

PhyzJob: Analog Measurement

Technique I: DISTANCE



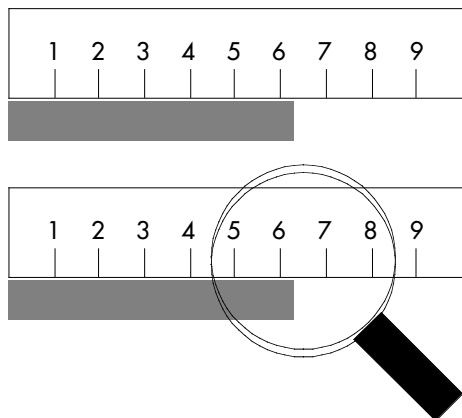
While we may be living at the dawn of the Digital Age, we must sometimes use analog measuring devices. To use these devices correctly, you must be able to apply a few simple but important techniques.

MAXIMIZE PRECISION WITH THE DIGIT OF ESTIMATION

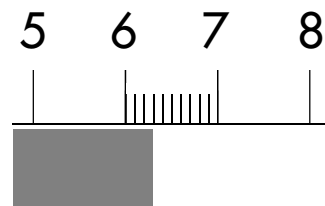
When measuring something against a ruled scale (as is done when measuring the length of a body using a meterstick), you are entitled to one digit of estimation. You visually dissect the space between two adjacent marks into ten divisions and estimate the length to the nearest of those ten divisions.

Consider the gray body being measured against the centimeter ruler shown.

The gray body has a length between 6 cm and 7 cm. We focus our attention to the space between the 6 cm mark and the 7 cm mark.

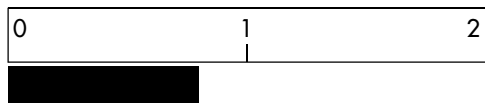


The visual dissection of the space between the 6 cm mark and the 7 cm mark is shown. Acceptable values are 6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.7, 6.8, and 6.9 cm. The best choice in this case is 6.3 cm.

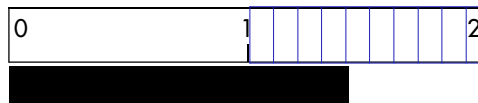


In the left column, an example of correct technique is shown. In the right column, you must apply the technique to determine the correct measurement.

1. A two-meter stick, marked in meters

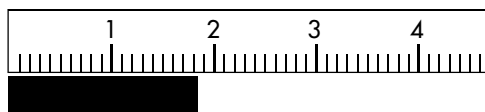


$L = 0.8 \text{ m}$
(Could be 0.7 m or 0.9 m, but not 0.75 m or 0.80 m.)

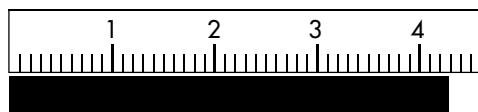


$L = 1.4 \text{ m}$
(Could be 1.3 m or 1.5 m, but not 1.43 m or 1.50 m.)

2. A centimeter stick, marked in centimeters with millimeter rules

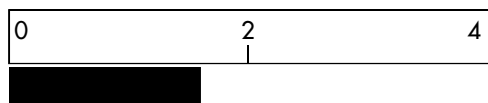


$L = 1.85 \text{ cm}$
(Could be 1.84 cm or 1.86 cm, but not 1.8 cm or 1.9 cm.)

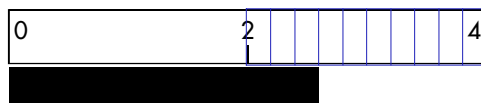


$L = 4.27 \text{ cm}$
(Could be 4.26 cm or 4.28 cm, but not 4.2 cm or 4.2 cm.)

3. A four-meter stick, marked in even meters

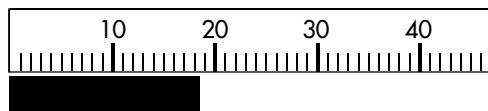


$L = 1.6 \text{ m}$
 (Not 1.5 m or 1.7 m; choices are limited to 0.0, 0.2, 0.4, ... 1.8, 2.0)

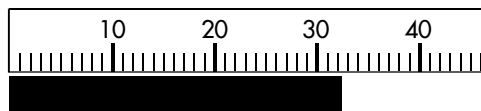


$L = 2.6 \text{ m}$
 (Not 2.5 m or 2.7 m; choices are limited to 2.0, 2.2, 2.4, ... 3.8, 4.0)

4. A centimeter stick, marked in decimeters with centimeter rules

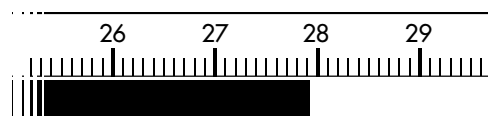


$L = 18.5 \text{ cm}$
 (Could be 18.4 cm or 18.6 cm, but not 18.45 cm, 18.50 cm, 18 cm, or 19 cm.)

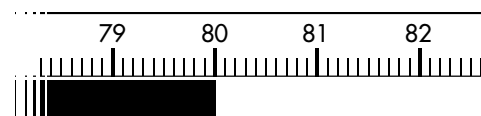


$L = 32.2 \text{ cm}$

5. Additional practice: centimeter stick, marked in centimeters with millimeter rules



$L = 27.91 \text{ cm}$

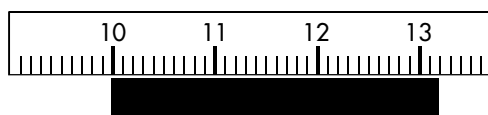


$L = 80.0 \text{ cm}$

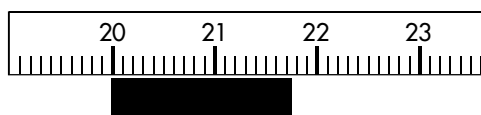
INCREASE ACCURACY BY AVOIDING METERSTICK ENDS

The ends of metersticks often get rounded with wear. This decreases the certainty of the location of the true zero of the stick.

6. Centimeter stick, marked in centimeters with millimeter rules



$L = 3.18 \text{ cm}$
 (Not 13.28 cm.)



$L = 1.74 \text{ cm}$
 (Not 21.74 cm.)