

Grade 1 Module 3 - Ordering and Comparing Length Measurements as Numbers

Terms:

- Centimeter (standard length unit within the metric system)
- Centimeter cube (pictured right)
- Length unit (measuring the length of an object with equal-sized units)



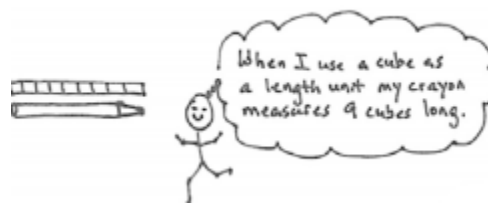
Topic A: Indirect Comparison in Length Measurement

- extends students' kindergarten experiences with direct length measurement to indirect measurement whereby the length of one object is used to compare that of two other objects
- Students explore direct comparison in Lesson 1, comparing the length of two objects paying close attention to the endpoints of each to ensure accurate comparisons.
- In Lesson 2, students begin to use indirect comparison (or transitivity) as they compare each item to one consistent item, such as a piece of string or a strip of construction paper of a specific length. Items are then compared to each other through the indirect comparison. For instance, if the crayon is shorter than the paper strip and the pencil is longer than the paper strip, we can say that the crayon is also shorter than the pencil. As a way to prove their conclusions from indirect comparisons, students use direct comparison to verify their claims.
- Lesson 3 extends the use of indirect comparison to compare distances between objects that cannot be moved next to each other for direct comparison. Students use the same transitive process to compare short distances within the classroom in order to see what the shortest path to their classroom door is, which is helpful to know for lining up and emergencies. After measuring each path from their desks to the door with the same piece of string, students are able to make statements such as, "Maya's path is shorter than the string. Bailey's path is longer than the string. That means Bailey's path to the door is longer than Maya's path."

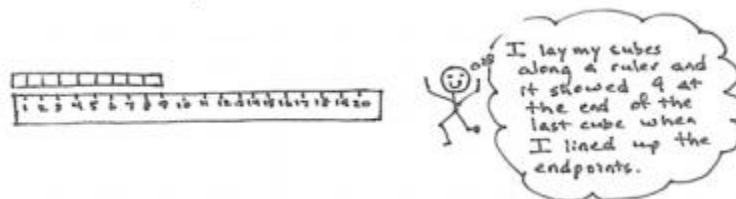


Topic B: Standard Length Units

- Takes longer than and shorter than to a new level of precision by introducing the idea of a length unit. Centimeter cubes are laid alongside the length of an object as students learn that the total number of cubes laid end to end with no gaps or overlaps represents the length of that object
- In Lesson 4, the objects being measured by students include many of the same objects measured in Topic A so that students can add greater precision to their measurements as they specify the number of units equal to the length of the objects being compared. For example, the length of the crayon can now be described not only as shorter than the paper strip, but more precisely as 9 centimeter cubes



- In Lesson 5, students lay those same centimeter cubes alongside a ruler, recognizing the meaning of the numbers on the ruler as describing the number of centimeter length units up to that number. The centimeter then connects students to their world, as they come to realize that the centimeter unit is used by first grade students in Brazil, by the restaurant owner across the street, and even by their families. Students explore the question, "Why would we use a standard unit to measure?" As the use of rulers to measure is a Grade 2 standard, students in Grade 1 simply rename their centimeter cube as a centimeter, as they continue to use the cubes to measure objects. The progressions document suggests that students engage in standard unit measurement in order to develop a solid understanding of why and how to measure, rather than measuring using a plethora of nonstandard measurement units.



- The topic closes with Lesson 6, where students measure and compare sets of three items with centimeter cubes, returning to the transitive statements of Topic A but with more sophisticated insights: "The pencil measures 10 centimeters. The crayon measures 6 centimeters. The book measures 20 centimeters. In order from shortest to longest is the crayon, the pencil, the book. The book is longer than the pencil, and the pencil is longer than the crayon, so the book is longer than the crayon". Students finally solve compare with difference unknown word problems, determining how much longer a given object is than another.

Topic C: Non-Standard and Standard Length Units

- Topic C gives students a chance to explore the usefulness of measuring with similar units. Lesson 7, students measure the same objects from Topic B using two different non-standard length units simultaneously, such as toothpicks and small paper clips. They then use small paper clips and large paper clips, two non-standard units that happen to be the same object but at different lengths. Each time they measure one object using both units and receive inconsistent measurement results. Students then begin to ask the question, “Why do we measure with same-sized length units?” As they explore why it is so important to use the same-sized length unit, they realize that doing so yields consistent measurement results.
- In Lesson 8, students explore what happens when they use a different unit of measurement from that of their classmates. As students measure the same objects with different non-standard length units, they realize that in order to have discussions about the lengths of objects together, they must measure with the same units. Students answer the question, “If Bailey uses paper clips and Maya uses toothpicks, and they both measure things in our classroom, will they be able to compare their measurements?”
- With this new understanding of consistent measurement, Lesson 9 has students solving compare with difference unknown problems using centimeters. Students explore and solve problems such as, “How much longer is the pencil than the marker?” Revisiting the centimeter here helps students recognize the value of having a consistent way to communicate about various measurements.

Topic D: Data Interpretation

- Students organize, represent, and interpret personally relevant data in Lesson 10. As students work as a class to collect, sort, and organize data into a graph, they find great purpose and excitement in data. They begin to answer, and then ask questions about, the number of data points in a given category, and in two categories.
 - (e.g., “How many students like carrots the best?”), and then combining categories (e.g., “How many total students like carrots or broccoli the best?”)
- For Lesson 11, students take a more independent role in the collecting, sorting, organizing, and representing phases involved in graphing. They work on their own to ask and answer questions about the data set, which prepares them for the comparison work of the last two lessons.
- In Lesson 12, students interpret information presented in the graphs by exploring compare with difference unknown problems (e.g. “How many more students preferred broccoli to string beans?”). They begin with visualizing these problems in their easily accessible “equalizing” contexts, by answering questions such as, “How many more students would Category A need to have the same amount as Category B?” Students use their understanding of comparing lengths from Topics A, B, and C to now compare the responses in three categories.
- Lesson 13 continues this exploration, with students again interpreting data sets to ask and answer varied word problems including, “How many students were polled in all?” and, “How many more students are in Category C than in Category A?”. Throughout Topic D, students also apply the learning from earlier in the module, as they lightly notice the connection between length units and data points on a graph.