DREME | TE

Early Math Resources for Teacher Educators

Measurement Assessment Protocol: Additional Tasks

Here are some tasks that can be used in conjunction with, or in addition to, the tasks in the *Measurement Assessment Protocol* (https://prek-math-te.stanford.edu/measurement-data/measurement-assessment-protocol). Select video examples of assessment items are available in *Measurement Assessment Videos* (https://prek-math-te.stanford.edu/measurement-data/measurement-assessment-videos).

by Colleen O. Oppenzato and Herbert P. Ginsburg

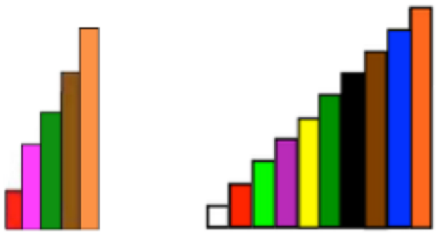
Comparing and Ordering Objects

Which is longer? (conservation of length) Choose two rods, each a different length. Lay them on the table, not lined up with a common origin (Figure A), and ask, "Which is longer? How do you know?" If the child correctly identifies the longer rod, move the shorter rod further to the child's right or left (as shown in Figure B) and ask, "Now, which is longer?" If the child seems to identify the longer rod based on the new locations after the rods were moved, ask, "How do you know this is longer? What does longer mean?" If the child says the purple rod is longer because it sticks out to the right or left, ask, "You said first that the yellow rod is longer. How can it now be shorter?" The child may not understand that the lengths do not change when the objects are moved.



Find a smaller/larger object From a collection of many rods of differing length, give the child two, and ask the child to compare their lengths. Then ask, "Can you choose a rod from among these (motioning to all of the other rods) that is smaller than both of these?" See if the child correctly chooses a shorter rod. You can also ask the child to find a rod that is larger than all of the given rods. After the child selects a rod, follow up by asking, "How can you tell?"

Order the lengths (seriation) Place several rods, all different lengths, flat on the table and scattered around. Modify how many rods you give and how similar or different they are in length based on the age of the child and how successful she has been so far. Ask the child, "Can you put these in order from shortest to longest?" Pay attention to the strategies the child uses. The child may line them up along their bases or may only compare the tops, ignoring the need for a common base. Notice whether the child makes errors and then self-corrects. You can read more about this in *A Thinking Story about Seriation and Measurement* (http://prek-math-te.stanford.edu/measurement-data/thinking-story-about-seriation-and-measurement).



Questions about storybook characters Ask, "Do you know the story of Goldilocks and the Three Bears?" If the child says yes, review the names of the characters. Then show a picture of the characters and ask, "Which one is Papa Bear? How do you know? Which one is Baby Bear?" and so on for all of the characters. See if the child discusses their sizes or focuses on other features, such as their clothing. You may follow-up by showing a picture with Goldilocks in it and asking about her size in relation to the three bears. If the child is unfamiliar with the story, give a brief account of the main characters and the plot.

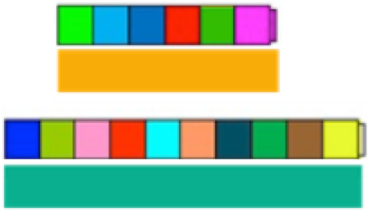
Use objects to represent sizes After asking about the sizes of the three bears, provide the child with three rods or sticks of clearly different lengths and ask the child, "Imagine these are the three bears. Which one is Papa Bear? Which is Baby Bear? Which is Mama Bear?" Determine whether the child can use the objects to represent the three bears in terms of their sizes and ask questions to determine how the child decided on the representation. For example, ask, "Why is this one Mama Bear and not this one?" This will help you determine if the child is representing the bears based on size or another feature, like color. Take note of what terms the child uses. For example, does the child say, "This one is Mama Bear because she is smaller than Papa Bear" or does the child say, "This one is Mama Bear because this one is medium" or does the child say, "This one is Mama because she is larger than Baby Bear?" Children may describe the bears using terms like large, medium, and small, or in relation to one another. Watch Bella: Compare & Represent in *Measurement Assessment Videos.*

Measuring Using Non-standard Units

Estimate length using non-standard units If the child was reasonably successful in measuring a previous object with cubes, present a second object that is longer. Ask, "How many cubes do you think you will need to measure this? How do you know?" Take note of whether the child's estimate is close, or if not close, whether it is in the correct direction. For example, if the shorter stick was six cubes long, does the child ask for more than six cubes? Give the child that number of cubes. If the child says too few or too many, allow the child to refine the estimate as often as needed, for example, "I think I still need one more...actually two more... still one more" until the length is measured. Watch Lucy: Estimate Length in *Measurement Assessment Videos.*



Which is longer? (using non-standard units) After the child has measured two objects (as six cubes long and 10 cubes long, for example), ask again, "So which is longer? How do you know?" See if the child explains using the number of cubes or if the child still compares the original objects, perhaps by sight or by placing them along a common baseline. You can prompt the child to consider the lengths, asking "Is 10 cubes longer than six cubes? How do you know?" Watch Alice: Measure & Compare Lengths in *Measurement Assessment Videos.*

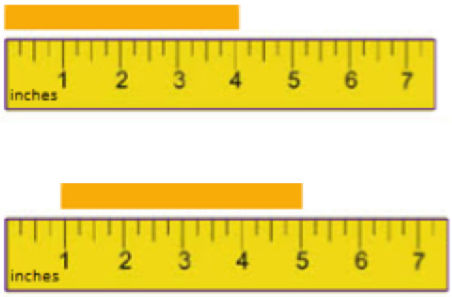


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Measuring with Inches and Centimeters

Conservation of length (using a ruler) If the child correctly uses a ruler to measure a length, lining up the base of the object and the zero mark on the ruler correctly, move the object along the ruler so it is not aligned with the zero mark and the other end lines up with a different number on the ruler. Ask, "Now how many inches long is it?" See if the child recognizes that the number the end lines up with now is not the length, or if the child states the lengths change when you move the object in different directions along the ruler.



Inch hunt Choose an object that is one inch long. If the child measures it accurately, ask, "What other objects in this room do you think are one inch long?" Allow the child to collect some objects that seem to be about one inch long and then measure with a ruler to check how close she was. This task can of course be done with centimeters instead although the numbers involved will be relatively large.

Relate units If the child has successfully measured with a ruler, show the child an object. Ask, "Would it take more inches, or more centimeters, to measure the length of this object? How do you know?" If the child recognizes that more centimeters are needed, the child may say that centimeters are closer together on the ruler so more are needed or the child may say centimeters are smaller so you would need more. Watch Diane: Relate Units in *Measurement Assessment Videos.*