Measurement

1. **Nidhi and her mother are trying to measure the length of the same table through handspans. Figure 9 shows how they measured. Why do you think that they got different measurements?**

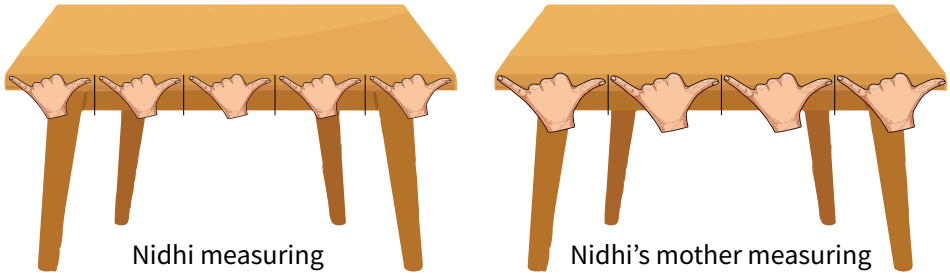

Figure 9

a. They are not measuring it accurately
b. Nidhi's hands are smaller than her mother's
c. Nidhi's hands are bigger than her mother's
d. One of them counted incorrectly

Note: This question is based on non-standard units and the distractors are based on the doubts which are normally observed in class. It reinforces that a handspan (or similar non-standard non-uniform units) is not reliable or "universal." The real-life context allows students to check for themselves how the same length can be measured (accurately) to provide different answers.

2. **Four friends are measuring the length of the same pencil using erasers. The image below shows how each of them measured the pencil. Who measured it correctly?**

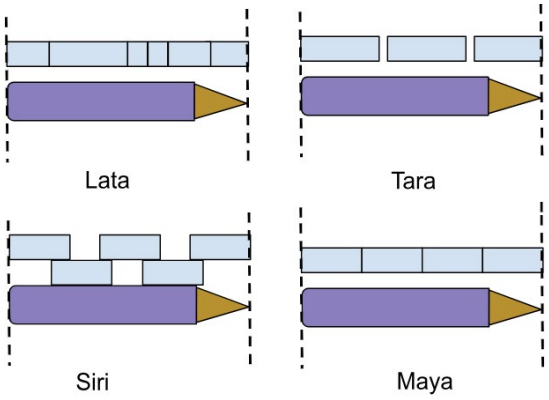

Figure 10

a. Only Maya
b. Lata and Maya
c. Only Tara
d. All of them

Note: This question checks the understanding of **measuring length using non-standard units** (in this case, erasers). It is immaterial that erasers of different sizes are used, the question is not asking the length of the pencil. It focuses on measurement with non-standard units. Measuring with non-standard units requires 3 major points to be kept in mind – (1) The repeating unit must be the same length, (2) There should be no overlaps, (3) There should be no gaps. Of course, the start and end points must align for both the object (pencil) and the unit (eraser). Multiple questions can be designed keeping these common errors in mind.

3. **What is the length of each item, in terms of paper clips? Write your answer next to each item.**

Figure 11

4. **How many blocks long is each object?**

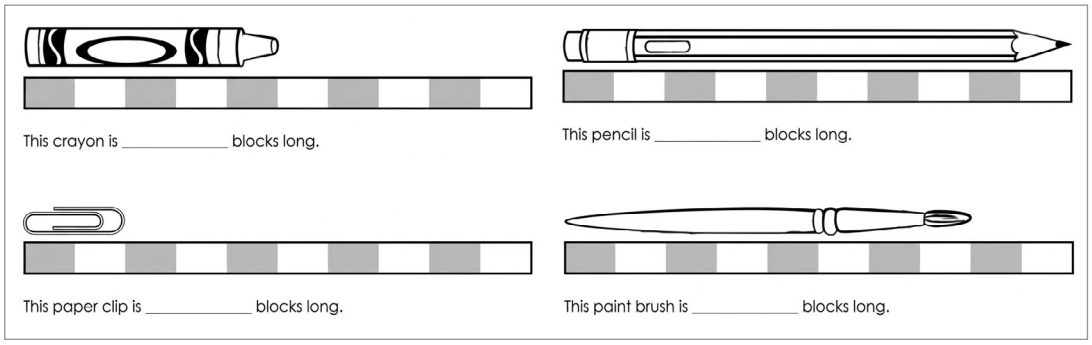

Figure 12

Note: Questions 3 and 4 are typical practice questions involving measurement using a non-standard uniform unit of measurement (a paper clip or block in these cases). Note the progression from discrete objects in Question 3 to a continuum in Question 4 – getting towards a scale – inspired by the old NCERT Class 3 Chapter 4 p.48.

5. **Sunil placed 6 blocks along the length of a pencil to measure it. How many MORE blocks does he need to measure it?**

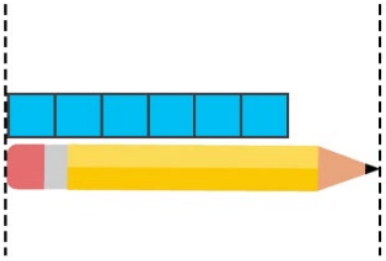

Figure 13

a. 2
c. 4
b. 6
d. 8

Note: Inspired by the old NCERT Class 3 textbook (Chapter 4, p.47), this question requires the skill of estimation. Students choosing option b may not have understood the question correctly and counted the number of blocks they see in the image, while those choosing option d may have counted the total number of blocks that measure the length of the pencil, failing to read what the question asked.

Question 6 again requires estimation.

6. **Estimate the length of each item in terms of paper clips. A few clips are placed to help you estimate.**

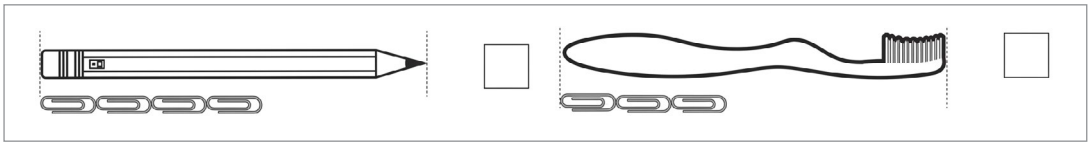

Figure 14

7. **What is the length of the pencil in each case?**

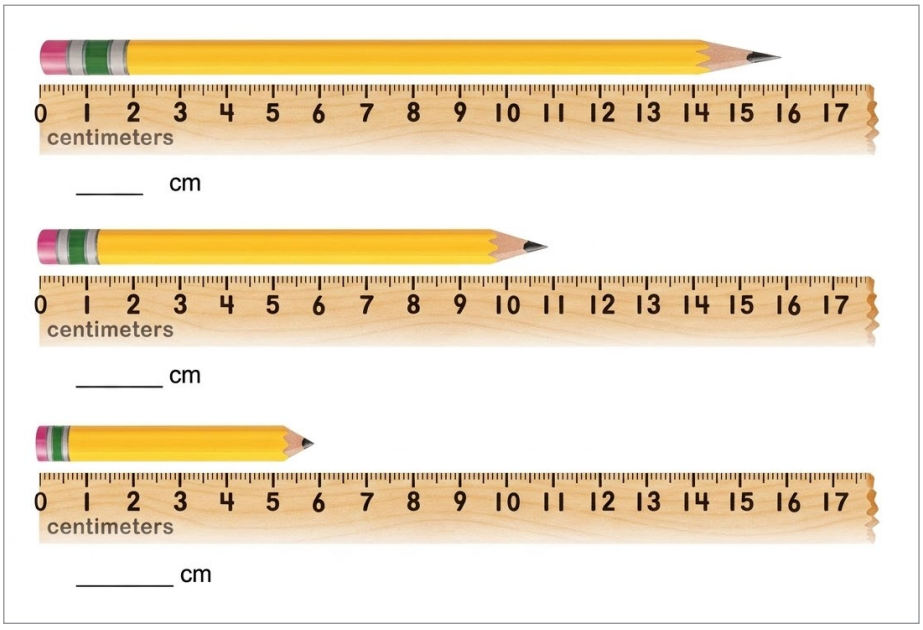

Figure 15

8. **What is the length of the colour pencil when measured using a ruler?**

Figure 16

a. 8 cm
b. 6 cm
c. 5 cm
d. 3 cm

Note: Questions 7 and 8 test a student's true understanding of measurement using a ruler. Questions on measuring length using a ruler always tend to place the object at the 0 mark. This may lead to alternative conceptions in the student's mind and generalisations about how the object is measured. The most common answer to question 8 is option a, where they blindly look at the pencil's endpoint without noticing the start point which is crucial for determining the length. Students who pick Option b count the number of lines between the start and end point, while those choosing Option d look only at the start point.

9. Ayra has a broken ruler with her, with which she wants to measure the length of her pencil. She places it as shown below. What is the length of the pencil?

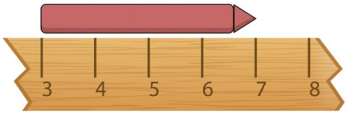

Figure 17

a. 4 cm
b. 5 cm
c. 7 cm
d. The length cannot be measured

Note: Question 9 is similar to the previous one, but the ruler is broken here, meaning some numbers at the start are missing. Students choosing option b are likely counting the number of lines from the start point to the end point, clearly missing that the distance between 2 lines counts as a unit. A student who chooses option c is looking only at the end point, because when we place the object at 0, its length is the same as the end point. The student generalizes this without realising that the crayon has been "shifted". Students choosing option d believe that the length cannot be measured from a point in between, and that it always needs to be measured from 0 (or that a broken ruler cannot show the right measurements!).

Editor's Note: The current NCERT textbooks have modified the sequence a bit. Class 3, Chapter 10 provides a lot of examples of measuring with NSU and introduces just the metre. So, the need for scale doesn't arise till Class 4 when centimetre gets introduced. Class 4, Chapter 6, p.84 introduces centimetre (cm) and measuring with the cm scale in a similar manner with the red bars taking the place of the strip with 10 squares (Figure 9). Students get to measure with broken scale (i.e., not start from 0) on p.88.

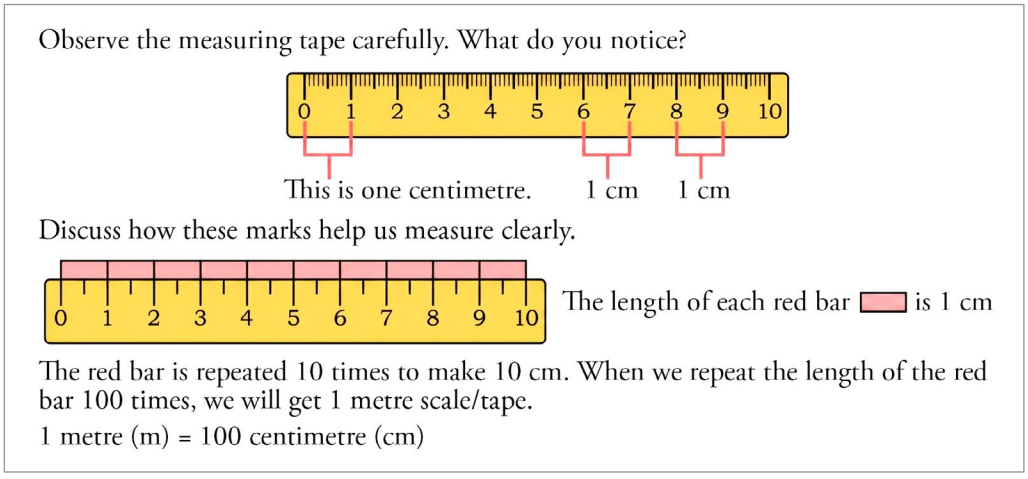

Figure 18

References

1. NCF 2023 - Link
2. Math Space: FLU - https://bit.ly/3QfYDQX