Guided Practice 4.1.1

Example 1

Aaron has diabetes, and needs to monitor his blood sugar level. He measures his blood sugar each day before he eats dinner. Aaron's results for the past 10 days are in the table below. Blood sugar levels for any person before meals should be between 80 and 120. Are there any striking deviations in the data?

Day	Blood sugar level
1	109
2	115
3	89
4	92
5	106
6	101
7	98
8	94
9	107
10	93

1. To see if there are any deviations in the data, start by finding Aaron's mean blood sugar level over the past 10 days.

2. First, find the sum of the data values.

$$109 + 115 + 89 + 92 + 106 + 101 + 98 + 94 + 107 + 93 = 1004$$

Instruction

3. Divide the sum of the data values by the number of data values.

   There are 10 data values.

   $$\frac{1004}{10} = 100.4$$

   Aaron's mean blood sugar level over the past 10 days was 100.4.

4. Examine the data for deviations.

   The lowest blood sugar level was 89. The highest blood sugar level was 115. These numbers are not very far apart in terms of the mean. Also, the data is within the suggested range of blood sugar levels. There are no striking deviations in the data.

Example 2

The yearly snowfall over the past 12 years in Athens, Georgia, is presented in the table below. Are there any deviations in the data?

Year	Snowfall in inches
1	1.5
2	2.0
3	0.9
4	1.6
5	2.1
6	1.8
7	1.7
8	1.3
9	2.0
10	1.2
11	1.0
12	0.8

Instruction

1. To see if there are any deviations in the data, start by finding the median snowfall, in inches, over the past 12 years.

2. First, order the data from least to greatest.

   0.8 0.9 1.0 1.2 1.3 1.5 1.6 1.7 1.8 2.0 2.0 2.1

3. If there is an odd number of data values, find the middle-most value. If there is an even number of data values, find the average of the two middle-most values.

   There are 12 data values in the data set. The average of the sixth and seventh data values, 1.5 and 1.6, is the median of this data set.

   $$\frac{1.5+1.6}{2}=1.55$$

   The median snowfall in Athens, Georgia, over the past 12 years is 1.55 inches.

4. Examine the data for deviations.

   The lowest snowfall amount in the past 12 years is 0.8 inches. The highest snowfall amount is 2.1 inches. These values do not differ greatly from the mean. A deviation could be an amount of 4 inches or more, since snow is not common for this part of Georgia. Therefore, there are no deviations in this data.

Instruction

Example 3

A website captures information about each customer's order. The total dollar amounts of the last 8 orders are listed in the table below. What is the mean absolute deviation of the data?

Order	Dollar amount
1	21
2	15
3	22
4	26
5	24
6	21
7	17
8	22

1. To find the mean absolute deviation of the data, start by finding the mean of the data set.

2. Find the sum of the data values, and divide the sum by the number of data values.

$$\frac{21+15+22+26+24+21+17+22}{8}=21$$

Instruction

3. Find the absolute value of the difference between each data value and the mean: |data value – mean|.

   |21 – 21| = 0

   |15 – 21| = 6

   |22 – 21| = 1

   |26 – 21| = 5

   |24 – 21| = 3

   |21 – 21| = 0

   |17 – 21| = 4

   |22 – 21| = 1

4. Find the sum of the absolute values of the differences.

   0 + 6 + 1 + 5 + 3 + 0 + 4 + 1 = 20

5. Divide the sum of the absolute values of the differences by the number of data values.

   $$\frac{20}{8} = 2.5$$

   The mean absolute deviation of the dollar amounts of each order set is 2.5. This says that the average cost difference between the orders and the mean order is $2.50.

Instruction

Example 4

A company keeps track of the age at which employees retire. It is considered an early retirement if the employee retires before turning 65. The age of the 11 employees who took early retirement this year are listed in the table below. Are there any striking deviations in the data?

Employee	Age at early retirement
1	56
2	55
3	60
4	51
5	53
6	58
7	56
8	64
9	59
10	42
11	48

1. First find the interquartile range.

2. Order the data set from least to greatest.

   42 48 51 53 55 56 56 58 59 60 64

3. Find the median of the data set.

   If there is an odd number of data values, find the middle-most value. If there is an even number of data values, find the average of the two middle-most values.

   There are 11 data values. The sixth data value is the middle-most value, and therefore is the median. The median of this data set is 56.

   42 48 51 53 55 (56) 56 58 59 60 64

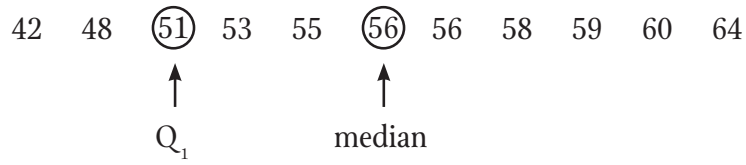
   ↑
   median

Instruction

4. Find the first quartile.

   The first quartile is the median of the lower half of the data set, or the values less than the median value.

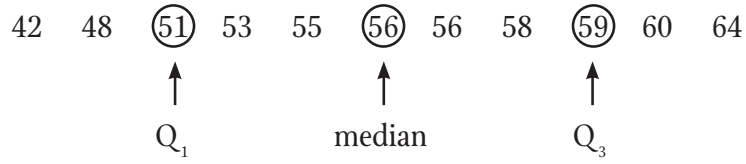
   The first five data values are the lower half of the data set: 42, 48, 51, 53, and 55. The median of the first five data values is the middle-most value of these five values. The first quartile is the third value, 51.



5. Find the third quartile.

   The third quartile is the median of the upper half of the data set, or the values greater than the median value.

   The last five data values are the upper half of the data set: 56, 58, 59, 60, and 64. The median of the last five data values is the middle-most value of these five values. The third quartile is the third value, 59.



6. Find the difference between the third and first quartiles: third quartile – first quartile, or $Q_3 - Q_1$.

   $59 - 51 = 8$

   The interquartile range is 8.

7. Look for striking deviations in the data.

   Think about the typical retirement age, which is 65. Also consider the interquartile range, which is 8. Retiring at the age of 42 is young and far away from the mean of 56. The age 42 would be considered a striking deviation because it is far away from the other data values.