3.5 Measures of Spread

Student Text Pages
140–147

Suggested Timing
80–160 min

Tools
• graphing calculators

Related Resources
BLM 3-11 Section 3.5 Measures of Spread
BLM 3-12 Section 3.5 Achievement Check Rubric

Link to Prerequisite Skills

Students should complete questions 1 to 3 in the Prerequisite Skills prior to starting this section.

Warm-Up

1. Find the mean, median, and mode for each set of data. Indicate which measure of central tendency best represents the data.
a) 20, 11, 8, 5, 6, 14, 4, 7
b) Quiz results: 1 student has 0%, 11 students have 65%, 2 students have 85%, 1 student has 90%.

2. Find the mean for each set of data. How close is each mean to the values in the set of data?
a) 56, 61, 58, 56, 59, 60, 63
b) 21, 57, 89, 51, 18, 92, 85

Warm-Up Answers

1 a) Mean 9; median 7.5; no mode. The mean is affected by the outlier 20, so the median is the best measure, even though it is a value that does not appear in the data.
b) Mean 65%; median 65%; mode 65%. The measures are the same so there is no need to choose which is best. But for this set of data, mode is the best measure, since 11 of the 15 students (or almost 70%) had this result.

2. a) 59. The mean is close to the values in the set of data.
b) 59. The mean is not close to the values in the set of data.

Teaching Suggestions

Warm-Up

- Write the Warm-Up questions on the board or on an overhead. Have students complete the questions independently. Then, discuss the solutions as a class.

Section Opener

- Discuss how the results of question 2 in the Warm-Up could apply to test scores. Students should see that the mean score on a test does not tell the whole story. There needs to be a way to show how spread-out the data are around the mean. This is the purpose of this section of the chapter.

Investigate

- Work through the Investigate yourself before assigning it to be sure you understand all the steps.
- Discuss the answers to **question 4** and go over the definitions of variance and standard deviation. Tell students that variance and standard deviation are measures that can be used instead of illustrating the spread using a box-and-whisker plot.

Investigate Answers (pages 140–141)

2. Class 1: 69; Class 2: 73.5. Class 2 has the better performance.

3. Class 1: 42; Class 2: 56. Class 2's marks are more spread out than Class 1's.

4. Class 1. Class 2 has a higher median but the marks of Class 1 are closer in range. Class 1 did better because fewer people had low marks.

Examples

- Work through Example 1. Give students time to determine the median themselves. An explanation of quartiles will be needed as students create the box-and-whisker plot.
- In Example 2, draw students' attention to the table. Ask students why they think the difference is squared before the values are added together. If you do not get an answer to this, have students add the Amount–Mean column to see what they get. This will help explain why these values need to be squared first.
- In Example 3, tell students that small standard deviations can often mean higher costs, since more care is required in the production. If a larger standard deviation can be used, a company can save money by using the manufacturer that has the larger standard deviation.

Key Concepts

- Read through the Key Concepts. If needed, have students summarize these points in their own words and write these summaries in their notes. You could also have students brainstorm as a class and then have pairs of students summarize the material.

Discuss the Concepts

- Have students work in pairs. Allow students to share answers as you take up the material.

Discuss the Concepts Suggested Answers (page 145)

D1. Yes, if all the values in the set of data are the same. The interquartile range, the variance, and the standard deviation would be zero as well.

D2. 0.01, 1, 100; 100, 100.02, 100.01

D3. The age of voters in an election may be a set of data in which a greater standard deviation is desirable. If the standard deviation is great, the age of voters is varied. This is desirable because all parts of the population are voting rather than a few age groups.

Practise (A)

- Encourage students to refer to the Investigate and the Examples before asking for assistance.

Apply (B)

- Have students work alone, and then check their answers in pairs.
- **Question 10** is a Literacy Connect. You may wish to assign this question as a journal entry or to discuss the question as a class.
- **Question 12** links to the Chapter Problem. Remind students to keep the solution to this question handy as the methods they used may help them with the Chapter Problem Wrap-Up.

Common Errors

- Some students may forget why they need to square the Value – Mean column to find the variance and standard deviation.

R_x Have students find the sum of the Value – Mean column for a variety of questions to verify that without squaring the values the sum will always be zero.

Accommodations

Memory—continue making the K.I.M. chart

Visual—write a set of data on slips of paper and move the slips to order the data

Perceptual—draw the box-and-whisker plots on large grid paper, using different colours for the 3 quartiles

Gifted and Enrichment—research various statistics about basketball players to look for trends

- **Question 13** is an Achievement Check question. Students can use Think-Pair-Share. You may wish to use **BLM 3-12 Section 3.5 Achievement Check Rubric** to assist you in assessing your students.

Extend (C)

- **Question 14** can be used as an assignment or as a class project. Have students create a display of their findings and make a box-and-whisker plot of the information.

Achievement Check Answers (page 147)

13. Joanna's. Joanna's scores have a mean of 81% and a standard deviation of 5%. Approximately $\frac{2}{3}$ of her scores are between 76% and 86%. Adam's scores have a mean of 84% and a standard deviation of 10%. Approximately $\frac{2}{3}$ of his scores are between 74% and 94%. Adam's mean is higher than Joanna's but his marks are more spread out. Joanna is a more consistent student.

Mathematical Process Expectations

Process Expectation	Questions
Problem Solving	11
Reasoning and Proving	8, 10, 13, 14
Reflecting	10, 14
Selecting Tools and Computational Strategies	1–7, 9, 11, 12, 14
Connecting	14
Representing	9
Communicating	8, 10, 11, 13, 14

Extra Practice

- You may wish to use **BLM 3-11 Section 3.5 Measures of Spread** for remediation or extra practice.