NVACS: Measurement and Data

In First Grade, students must:

Measure lengths indirectly and by iterating length units.

1.MD.1 - Order three objects by length; compare the lengths of two objects indirectly by using a third object.

1.MD.2 - Express the length of an object as a whole number of length units, by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. *Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps.*

1.MD.3. - Tell and write time in **hours** and **half-hours** using analog and digital clocks.

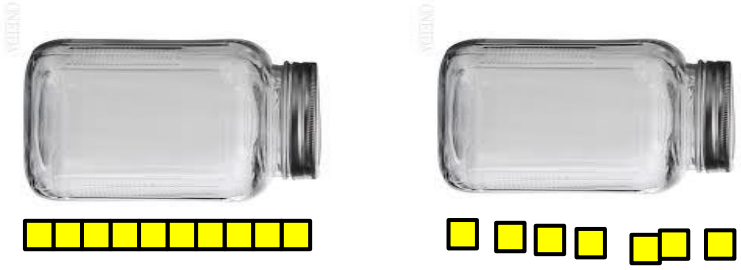
Represent and interpret data.

1.MD.4 - Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and **how many more** or **less** are in one category than in another.

Students develop an understanding of the meaning and processes of measurement, including underlying concepts such as iterating and the transitivity principle for indirect measurement. Students in first grade do not need to know these terms but they must have an understanding of the concepts.

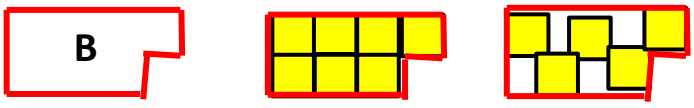
Iterating

Iterating in linear measurement means that the students line up the unit of measurement end to end without spaces in between.



correct iteration incorrect iteration

Iterating in area measurement means that the students cover all of the space.



correct iteration incorrect iteration

Through numerous experiences and careful questioning by the teacher, students will recognize the importance of making sure that there are not any gaps or overlaps in order to get an accurate measurement. This concept is a foundational building block for the concept of area in 3rd Grade.

Transitivity principle:

This is the understanding that when measuring three objects: if A is longer than B, and B is longer than C, then A is longer than C.

Students have the opportunity to apply their counting skills while measuring with non-standard units. Students in first grade work with whole numbers to describe the length of objects. However, in the real world, not all objects will measure to an exact whole unit. When students determine that the length of a marker is five to six paperclips long, they can state that it is about six paperclips long.

Students also need to understand that length is measured from one end point to another end point in order for students to be able to compare object. By physically aligning the objects, they determine which of two objects is longer.

Rather than terms such as bigger or smaller, students should be using terms that are measurable attributes: **length, weight, heavy, heavier, long, longer, tall, taller, short, shorter, more of, less of.**

Examples of Direct Comparisons:

- Order three students by their height
- Order pencils, crayons, and/or markers by length
- Build three towers (with cubes) and order them from shortest to tallest
- Three students each draw one line, then order the lines from longest to shortest

Example of Indirect Comparisons:

Two students each cut a string that measures the distance around their waists. The students then compare their strings to a cube tower. The students make statements such as, "The string that went around my waist is longer than the cube tower and your string is shorter than the cube tower. So, the length around my waist is longer than the length around your waist.

Time to hour and half-hour

First grade students must be able to read both analog and digital clocks and then orally tell and write the time. Times should be limited to the hour and the half-hour. Students need to develop the idea that when the time is at the half-hour the hour hand is between numbers and not on a number through varied experiences. They also need to know that on the half-hours, the hour is the number before where the hour hand is and that the minute hand is on the six.

For example, if the time is 4:30. The hour hand is between the 4 and 5, but the hour is 4 since it is before 5:00.

Ideas for students to understand about telling time:

- Within a day, the hour hand goes around a clock twice in the same direction.
- When the hour hand points exactly to a number, the time is exactly on the hour.
- Time on the hour is written the same way it shows on a digital clock.
- The minute hand goes around the clock once every hour.
- When the minute hand is on the 12, it is exactly on an hour.
- There are 60 minutes in one hour, so when 30 minutes have passed, halfway between the hours, the minute hand is on the 6.
- Half hour is written with the hour:30. For example: 4:30.

Data:

First grade students need to create graphs and tally charts using data that is relevant to their lives. They should use categorical data such as,

"How did you get to school?"
"Which book would you like to read today?"
"Which is your favorite flavor of ice cream?

Data can be collected and graphs constructed by individual students or as groups. The students should collect, organize, represent, and interpret data in multiple ways, for multiple purposes and for multiple audiences.

Students should have experiences posing a question with 3 possible responses and then work with the data that they collect on graphs and tally charts. They should also ask and answer questions based on these charts or graphs that reinforce other mathematics concepts. This gives students opportunities to apply their knowledge of number concepts in real world situations.

Types of questions to ask about the data to reinforce other mathematical concepts:

How many items are in each category?
Which one has the most? least?
How many more or less items are in one category than another?
How many in these two, or three, categories altogether?