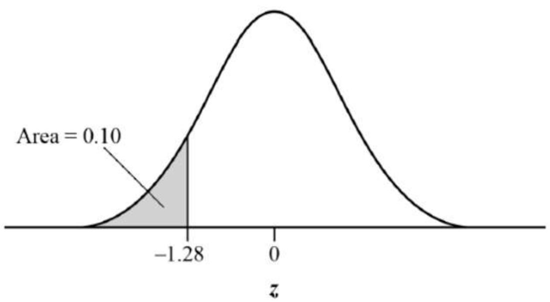
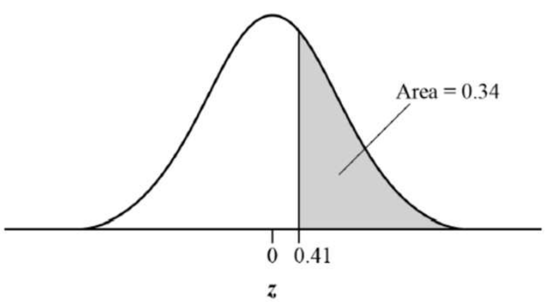
Homework Unit 1

Assignment 5

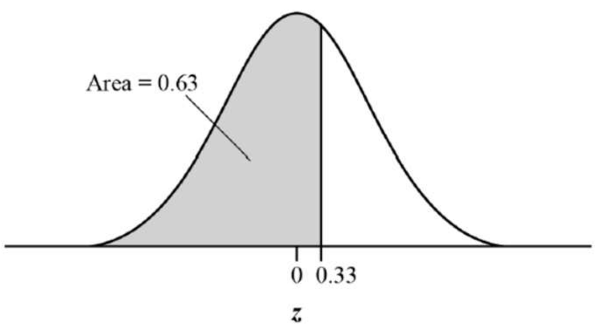
2.51 (a) The value that is closest to 0.1000 in Table A is 0.1003. This corresponds to a value of -1.28 for z.



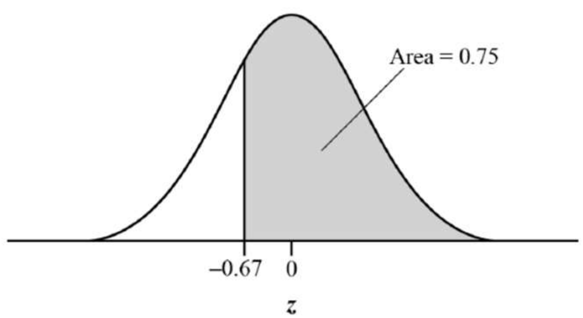
(b) The point where 34% of observations are greater is also the $100-34=66^{\text{th}}$ percentile. The value that is closest to 0.6600 in Table A is 0.6591, which corresponds to a z-score of 0.41.



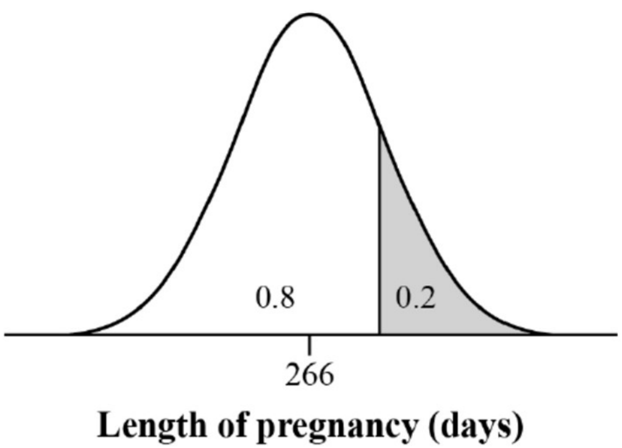
2.52 (a) The value that is closest to 0.6300 in Table A is 0.6293, which corresponds to a z-value of 0.33.



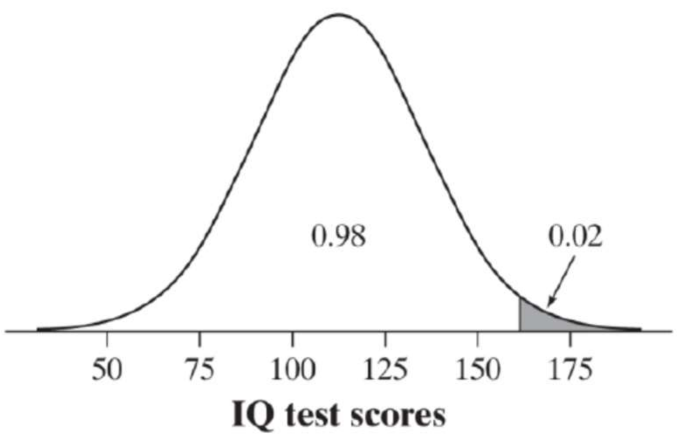
(b) If 75% of values are greater than z, then 25% are lower. The value that is closest to 0.2500 in Table A is 0.2514, which corresponds to a z-score of –0.67.



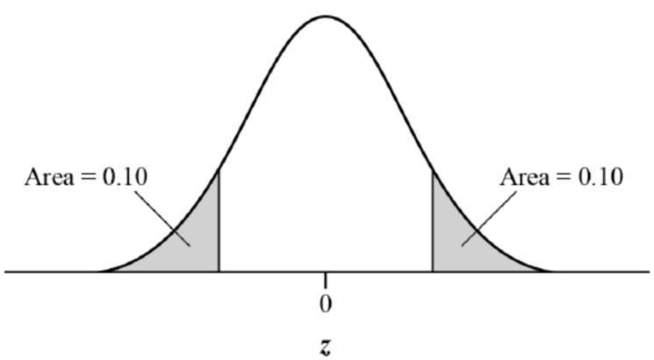
2.53 (c) **Step 1: State the distribution and values of interest.** The length of pregnancies follows a Normal distribution with $\mu = 266$ days and $\sigma = 16$ days. We are looking for the boundary value x that has an area of 0.20 to the right and 0.80 to the left (see graph below). **Step 2: Perform calculations. Show your work.** Look in the body of Table A for the value closest to 0.80. A z-score of 0.84 gives the closest value (0.7995). Solving $0.84 = \dfrac{x - 266}{16}$ gives $x = 279.44$. *Using technology:* The command invNorm(area: 0.8, μ: 266, σ: 16) gives a value of 279.47. **Step 3: Answer the question.** The longest 20% of pregnancies last longer than 279.47 days.



2.54 (c) **Step 1: State the distribution and values of interest.** For the 20 to 34 age group, IQ scores follow a Normal distribution with $\mu = 110$ and $\sigma = 25$. We are looking for the boundary value x that has an area of 0.02 to the right and 0.98 to the left (see graph below). **Step 2: Perform calculations. Show your work.** Look in the body of Table A for a value closest to 0.98. A z-score of 2.05 gives the closest value (0.9798). Solving $2.05 = \dfrac{x - 110}{25}$ gives $x = 161.25$. *Using technology:* The command invNorm(area: 0.98, μ: 110, σ: 25) gives a value of 161.34. **Step 3: Answer the question.** Scores greater than 161.34 qualify for MENSA.



2.59 (a) Using Table A, we are looking for the values of z that have areas of 0.10 and 0.90 to the left of z (see graph below). The value $z = -1.28$ has an area of 0.1003 to the left and the value $z = 1.28$ has an area of 0.8997 to the left. *Using technology*: The command invNorm(area: 0.10, μ : 0, σ : 1) gives $z = -1.282$ and the command invNorm(area: 0.90, μ : 0, σ : 1) gives $z = 1.282$.



(b) Solving $-1.28 = \dfrac{x - 64.5}{2.5}$ gives $x = 61.3$ inches and solving $1.28 = \dfrac{x - 64.5}{2.5}$ gives $x = 67.7$ inches. The first decile is 61.3 inches and the last decile is 67.7 inches. *Using technology*: Solving $-1.282 = \dfrac{x - 64.5}{2.5}$ gives $x = 61.295$ inches and solving $1.282 = \dfrac{x - 64.5}{2.5}$ gives $x = 67.705$ inches. The first decile is 61.295 inches and the last decile is 67.705 inches.

Assignment 6

2.35 (a) It is on or above the horizontal axis everywhere, and the area beneath the curve is $\frac{1}{3} \times 3 = 1$.

(b) This is a $\frac{1}{3}$ by 1 rectangle, so the area (proportion) is $\frac{1}{3} \times 1 = \frac{1}{3}$.

(c) Because $1.1 - 0.8 = 0.3$, this is a $\frac{1}{3}$ by 0.3 rectangle, so the proportion is $\frac{1}{3} \times 0.3 = 0.1$.

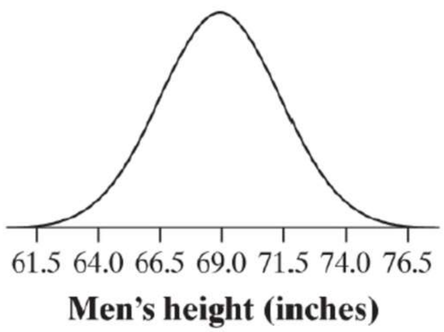
2.36 (a) It is on or above the horizontal axis everywhere, and the area beneath the curve is $\frac{1}{10} \times 10 = 1$.

(b) Because 10 – 8 = 2, this is a 1/10 by 2 rectangle, so the percent is $\frac{1}{10} \times 2 = 0.2 = 20\%$.

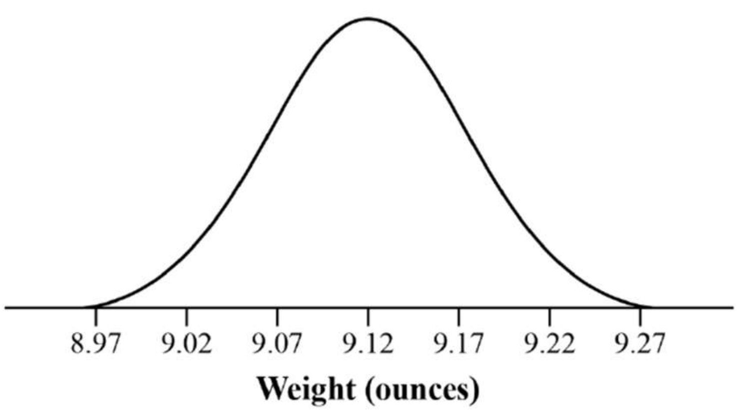
(c) Because 5.3 – 2.5 = 2.8, this is a 1/10 by 2.8 rectangle, so the percent is $\frac{1}{10} \times 2.8 = 0.28 = 28\%$.

2.37 Both are 1.5. The mean is 1.5 because the balance point of a symmetric density curve is exactly in the middle. The median is also 1.5 because half of the area lies to the left of 1.5 and half to the right of 1.5.

2.41 The Normal density curve with mean 69 and standard deviation 2.5 is shown below.



2.42 The Normal density curve with mean 9.12 and standard deviation 0.05 is shown below.



2.43 (a) Approximately 95% of men have heights within 2 standard deviations of the mean. That is, between $69 - 2(2.5) = 64$ and $69 + 2(2.5) = 74$ inches.

(b) 74 inches is two standard deviations above the mean, so approximately $\frac{100\% - 95\%}{2} = 2.5\%$ of men are taller than 74 inches.

(c) Approximately $\frac{100\% - 68\%}{2} = 16\%$ of men are shorter than 66.5 inches, because 66.5 is one standard deviation below the mean. Approximately $\frac{100\% - 95\%}{2} = 2.5\%$ are shorter than 64 inches, because 64 inches is two standard deviations below the mean. So, approximately $16\% - 2.5\% = 13.5\%$ of men have heights between 64 inches and 66.5 inches.

(d) The value 71.5 is one standard deviation above the mean. Because $\frac{100\% - 68\%}{2} = 16\%$ of the area is to the right of 71.5, $100\% - 16\% = 84\%$ of the area is to the left of 71.5. Thus, a height of 71.5 is at the 84^{th} percentile of adult male American heights.

2.44 (a) Approximately 68% of bags have weights within 1 standard deviation of the mean. That is, between $9.12 - 0.05 = 9.07$ ounces and $9.12 + 0.05 = 9.17$ ounces.

(b) 9.02 is two standard deviations below the mean, so approximately $\frac{100-95}{2} = 2.5\%$ of bags weigh less than 9.02 ounces.

(c) Approximately $100\% - \frac{100\% - 68\%}{2} = 100\% - 16\% = 84\%$ of bags have weights less than 9.17 ounces, because 9.17 is one standard deviation above the mean. Approximately $\frac{100\% - 99.7\%}{2} = 0.15\%$ of bags have weight less than 8.97 ounces, because 8.97 is three standard deviations below the mean. So, approximately $84\% - 0.15\% = 83.85\%$ of bags have weights between 8.97 and 9.17 ounces.

(d) The value 9.07 is one standard deviation below the mean. Approximately $\frac{100\% - 68\%}{2} = 16\%$ of the bags weigh less than 9.07 ounces. In other words, 9.07 is the 16th percentile of the weights of these potato chip bags.

2.45 Approximately 95% of the values for the taller curve are between –0.4 and 0.4, so the standard deviation is approximately 0.2. Approximately 95% of the values for the shorter curve are between –1 and 1, so the standard deviation is approximately 0.5. These values can also be obtained by finding the inflection points on each curve and estimating the horizontal distance between the inflection point and the mean.