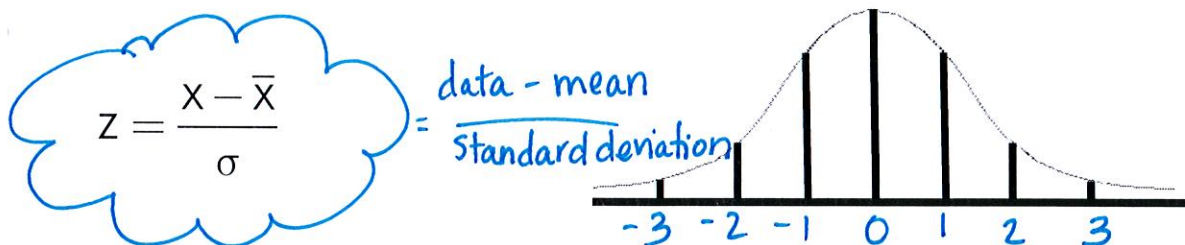


Name: _____

Date: _____

Z-Score:The number of standard deviations the x-value lies above or below the mean.

We can use z-score to compare two different sets of data

Ex. 1 A normal distribution has a mean of 50 and a standard deviation of 5. Find the z-score. for 67.

$$\begin{aligned} x &= 67 \\ \bar{x} &= 50 \\ \sigma &= 5 \end{aligned}$$

$$z = \frac{67 - 50}{5} = 3.4$$

Ex. 2 A normal distribution has a mean of 50 and a standard deviation of 5. Find the z-score. for 38.

$$z = \frac{38 - 50}{5} = -2.4$$

Ex. 3 Test scores on the last major test were normally distributed with a mean of 60 and a standard deviation of 9. You made a 54. (Yikes!)

$$\sigma = 9$$

a. What is the z-score associated with your grade?

$$\begin{aligned} \text{data} \\ x &= 54 \end{aligned}$$

$$z = \frac{54 - 60}{9} = -.67$$

b. Your very kind teacher decided to curve the grades. She changed the mean to a 70 and the standard deviation to 5 but kept the z-scores the same. What is your new score?

$$\begin{aligned} \bar{x} &= 70 \\ \sigma &= 5 \\ z &= -.67 \end{aligned}$$

$$z = \frac{x - \bar{x}}{\sigma}$$

$$-.67 = \frac{x - 70}{5}$$

$$\begin{aligned} -.67(5) &= x - 70 \\ -3.35 &= x - 70 \\ +70 & \quad +70 \end{aligned}$$

$$x = 66.65\%$$

Ex. 4 Bill plays for the Silver Hawks basketball team. He scores 8 points a game. The team average is 6.5 points per game with a standard deviation of 1.0.

His friend Ryan plays for the Red Hawks basketball team. He scores 8 points per game. The team average is 5 points per game with a standard deviation of 1.5.

They argue that they are equally as good as each other. Are they right? Who is more valuable to their team?

$z = \frac{x - \bar{x}}{\sigma}$

<u>Bill</u>	<u>Ryan</u>	
$z = \frac{8 - 6.5}{1}$	$z = \frac{8 - 5}{1.5}$	
$z = 1.5$	$z = 2$	Ryan is more valuable to his team because his z-score is greater.

Ex. 5 At Eastview Pizza, orders for delivered pizza are free if the pizza is delivered more than 45 minutes after it is ordered. It always takes 15 minutes to prepare a pizza at this restaurant, so you have to add this to each driver's mean delivery time. This table shows statistics on the delivery times for two drivers. *Ben is more likely to give away free pizza.*

Which driver is more likely to give away free pizzas?

Driver	Mean Delivery Time	Standard Deviation
Ben	12 minutes	10 minutes
Jim	15 minutes	6 minutes

Ben

$\bar{x} = 27$ $\sigma = 10$

$x = 45$ $z = \frac{45 - 27}{10} = 1.8$

27 37 47 57

Jim

$\bar{x} = 30$ $\sigma = 6$

$x = 45$ $z = \frac{45 - 30}{6} = 2.5$

30 36 42 48

Ex. 6 Lewis earned 85% on his biology test & 80% on his history test. In his biology class the mean was 79% with a standard deviation of 3. In his history class the mean was 76% with a standard deviation of 4.

a. What percentage of the class was below Lewis in the biology class?

Biology

$\bar{x} = 79$ $\sigma = 3$

70 73 76 79 82 85 88

50%
+ 34%
+ 13.5%

97.5%

b. What percentage of the class was below Lewis in the history class?

History

$\bar{x} = 76\%$ $\sigma = 4$

64 68 72 76 80 84 88

50%
34%
84%

c. On which test did he do better compared to the rest of the class? *Lewis did better on the Biology.*

Biology z-score = $\frac{85 - 79}{3} = 2$ History = $\frac{80 - 76}{4} = 1$