

Significant Digits and Measurement

What digits are significant when recording a measurement?

Why?

Scientists do a lot of measuring. When scientists use an instrument (such as a ruler, graduated cylinder, spectrophotometer or balance) to measure something, it is important to take full advantage of the instrument. However, they can't cheat and record a better measurement than the instrument is capable of. There is an understanding among scientists of the proper way to record valid measurements from any instrument. When you are the scientist, you must record data in this way. When you are reading other scientists' work, you must assume they recorded their data in this way.

Model 1 – Ruler A



Susan	3 cm
Maya	2 cm
Jonah	2.5 cm
Tony	3.00 cm
Emily	3¼ cm
Dionne	3.33 cm

1. What distances can you be certain of on the ruler in Model 1?
2. Six students used the ruler in Model 1 to measure the length of a metal strip. Their measurements are shown at the right. Were all of the students able to agree on a single value (1, 2, 3...) for any digit (ones place, tenths place, etc.) in the measurement? If yes, which value and digit did they agree on?
3. The ruler in Model 1 is not very useful, but a measurement can be estimated. Discuss in your group how each student might have divided up the ruler "by eye" in order to get the measurement that he or she recorded.

Model 2 – Ruler B



Susan	3.2 cm
Maya	3.1 cm
Jonah	3.3 cm
Tony	3 cm
Emily	3.25 cm
Dionne	3.20 cm

- The students obtained a better ruler, shown in Model 2. What distances can you be certain of on this ruler?
- Were the students able to agree on a single value (1, 2, 3...) for any digit (ones place, tenths place, etc.) in their measurements using the ruler in Model 2? If yes, what value in what digit did they agree on?
- What feature of the ruler in Model 2 made it possible for the students to agree on a value in that digit?



- There will always be uncertainty in any measurement. This causes variation in measurements even if people are using the same instrument. Compare the variation in the measurements made by the six students using the rulers in Models 1 and 2. Which ruler resulted in greater variation? Explain why that ruler caused more variation.

Model 3 – Ruler C



Susan	3.21
Maya	3.20 cm
Jonah	3.22 cm
Mark	3.2 cm
Emily	3.215 cm
Dionne	3.205 cm

- The students obtained an even better ruler, shown above in Model 3.
 - Were the students able to agree on a single value for any of the digits in their measurements using the new ruler? If yes, what value(s) did they agree on in which digits?
 - What feature of the ruler in Model 3 made it possible for the students to agree on the values in those digits?