

1. A student took her college placement exams in French and mathematics. In French, she scored 82 and in math 86. The overall results on the French exam had a mean of 72 and a standard deviation of 8. The mean math score was 68 with a standard deviation of 12. On which exam did she do better compared with other incoming freshman?

$$\text{French Z-score} = \frac{82 - 72}{8} = 1.25$$

$$\text{Math Z-score} = \frac{86 - 68}{12} = 1.5$$

She did better on the Math placement test b/c z-score is higher.

2. Until the scale was changed in 1995, SAT scores were based on a scale set many years ago. For Math scores, the mean under the old scale in the 1990s was 470 with a standard deviation of 110. In 2009, the mean was 515 with a standard deviation of 116. Gina took the SAT in 1994 and scored 500. Her cousin, Colleen took the SAT in 2013 and scored 530. Who did better on the exam?

$$\text{Gina Z-score} = \frac{500 - 470}{110} = .27$$

$$\text{Cousin Z-score} = \frac{530 - 515}{116} = .13$$

Gina did better on the exam because her z-score was larger.

3. The average sugar in 23 kinds of cereals is 7.6 grams of sugar per serving with a standard deviation of 4.5 grams. For a-c, find the z-scores for the following cereals and describe what the z-score tells you about that cereal.

- a. Frosted Flakes: 11 grams of sugar per serving

$$\frac{11 - 7.6}{4.5} = .76$$

- b. Apple Jacks: 14 grams of sugar per serving

$$\frac{14 - 7.6}{4.5} = 1.42$$

- c. Honey Oats: 3 grams of sugar per serving

$$\frac{3 - 7.6}{4.5} = -1.02$$

- d. The z-score for Honey Smacks' sugar content is 3.871. How many grams of sugar are in one serving?

$$3.871 = \frac{x - 7.6}{4.5} \quad x = 25 \text{ grams sugar}$$

- e. A bran cereal is very low in sugar with a z-score of -0.8. How many grams of sugar are in one serving?

$$-0.8 = \frac{x - 7.6}{4.5} \quad x = 4 \text{ grams sugar}$$

4. The Virginia Cooperative Extension reports that the mean weight of yearling Angus steers is 1152 pounds. Suppose that the standard deviation is 84 pounds.

- a. How many standard deviations from the mean would a steer weighing 1000 pounds be?

$$\frac{1000 - 1152}{84} = -1.81$$

1.81 st deviations below mean

- b. Which is more unusual, a steer weighing 1000 pounds or a steer weighing 1250 pounds?

$$\frac{1250 - 1152}{84} = 1.17$$

A steer weighing 1000 pounds is more unusual because its std deviation is further from mean.

- c. What's the actual weight of a steer with a z-score of -1.5?

$$-1.5 = \frac{x - 1152}{84}$$

$$x = 1026 \text{ lbs}$$

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

$$\text{Jan z-score} = \frac{55 - 36}{10} = 1.9$$

$$\text{July z-score} = \frac{55 - 74}{8} = -2.375$$

It is more unusual in July because its z-score is further from mean.