Methods for Describing Sets of Data

2. 8   Z-Scores

1. In 2004, a study of 10,000 Americans was done to measure the typical American body. In the study, it was found that men in the survey, ages 18 to 25 had, on average, a 41-inch chest, 35-inch waist, and 41-inch hips. The standard deviation for waist sizes is approximately 3.5 inches. Would a 19 year old male with a 30 inch waist have an unusually small waist?

2. In the same 2004 study of 10,000 Americans, men in the survey from the ages of 36 to 45 had the following average waist measurements by race: white men came in 38, black men at 37, and Hispanic men 38 and ''other'' 37. Assume the standard deviation for waist sizes in this age group to be approximately 3.4 inches. Would a 36 year old black male with a 31.5 inch waist be considered to have an unusually small waist?

3. The CDC reports that the average: height for women is 63.8 inches, weight for women is 164.7 pounds, and waist circumference is 37 inches. For men, the CDC reports the following numbers: height for men is 69.4 inches, weight for men is 194.7 pounds, and waist circumference is 39.7 inches (note: these values are for men and women 20 years old and up). Assume that the standard deviation for women's waist circumference is 3.1, and the standard deviation for men's waist circumference is 3.6. Based on these numbers, who has a relatively thinner waist a woman who has a 25 inch waist or a man with a 30 inch waist?

4. Who did relatively better on their College Algebra final: a student who scored an 86 on an exam with a class average of 74 and a standard deviation of 14, or a student who scored an 80 in a class with an average of 72 and a standard deviation of 16.4?

5. Who scored relatively better on their sociology final exam? A student who earned a 64 on an exam with a mean of 72 and a standard deviation of 12.1, or a student who earned a 56 on an exam with a mean of 63 and a standard deviation of 11.3.

6. A student in Physics 101 scored a 65 on his first exam. The class average was a 76, and the standard deviation was a 10.1. Her friend in another class scored a 58 on her first Physics 101 exam, but her exam had a class average of 69 with a standard deviation of 11.5. Which grade is relatively better, the 65 or the 58?

Answers:

1. This is not unusual, because the z score is only -1.43. This is only 1.43 standard deviations below average.

2. This is not unusual, because the z score is only -1.62. This is only 1.62 standard deviations below average.

3. The woman is thinner because her waist size has a z-score of -3.87. The man's score was only -2.69. Both are unusually thin, but the woman's size is more extreme (notice a lower z-score here means a smaller waist).

4. The 86 is better since it has a z-score of 0.86 versus the score of 80 which only has a z-score of 0.49 (remember a higher z-score means a higher grade).

5. The 56 is the better grade with a z-score of -0.62. The 64 only had a z-score of -0.66 (remember that the higher z-score is the better grade and -0.62 > -0.66).

6. The 58 is better with a z-score of -0.96 versus the 65 with a z-score of -1.09.