Name Key

Z-SCORES

A z-score for a value x is the number of standard deviations that x falls from the mean μ.

Formula: $Z = \frac{X - \mu}{\sigma}$

1. Find the z-score corresponding to a grade of 52 from a normal distribution with a mean of 48 and a standard deviation of 1.8.

$Z = \frac{52-48}{1.8}$ $Z = 2.2$

2. In North America, adult female heights have an approximate normal distribution with a mean of 65.0 inches and a standard deviation of 3.5 inches. Adult male heights have an approximate normal distribution with a mean of 70.0 inches and a standard deviation of 4.0 inches.

What is your height in inches? 66 (5'6")

Find the z-score of your height. $Z = 0.29$

$Z = \frac{66-65}{3.5} = 0.29$

3. A certain brand of automobile tire has a life span of 35,000 miles and a standard deviation of 2250 miles. If the life spans of three randomly selected tires are 34,000 miles, 37,000 miles, and 31,000 miles. Find the z-scores that correspond with each of these mileages. Would the life spans of any of the tires be considered unusual? Explain.

$Z = \frac{34000-35000}{2250} = -0.44$ $Z = \frac{37000-35000}{2250} = 0.89$ $Z = \frac{31000-35000}{2250} = -1.78$

4. A highly selective university will only admit students who place at least 2-zscores above the mean on the ACT that has a mean of 18 and a standard deviation of 6. What is the minimum score that an applicant must obtain to be admitted to the university?

$2 = \frac{X-18}{6}$ $12 = X - 18$ $30 = X$

5. On a statistics test the class mean was 63 and the standard deviation was 7 and for the biology test the mean was 23. $\sigma = 3.9$
Use z-scores to determine on which test the student did better.

a) A student received a 73 on the stat test and a 26 on the biology test.

$Z = \frac{73-63}{7} = 1.4$ $Z = \frac{26-23}{3.9} = .77$ STAT

b) A student received a 60 on the stat test and a 20 on the biology test.

$Z = \frac{60-63}{7} = -0.43$ $Z = \frac{20-23}{3.9} = -0.77$ STAT

c) A student received a 78 on the stat test and a 29 on the biology test.

$Z = \frac{78-63}{7} = 2.1$ $Z = \frac{29-23}{3.9} = 1.5$ STAT

d) A student received a 63 on the stat test and a 23 on the biology test.

$Z = \frac{63-63}{7} = 0$ $Z = \frac{23-23}{3.9} = 0$ The Same

6. A manufacturer of bolts has a quality control policy that requires it to destroy any bolts that are more than 2 standard deviations from the mean. The quality control engineer knows that the bolts coming off the assembly line have a mean length of 8 cm with a standard deviation of 0.05 cm. For what length(s) will a bolt be destroyed?

$-2 = \frac{x-8}{0.05} = 7.9$ $\quad 2 = \frac{x-8}{0.05}$ $\quad 0.1 = x-8$ $\quad 8.1 = x$ $\quad x \leq 7.9$ $\quad x \geq 8.1$

7. A pharmaceutical company wants to test a new cholesterol drug. The average cholesterol of the target population is 200 mg and they have a standard deviation of 25 mg. The company wished to test a sample of people who fall between 1.5 and 3 z-scores above the mean. Into what range must a candidate's cholesterol level be in order for the candidate to be included in the study?

$1.5 = \frac{x-200}{25}$ $\quad 3 = \frac{x-200}{25}$

$37.5 = x-200$ $\quad 75 = x-200$

$x = 237.5$ $\quad x = 275$

$237.5 \leq x \leq 275$