Chapter 2 Packet: Multiple Choice Practice Solutions

4. The distribution of heights of students in a large class is roughly Normal. The average height is 68 inches, and approximately 99.7% of the heights are between 62 and 74 inches. Thus, the variance of the height distribution is approximately equal to

1. 2
2. 3
3. 4
4. 6
5. 9

The answer is C. We know that approximately 99.7% of the data fall within 3 standard deviations of the mean according to the 68-95-99.7 rule, so 74 is +3 standard deviations away from the mean (and 62 is – 3 standard deviations away from the mean). Written as an equation, this is

$$74=\overbar{x}+3σ$$

$$74=68+3σ$$

$$2=σ$$

Because $variance=σ^{2}$, the variance is 4.

5. The mean age (at inauguration) of all U.S. Presidents is approximately Normally distributed with a mean of 54.6. Barack Obama was 47 when he was inaugurated, which is the 11th percentile of the distribution. George Washington was 57. What percentile was he in?

1. 6.17
2. 65.17
3. 62.92
4. 34.83
5. 38.9

The answer is B. You should draw the Normal curve to visually see what information you have and what you are looking for. Ultimately, we need to know the z-score for Washington’s age of 57. If we have that information, we can look up the area to the left of the z-score using Table A in the back of the book or using the normalcdf( ) function on the calculator.

$$z=\frac{x-μ}{σ}$$

$$z=\frac{57-54.6}{σ}$$

We just need to figure out what the standard deviation is to get the z-score above. To do this, we’ll use the information given for Obama’s percentile and work backward to find the standard deviation. If Obama is in the 11th percentile, we can look that up in Table A or use the calculator function invNorm( ) to get the z-score if we know the percentile. Thus, for an area of 0.11, the z-score is -1.23. This means

$$z=\frac{x-μ}{σ}$$

$$-1.23=\frac{47-54.6}{σ}$$

$$-1.23=\frac{-7.6}{σ}$$

$$σ=\frac{-7.6}{-1.23}$$

$$σ≈6.18$$

Now that we know the approximate value of the standard deviation, we can find the z-score for Washington and use it to find his percentile (area to the left of his z-score under the standard Normal curve).

$$z=\frac{57-54.6}{6.18}$$

$$z≈0.3883$$

Looking this value up in Table A or using the normalcdf(-100, 0.3883, 0, 1) function in the calculator (where mean = 0 and standard deviation = 1 because it’s the standard Normal curve and -100 is the lower bound because we’re looking for the area to the very end of the tail of the distribution), we get 0.6517. Thus, Washington was older than 65% of presidents at inauguration.