8/30/2019

Density

$d = m/v$

ex: "gold nugget" has a mass = 59.9g
volume = 5.25mL

$d = \frac{59.9\,g}{5.25\,mL} = 11.4\,g/mL$ gold? No!

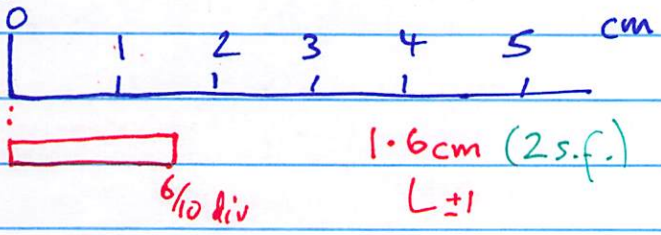
How certain are we?

When we measure, we generally assume last digit has some error, ±1.

ex: 8.2mL — 8 certain, 2 uncertain ±1 → 8.1 - 8.3

vs. 8.25mL — certain ±1 → 8.24 - 8.26

When we read a scale, we always estimate our reading to 1/10 division.



6/10 div

1.6cm (2 s.f.)
L ±1

a measure of precision

Significant Figures (sig figs, s.f.) = # certain digits + 1

Rules for counting #s.f.

1. Non-zero digit ✓ ex: 73s (2s.f.)
2. Interior zeros ✓ ex: 108kg (3s.f.)
3. Leading zeros ✗ ex: 0.01307m (4s.f.)
4. Trailing zeros: ✓ if d.p. ex: 5.0000 mol (5 s.f.)
   ✗ if no d.p. ex: 50,000 mol (1s.f.)

7305.0 μm (5s.f.)
0.008 010 ns (4s.f.)

600. A (3s.f.) → 599-601
600 A (1s.f.) → 500-700

Sci. Notation

	7.1×10^{-8}	1.300×10^{1024}
# s.f.	(2s.f.) ignore	(4s.f.) ignore

Defined / Exact / Counted #'s

	(∞ s.f.)	(∞ s.f.)	∞ s.f.	∞ s.f.
ex:	2.54cm = 1 in		1 min = 60s	4 fingers
	(defined)		(exact)	counted
	no error			

Calculations w/ sig-figs

- least precise # affects the final answer!

(1) ×, ÷ ... fewest #s.f.

ex: $\frac{3.8 \times 2.00}{8.4381} = 0.900676693$ (2s.f.)

2s.f. 3s.f. × ✓✓× —— 5s.f.

$= 0.90$ (2s.f.)

× ✓✓× — 2s.f.

ex: $0.937 \longrightarrow 0.94$ (2s.f.)

(2) +, − ... fewest #dp

└ decimal places.

ex:
$$\begin{array}{r} 1.8470 \quad (4dp) \\ +\ 3.22 \quad (2dp) \\ \hline 5.0670 \quad (2dp) \end{array}$$

↳ 5.07 (2d.p.)

what about: $\frac{8.71 + 0.03}{0.001714} = ?$ ② $\frac{8.74}{0.001714}$

① add 8.74

(3s.f.) ↙ 2dp.

(4s.f.)

✓✓✓× ——

5099.183... (3s.f.)

5100 (2s.f.)

5100. (4s.f.) ⟶ 5100 (3s.f.)

5.10×10^3 (3s.f.)