Middle Value (Median) of a Set of Data

**Objectives** To guide children as they sort numerical data and arrange data in ascending or descending order, and as they find the middle value (median) for a set of numerical data.

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### 1. Teaching the Lesson

#### Key Concepts and Skills
- Order and compare numbers.
  - [Number and Numeration Goal 7]
- Collect and organize data.
  - [Data and Chance Goal 1]
- Find the median of a data set using concrete materials.
  - [Data and Chance Goal 2]

#### Key Activities
Children sort their class standing long jump data by arranging the data in ascending order. Children find the median jump length in centimeters for the class.

#### Key Vocabulary
- median
- middle value
- sort (the data)

#### Materials
- Math Journal 2, p. 173
- My Reference Book, pp. 45 and 46
- Home Link 7-6
- masking tape (about 20 feet)
- half-sheets of paper
- slate
- number grid (optional)

### 2. Ongoing Learning & Practice

#### Measuring Objects
- **Math Journal 2, pp. 176 and 177**
- **ruler**
  - Children measure pictured objects to the nearest inch and the nearest centimeter.

#### Math Boxes 7-7
- **Math Journal 2, p. 178**
  - Children practice and maintain skills through Math Box problems.

#### Ongoing Assessment: Recognizing Student Achievement
- Use Math Boxes, Problem 1.
  - [Measurement and Reference Frames Goal 6]

#### Home Link 7-7
- **Math Masters, pp. 215 and 216**
  - Children practice and maintain skills through Home Link activities.

### 3. Differentiation Options

#### READINESS
**Ordering Numbers**
- **Math Masters, p. 217**
  - Children sort numbers from the smallest to the largest.

#### ENRICHMENT
**Finding the Median**
- **Math Masters, p. 218**
  - Children find the median of an even set of numbers and explain their solution.

#### ELL SUPPORT
**Discussing the Word Median**
- Children discuss the word *median* and find the median for sets of numbers.

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**Advance Preparation**
For the Math Message, place a stack of half-sheets of paper next to the problem.

Before beginning the Sorting the Standing Jump Data activity in Part 1, tape a 20-foot baseline along the floor in a large, open space.

Getting Started

Mental Math and Reflexes
Have children use <, >, or = to compare large numbers. Ask them to explain their answers in terms of place value.
Suggestions:

| 132 and 123  | 6,989 and 6,979  |
| 234 and 334  | 10,001 and 10,010 |
| 456 and 457  | 9,877 and 9,777  |
| 1,054 and 1,154 | 1,243 and 1,233  |
| 1,522 and 1,622 | 1,522 and 1,622  |

Math Message
Turn to Math Journal 2, page 173. Write your longer jump length in centimeters on a half-sheet of paper.

Then open My Reference Book to pages 45 and 46. Read about range and median with a partner.

Example

86 cm

Longest Jump: 94 cm
Shortest Jump: 34 cm

Difference

94 - 39 = 55
The difference is 55 cm.

Home Link 7-6 Follow-Up
Have children name some objects that are about the same length as their arm span. Have them share their answers to Problem 4.

1 Teaching the Lesson

Math Message Follow-Up
(My Reference Book, pp. 45 and 46)

Briefly discuss range and median with children, including the examples in My Reference Book, pages 45 and 46. The range is the difference between the minimum and maximum values of a data set. The term median is another widely used name for middle value.

Write a list of the children’s jump lengths on the board. Be sure that children recorded their centimeter data. Ask children to identify the shortest jump length and the longest jump length from the class data. Then, tape an actual tape measure to the board and mark the longest and shortest jump lengths. (See margin.) To support English language learners, remind children that the shortest jump length is called the minimum value and the longest jump length is called the maximum value. Label the shortest and longest jump lengths with the words minimum and maximum.

Working together, calculate the difference between the longest and shortest jumps. Draw a comparison diagram on the board. Fill in the known quantities—the longest and the shortest jump lengths. The difference is what you want to find, so write a question mark for the difference. Some children may use the number grid to find the difference. Others may subtract by counting up.

Links to the Future
Do not expect children to remember how to find the range of a data set. This is an early exposure. Use the word range but do not expect children to use it at this time. Finding the range of a data set is a Grade 3 Goal.
**Records of Our Jumps**

You will make two jumps. For each jump, measure to the nearest centimeter and to the nearest inch.

**How to Measure Each Jump**

Place a penny or other marker (or make a dot with chalk) where the Jumper’s back heel lands. Measure from the starting line to the marker.

1. Record your two jumps.
   - First jump: __________ centimeters, __________ inches
   - Second jump: __________ centimeters, __________ inches
2. Circle the measures for your longer jump. **Answers vary.**
3. A middle value of jumps for our class is __________ centimeters.

**Sorting the Standing Jump Data**

Explain to children that they have found the smallest value, the largest value, and the range. Now they are going to find the middle value.

Because data values are frequently listed in haphazard order such as the list on the board, a common first step in analyzing numerical data is to sort the data—that is, to arrange it in ascending or descending order. This sorting is typically done with paper and pencil or a computer.

Children will sort the standing jump data by arranging themselves in a single line—from shortest jump length at one end of the line to longest jump length at the other end. Use the following routine:

1. Select a large, open space. Tape a 20-foot baseline on the floor.
2. Have children stand away from the line until they are called. Children should carry their half-sheets of paper (showing their jump lengths in centimeters) with them.
3. Ask the children who made the shortest and the longest jumps to step forward and stand on the line—shortest at one end and longest at the other end.
4. One-by-one, ask the remaining children to step forward and find their correct position on the line. They do this by comparing the length of their jump to the lengths of the other children’s jumps, as shown on their half-sheets of paper. (You should pause several times during the routine to make sure the children standing on the line are evenly distributed along it. This will allow for spaces for the remaining children to fit themselves into the line.)
5. Several children may have the same jump length. If this is the case, they should be together on the line, but it does not matter which order these children are in.

When all children have found their places on the line, make an oral check that they are sorted by the lengths of their jumps. Begin at the end with the shortest length. Move down the line, in order, asking each child to say his or her jump length. If any child says a length that is smaller than a length already named, that child is not in the correct position.

**The Lengths of Objects**

Measure each item to the nearest inch. Measure each item to the nearest centimeter. Record your answers in the blank spaces.

1. pencil
   - about 7 in.
   - about 17 cm
2. screwdriver
   - about 6 in.
   - about 15 cm
3. pen
   - about 5 in.
   - about 13 cm

**Adjusting the Activity**

Have children use the number grid or Class Number Line to figure out the order of their numbers.
Finding the Median Length of the Standing Long Jumps

(Math Journal 2, p. 173)

If you have not already done so, you might want to introduce the term *median* at this time. The routine for finding the median is quite simple. After arranging the data in ascending or descending order, count from either end to the number in the middle. If the data set consists of an even number of data, there are two middle values and the median is the number halfway between those two middle values. At this stage, either value or any number between them is acceptable.

To find the median for the standing long jump data, use this routine:

1. Ask the children at each end of the line to take two large steps forward.
2. Identify the two children who are at each end of the line now, and ask them to take two large steps forward.
3. Continue to repeat this process. Each time that a child at each end steps forward, the original line of children is reduced by two. (See margin.)
4. If you have an odd number of children in your class, there will be one remaining child on the line. The length of his or her jump is the median length.

![Diagram of children taking steps](image)

5. If you have an even number of children in your class, there will be two remaining children on the line. The lengths of their jumps are the middle values. The median is officially the number halfway between these two lengths, but either value (or any number between them) is an acceptable answer.

![Diagram of children taking steps](image)

Ask children to record the median jump length on journal page 173. Review the usefulness of finding a middle value: Because there are great differences in second graders’ jumps, it is easier to talk about a median length than about many different lengths.
2 Ongoing Learning & Practice

Measuring Objects

(Math Journal 2, pp. 176 and 177)

Children measure the lengths of various items to the nearest inch and to the nearest centimeter. Then they list the objects in order from shortest to longest and compare lengths.

Math Boxes 7-7

(Math Journal 2, p. 178)

Mixed Practice Math Boxes in this lesson are paired with Math Boxes in Lesson 7-5. The skill in Problem 6 previews Unit 8 content.

Writing/Reasoning Have children draw, write, or verbalize their answers to the following: Tell the time 2 hours later than the time shown in Problem 1. How did you figure it out? Sample answer: The time will be 6:15. The hour hand goes around the clock two times, to 5:15 and then to 6:15.

Ongoing Assessment: Recognizing Student Achievement

Use Math Boxes, Problem 1 to assess children’s progress with telling time to the quarter-hour. Children are making adequate progress if they successfully complete the problem.

(Mathematics and Reference Frames Goal 6)
**Home Link 7-7**  
*(Math Masters, pp. 215 and 216)*

**Home Connection** Children sort data and find the median.

### 3 Differentiation Options

#### Readiness

**Ordering Numbers**  
*(Math Masters, p. 217)*

To provide experience with comparing and ordering numbers using a visual model, have children match number cards to a quantity and to a location on a number line. When children have completed the master, have them describe how they decided where to put the numbers.

#### Enrichment

**Finding the Median**  
*(Math Masters, p. 218)*

To apply their knowledge of finding the median, have children review the data on *Math Masters*, page 218. Children find the median of an even set of numbers and explain their solution.

#### ELL Support

**Discussing the Word Median**

To provide language support for data landmarks, have children determine the median for sets of numbers. The median is the middle value of a set of ordered data. Write five numbers in ascending order on the board. Ask children to identify the middle number or median. Circle the number and label it with the synonyms *middle number* and *median*. Provide children with lists of five numbers that are out of sequence. Have them put the numbers in order and circle the median.

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**Teaching Master**

Choose from the number cards pictured below.

Match a number card to each of the sets of pictured dots.

Match a number card to each of the number lines below. Draw a small mark on the number line about where you think the number would be. Label your mark with the number.

1. 27 92 57 80
2. 92 57 80 27
3. 80 57 27 92
4. 92 80 57 27

**Math Masters, p. 217**

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**Lesson 7-7**

**Sample answer:** I ordered the numbers from smallest to largest. The two middle numbers are 89 and 91. The median is 90 because it is halfway between 89 and 91.

**Math Masters, p. 218**

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**INDEPENDENT ACTIVITY**

**INDEPENDENT ACTIVITY**

**SMALL-GROUP ACTIVITY**