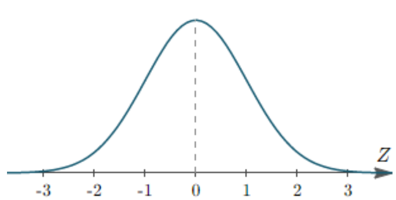
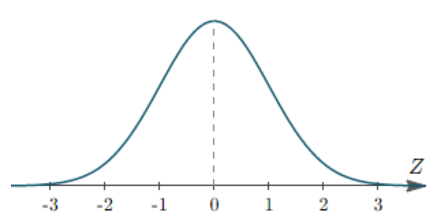
A z-score is the number of _________________________ from the mean a data point is on a normal distribution. On a standard normal distribution, the mean is ___________ and the standard deviation is __________.

We can work backwards so that if we know what probability/area we want under the curve, then we can find the z −score.

2. Estimate the z-score by making a mark that separates the given area on the following standard normal distributions.

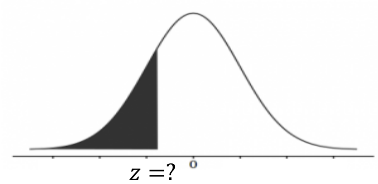
a) Lower 10% of z-scores	b) Lower 45% of z-scores	c) Lower 75% of z-scores
		

3. Estimate the z-score by making a mark that separates the given area on the following standard normal distributions.

a) Top 10% of z-scores	b) Top 45% of z-scores	c) Top 75% of z-scores
		

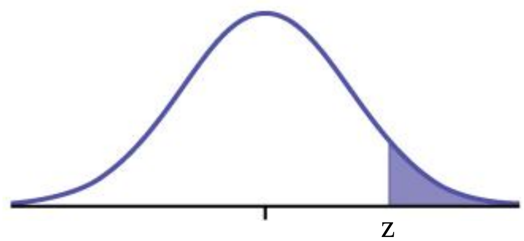
4. For the last two exercises, what do you notice about the estimated numerical values of your z-scores? Why do you think that is?

5. Is this the correct picture for a z −score that separates the bottom 85% of the data from the top 15%. Why or why not?



6a. Given the diagram below, circle which area to the right you think is shaded out of the options below:

- 10% to the right of z
- 5% to the right of z
- 90% to the right of z
- 1% to the right of z



6b. Why did you choose this answer out of the four options? What does that mean the area to the left will be?

6c. Do you think the z-score we find will be negative, zero, or positive? Explain your reasoning.

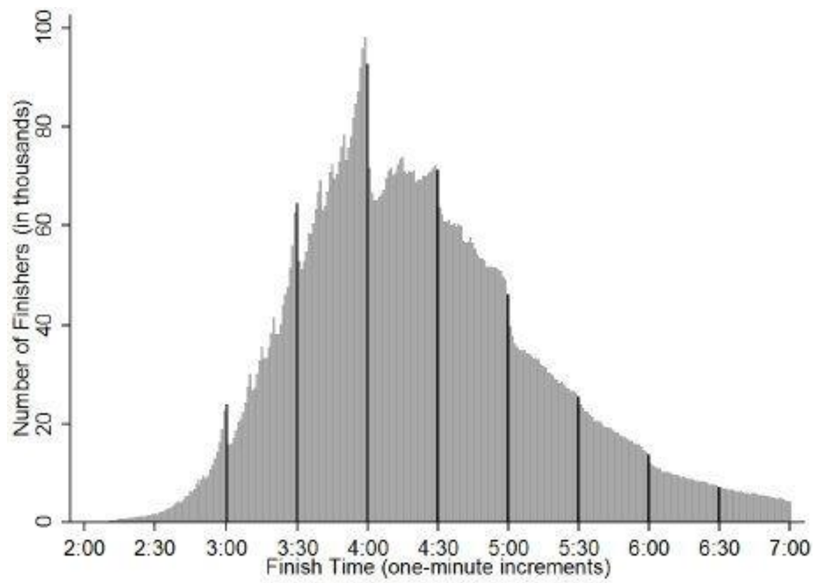
Sources used: Allen, Eric & Dechow, Patricia & Pope, Devin & Wu, George. (2016). Reference-Dependent Preferences: Evidence from Marathon Runners. Management Science. 63. 10.1287/mnsc.2015.2417 and https://www.theatlantic.com/sexes/archive/2013/01/why-its-so-rare-for-a-wife-to-be-taller-than-her-husband/272585/

The following infographic is a real world example of an approximately normal distribution, made up of around 9 million marathon (26.2 miles) finishing times (in hours and minutes).

7a. What marathon time has the highest frequency? Why do you think that is?

7b. What would you estimate the mean marathon time to be, and why?

Distribution of Marathon Finishing Times

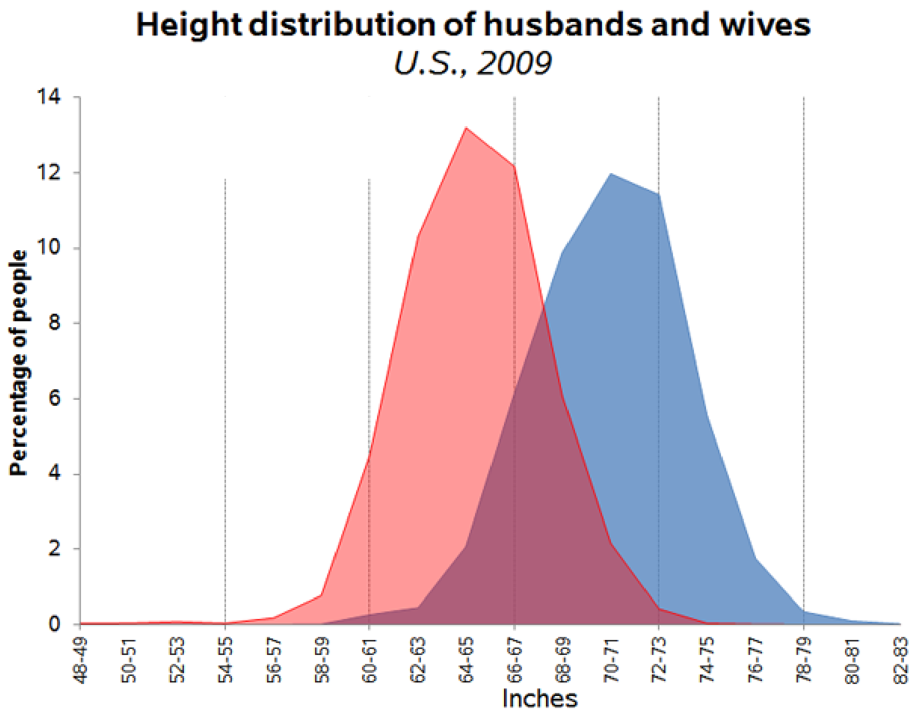


7c. What marathon time would you estimate to separate the fastest 5% of finishers from the other 95%?

7d. What marathon time would you estimate to separate the slowest 20% of finishers from the other 80%?

Sources used: Allen, Eric & Dechow, Patricia & Pope, Devin & Wu, George. (2016). Reference-Dependent Preferences: Evidence from Marathon Runners. Management Science. 63. 10.1287/mnsc.2015.2417 and https://www.theatlantic.com/sexes/archive/2013/01/why-its-so-rare-for-a-wife-to-be-taller-than-her-husband/272585/

The following infographic is a real world example of two approximately normal distributions, made up of a survey on the height distributions of 4,600 husbands and wives in the United States in 2009.



8a. Which distribution belongs to the husbands and which to the wives? Why do you believe that?

8b. What do you believe is the mean height for the wives?

8c. Which distribution has a smaller standard deviation?

8d. What height would you estimate to separate the shortest 30% of husbands from the taller 70%?

8e. What two heights would you estimate to contain the middle 50% of wives?

Sources used: Allen, Eric & Dechow, Patricia & Pope, Devin & Wu, George. (2016). Reference-Dependent Preferences: Evidence from Marathon Runners. Management Science. 63. 10.1287/mnsc.2015.2417 and https://www.theatlantic.com/sexes/archive/2013/01/why-its-so-rare-for-a-wife-to-be-taller-than-her-husband/272585/