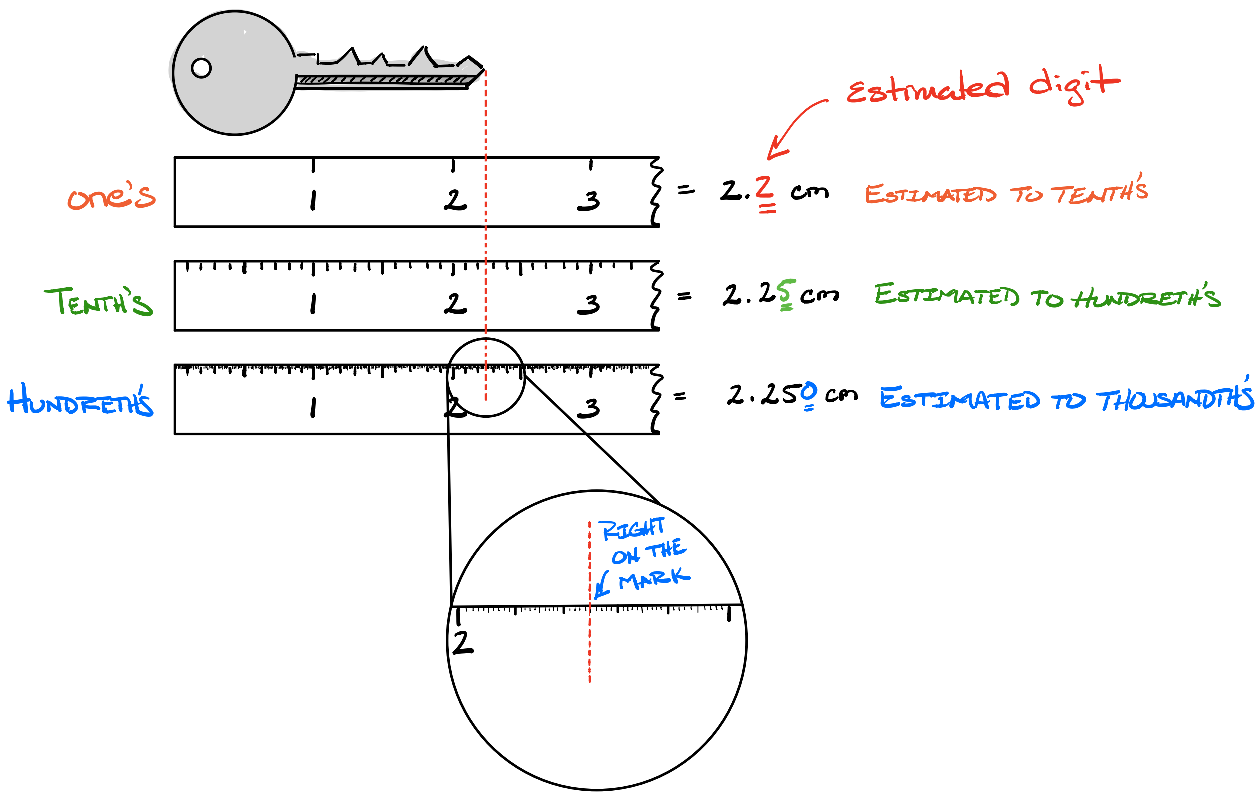
Numbers in Chemistry

Measurments

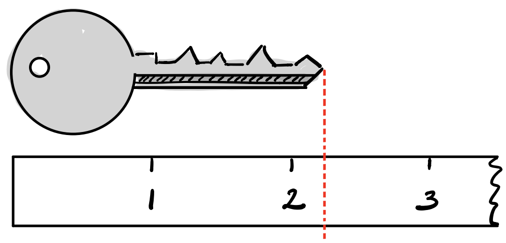
have uncertainty in their value

Definitions & Counted Values

Exact values w/ no uncertainty



on first ruler

one's  = 2.2 cm   ESTIMATED TO TENTH'S

(Estimated digit → the second 2)

2.2 cm ± 0.1 cm

As big as 2.3 cm
As small as 2.1 cm
} uncertainty within measurment

Example

31.62 m ± 0.01 m
(uncertainty → 2)

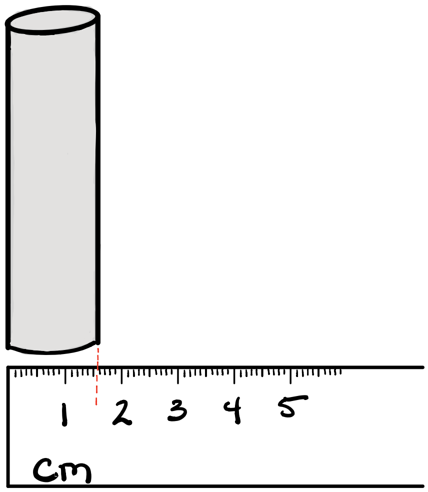
31.63 m
31.61 m

21,000 L ± 1,000 L
(uncertainty → 1)

22,000 L
20,000 L

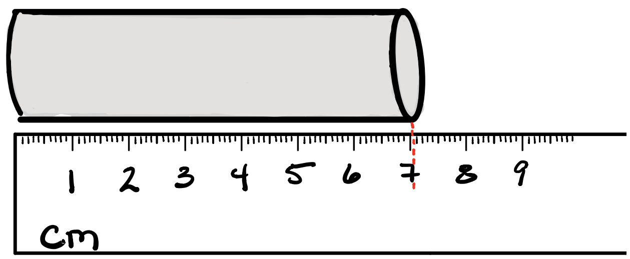
21,000. L ± 1 L
(uncertainty → last 0)

21,001 L
20,999 L

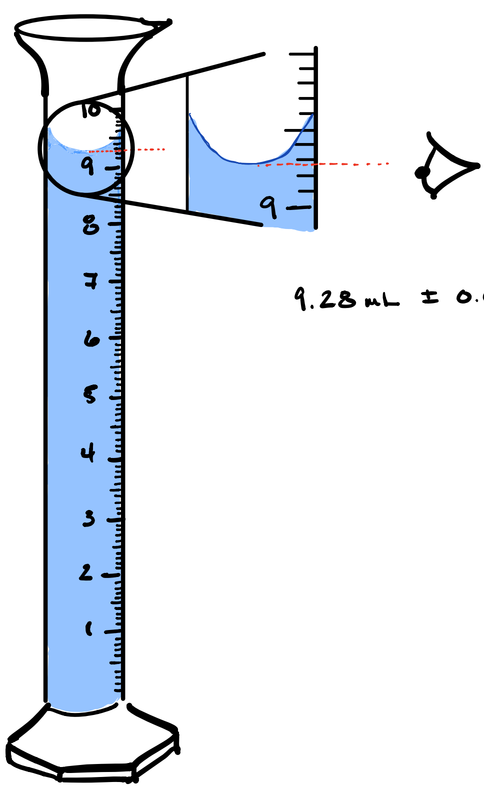


1.59 cm
1.58 cm

1.58 cm ± 0.01 cm



7.05 cm ± 0.01 cm



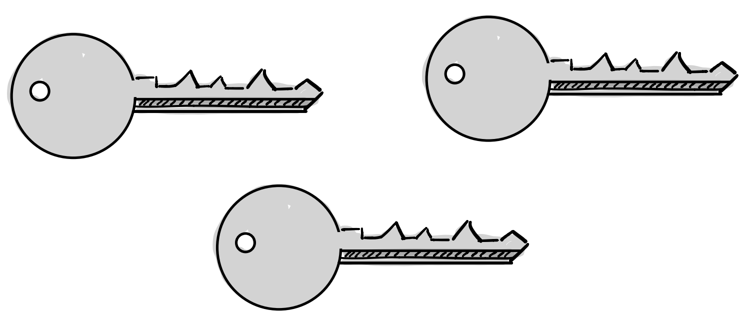
9.28 mL ± 0.01 mL

Measurments have 2 parts

value unit
↑ ↑
number what is being measured

cm centimeters
m meters
L Liters
in inches
ft feet
gal gallons

Values that are exact ⇒ no uncertainty



How many keys ⇒ 3 keys no ±

Counted value rather than measured

Example

Measured 3 ft obtained by ruler ⇒ contains uncertainty

3 ft ± 1 ft   4 ft - 2 ft

Counted 3 pens obtained by counting ⇒ Exact

no ±

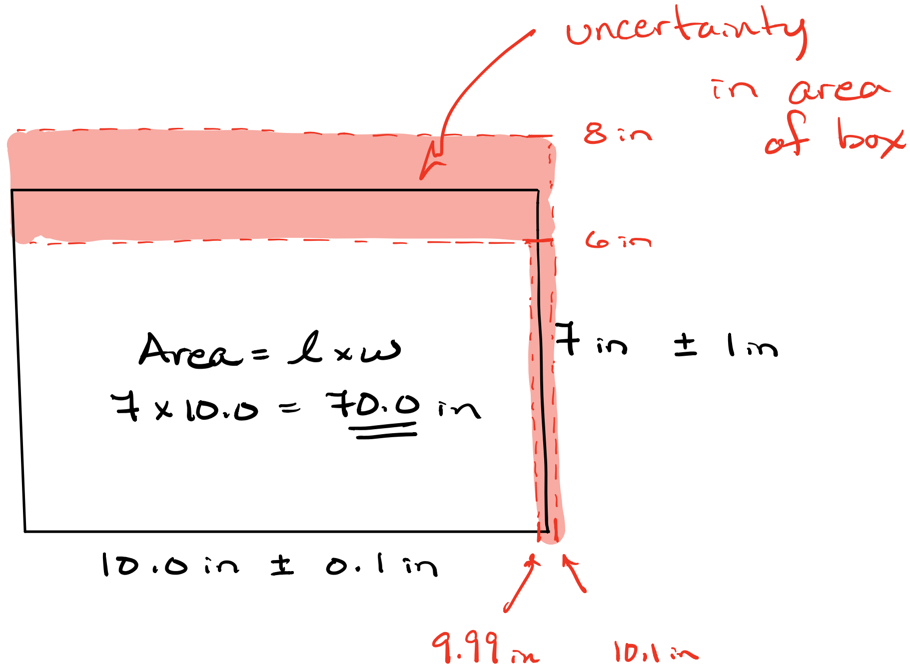
2nd Type of exact value is a definition

Definitions

Exactly 12 in in 1 foot

12 in = 1 ft
100 cm = 1 m
1000 mm = 1 m

} Exact equalities



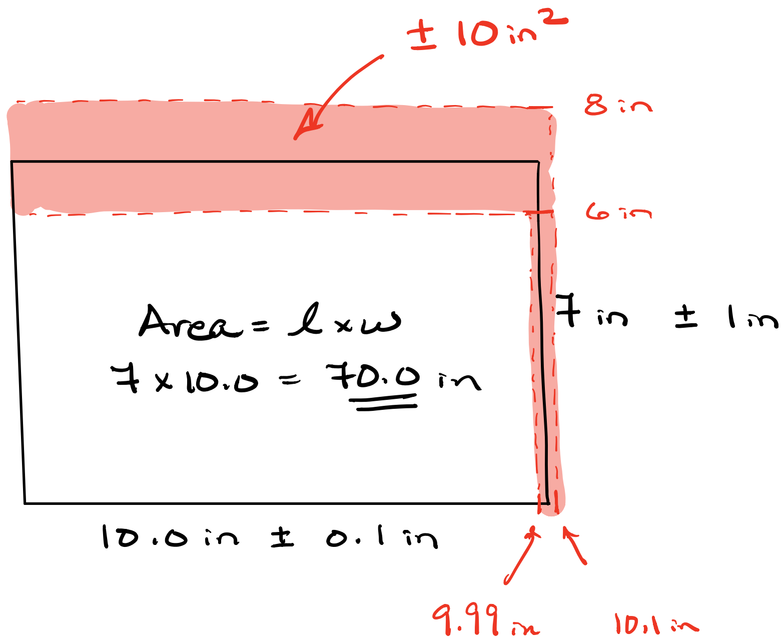
$$7 \text{ in} \times 10.0 \text{ in} = 70.0 \text{ in}^2 \pm 0.1 \text{ in}^2$$

$$70.1 \text{ in}^2 - 69.9 \text{ in}^2$$

Significat Figures (Significant Digits)

System for estimating uncertainty in a calculation

- Rules for how many sig figs are in an individual measurment
- Rules for how to apply sig figs in a calculation



Applying Sig figs

1 SF 3 SF

$7\text{ in} \times 10.0\text{ in} = 70.0\text{ in}^2$

Answer must be rounded to the smallest 1 SF ⟹

$70\text{ in}^2 \pm 10\text{ in}^2$

$80\text{ in}^2 \leftrightarrow 60\text{ in}^2$