

Significant Digits

Anytime you record a measurement you are making a guess.

Consider the bounce that ball lab:

$$\underline{38.5278921 \text{ cm}}$$

guess

You can only record 1 guessed (estimated) digit.

$$\underline{38.5} \text{ cm} \rightsquigarrow 3 \text{ sd}$$

certain digit ↑ guessed digit ⇔ uncertain digit

When counting significant digits, you count all the certain digits and the one uncertain digit.

Basic Skill Sheet

17. $\underline{2.9910} \text{ m} \rightsquigarrow 5 \text{ sd}$ (any zero following a non-zero digit after the decimal is significant)

certain ↑ uncertain

19. $\underline{0.00670} \text{ kg} \rightsquigarrow 3 \text{ sd}$ (leading zeroes do not count as significant digits)

leading zeroes. certain ↑ uncertain

20. $\underline{809} \text{ g} \rightsquigarrow 3 \text{ sd}$ (zeros between non-zero digits count as significant digits)

certain ↑ uncertain

18. $5600 \text{ km} \rightsquigarrow \textcircled{2} 3 \text{ or } 4 \text{ sd}$ (depends on the precision of the measuring instrument)

$\underline{5.6} \times 10^3 \text{ km} \rightsquigarrow 2 \text{ sd}$

$\underline{5.60} \times 10^3 \text{ km} \rightsquigarrow 3 \text{ sd}$

$\underline{5.600} \times 10^3 \text{ km} \rightsquigarrow 4 \text{ sd}$

$5600. \rightsquigarrow 4 \text{ sd}$

$560\bar{0} \rightsquigarrow 4 \text{ sd}$

Calculations involving Significant Digits

Adding + Subtracting

$$\begin{array}{r}
 123.\underline{4} \text{ g} \\
 2.\underline{56} \text{ g} \\
 0.\underline{479} \text{ g} \\
 + 3\underline{1} \text{ g} \\
 \hline
 \end{array}$$

$$15\underline{7}439 \text{ g}$$

$$\approx 157 \text{ g}$$

↑ round to place value here
(can only have 1 uncertain digit)

When adding and subtracting, you round your final answer to the least precise place value

Multiplying and Dividing

$$\begin{array}{r}
 13.\underline{21} \text{ m} \quad (4\text{sd}) \\
 \times 2.\underline{3} \text{ m} \quad (2\text{sd}) \\
 \hline
 3963 \\
 2642 \\
 \hline
 30383 \text{ m}^2 \quad (2\text{sd})
 \end{array}$$

$$\approx 30 \text{ m}^2$$

$$3.0 \times 10^1 \text{ m}^2$$

When multiplying and dividing, you round your final answer to the least # of significant digits

Basic Skill

21. $\frac{2.674 \text{ m}}{2.0 \text{ m}} = 1.337$

4sd (pointing to 2.674)
 2sd (pointing to 2.0)
 2sd (pointing to 1.337)
 ≈ 1.3 (circled)

22. $5.25 \text{ L} \times 1.3 \text{ L} = 6.825 \text{ L}^2$

3sd (pointing to 5.25)
 2sd (pointing to 1.3)
 2sd (pointing to 6.825)
 $\approx 6.8 \text{ L}^2$ (circled)

6.825 L²
 ↑
 6.82 L² (circled)
 6.835 L²
 ↑
 6.84 L²

23. $9.0 \text{ cm} + 7.66 \text{ cm} + 5.44 \text{ cm} = 22.10 \text{ cm}$

least precise place value (pointing to 9.0)
 $= 22.1 \text{ cm}$ (circled)

24. $10.07 \text{ g} - 3.1 \text{ g} = 6.97 \text{ g}$

$\approx 7.0 \text{ g}$ (circled)