

Comparing Prices

ID: 16813

Time required

15-20 minutes

Activity Overview

In this activity, students will use the mean and standard deviation (SD) and the median and interquartile range (IQR) to measure the center and spread of price data. Students will recognize that in a skewed distribution the values are not centered about the mean, and the standard deviation is increased. In a distribution with an outlier, the mean is pulled in the direction of the outlier, and the standard deviation is increased.

Topic: Univariate Data

- Gather univariate data and interpret measures of center and spread.
- Display the distribution, describe its shape, and select and calculate summary statistics.

Teacher Preparation and Notes

- Students should understand measures of center and spread before starting this lesson. They should also be familiar with different shapes and graphs of distributions of univariate data.
- **To download the student and solution TI-Nspire documents (.tns files) and student worksheet, go to education.ti.com/exchange and enter “16813” in the keyword search box.**

Associated Materials

- *ComparingPrices_Student.doc*
- *ComparingPrices.tns*

Suggested Related Activities

To download any activity listed, go to education.ti.com/exchange and enter the number in the keyword search box.

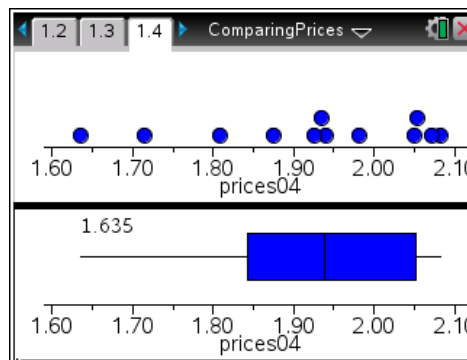
- *Center and Spread (TI-Nspire technology)* — 16176
- *Exploring Bivariate Data (TI-Nspire technology)* — 17258

Problem 1 – Gasoline Prices 2004

On page 1.3, students are to find the mean and standard deviation in cells E1 and E2 for the 2004 gasoline prices data.

month	prices04	prices05	
1 jan	1.635	1.866	mean04:
2 feb	1.715	1.96	stddev04:
3 mar	1.809	2.107	mean05:
4 apr	1.875	2.325	stddev05:
5 may	2.05	2.257	
6 jun	2.082	2.218	

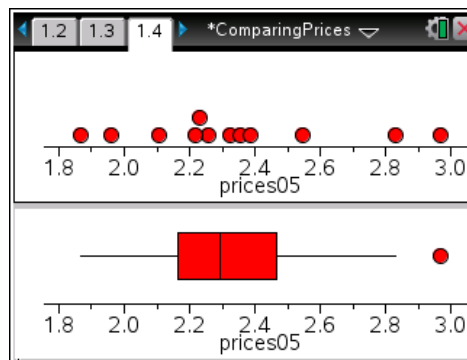
The box plot for the 2004 data has been constructed for students on page 1.4. To view the five-number summary of the box plot, students should hover the cursor over the different areas of the box.



Make sure students notice that the IQR is a smaller range than one standard deviation from the mean.

Problem 2 – Gasoline Prices 2005

Students should move back to page 1.3 and find the mean and standard deviation in cells E3 and E4 for the 2005 gasoline prices data.



To change the dot plot and box plot, students need to click the label on each horizontal axis and select **prices05**.

Wrap Up

Upon completion of the discussion, the teacher should ensure students understand that:

- the mean and standard deviation (SD) and the median and interquartile range (IQR) are two ways to measure center and spread.
- in a skewed distribution most of the data values lie on one side in relation to the mean, and the standard deviation is increased; in a distribution with an outlier the mean is pulled in the direction of the outlier and the standard deviation is increased.
- the median and IQR are resistant to skewness/outliers while the mean and standard deviation are not.
- the median/IQR are preferred when a distribution is skewed while either mean/SD or median/IQR are acceptable for approximately symmetric distributions.

Worksheet Solutions

1. Mean = \$1.92; Standard Deviation = \$0.14
2. Median: \$1.94; IQR: \$0.21
3. Since the data is skewed to the left, the most of the data values lie to the right of the mean.
4. A majority of the 2004 gas prices were within one standard deviation of the mean, or between \$1.78 and \$2.06.
5. Fifty percent of the data falls within the interquartile range, or between \$1.84 and \$2.05, and the median is between the two at \$1.94.
6. Mean: \$2.34; Standard Deviation: \$0.31
7. Median: \$2.29; IQR: \$0.31
8. The mean is greater than the median because the mean is affected by the outlier and the skew of the data. The data is skewed to the right, and there is a large outlier on the positive side, so most of the data values lie to the left of the mean.
9. Using the mean and standard deviation, the majority of values are between \$2.03 and \$2.65. Using the median and IQR, the majority of data is between \$2.16 and \$2.47. One IQR of the median gives a smaller and possibly more accurate range.
10. The median is a better representation because the mean is overly affected by the skew of the graph and any outliers.
11. The median gas price per gallon for 2004 was \$1.94 while the median gas price for 2005 was \$2.29. In addition, the median range of values, the interquartile range, for 2004 was between \$1.84 and \$2.05. The median range of values for 2005 was between \$2.16 and \$2.47. Therefore, gas prices increased overall by about \$0.30 per gallon.
12. Because the data is roughly symmetrical, the mean and median are about the same (\$2.73). Therefore, either the mean or the median would be a good representation for the center of the data.