Lesson 11: Standardized Scores (Z-Scores)

Daily Data Collection

What is the appropriate amount to spend on a first date?

Standardized Scores, called Z-scores (Measures of Relative Standing)

The z-score tells us how many standard deviations a particular piece of data is away from the mean of the distribution. It therefore allows us to make comparisons across distributions. A z-score is very, very, very useful in statistics.

If x is an observation from a distribution that has a mean □ and a standard deviation □, then the standardize value of x (often called the z-score) is:

$$z = \frac{x - \text{mean}}{\text{standard deviation}}$$

Often times we are asked to compare the scores of two pieces of data that do not come from the same distribution. In order to decide which score is in fact higher, we must first standardize the scores.

A Z-score of 1.4 represents a value that is 1.4 standard deviations *above* the mean.

A Z-score of -2.1 represents a value that is 2.1 standard deviations *below* the mean.

Class Data – Amount Spent on a date

Fill in the table below:

Spent	frequency
0 – 4.99	
5 – 9.99	
10 – 14.99	
15 – 19.99	
20 – 24.99	
25 – 29.99	
30 – 34.99	
35 – 39.99	
40 – 44.99	
45 – 49.99	
50 – 54.99	
55 – 59.99	
60 +	
Mean:	
St. Dev:	

Draw a histogram and describe the distribution:

Find the percentile rank for your value and explain the meaning:

Find the z-value for your value and explain the meaning:

Guided Practice

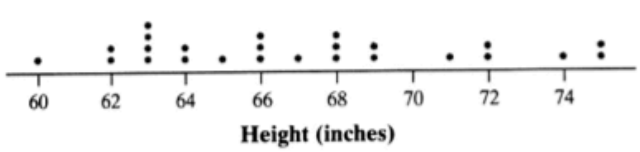
Suppose there is one spot left in the University of Michigan class of 2014 and the admissions department has the decision narrowed down to 2 applicants. Everything about these 2 students is similar except their GPAs. Ferris has a 2.8 while Cameron has a 3.1. Now on paper it seems like Cameron has the higher GPA, but what about the difference in academic rigor of the student's respective high schools. That must count for something. And it does. Ferris' high school mean GPA is a 2.41 and the standard deviation is 1.09. Cameron's high school mean GPA is 2.91 with a .87 standard deviation. An important assumption to make is the distribution of GPAs is approximately symmetrical. So the question is who deserves the spot?

So now we can figure out whose GPA is more impressive, Ferris or Cameron.

CHECK YOUR UNDERSTANDING

Mrs. Navard's statistics class has just completed the first three steps of the "Where Do I Stand?" Activity (page 84). The figure below shows a dotplot of the class's height distribution, along with summary statistics from computer output.

1. Lynette, a student in the class, is 65 inches tall. Find and interpret her z-score.



Variable	n	$\bar{x}$	s_x	Min	Q_1	M	Q_3	Max
Height	25	67	4.29	60	63	66	69	75

2. Another student in the class, Brent, is 74 inches tall. How tall is Brent compared with the rest of the class? Give appropriate numerical evidence to support your answer.

3. Brent is a member of the school's basketball team. The mean height of the players on the team is 76 inches. Brent's height translates to a z-score of -0.85 in the team's height distribution. What is the standard deviation of the team members' heights?

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