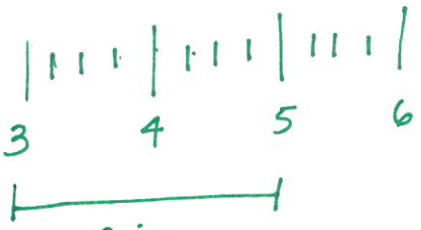
Precision Measurement

$$\text{Precision} = \frac{\text{measurement}}{\#\text{ of tick marks}}$$



there are 8 ticks.

$$= \frac{2\text{ in}}{8\text{ ticks}}$$

$$= 0.25\text{ in}$$

$$\text{Uncertainty} = \frac{\text{Precision}}{2}$$

$$= \frac{0.25}{2}$$

$$= 0.125$$

If we have only the measurement; and we are trying to figure out Precision and uncertainty.

Ex: 15 months ← look at the last digit and place value.

$p = 1$ $\quad unc = 0.5$

13.7 cm ← $p = 0.1$ $\quad unc = 0.05$

100.73 m ← $p = 0.01$ $\quad unc = 0.005$

Uncertainty: measurement $\pm$ uncertainty

Ex: 12.5 cm ← measurement

$p = 0.1$ cm $\quad unc = 0.05$

12.5 ± 0.05

max measurement = 12.55 cm

min measurement = 12.45 cm

Perform operation w/ uncertainties.

Ex: 12.5 cm and 5.7 cm

If we add them.

$12.5 + 5.7 = \underline{18.2\ cm}$

$p = 0.1$ $\quad$ $p = 0.1$

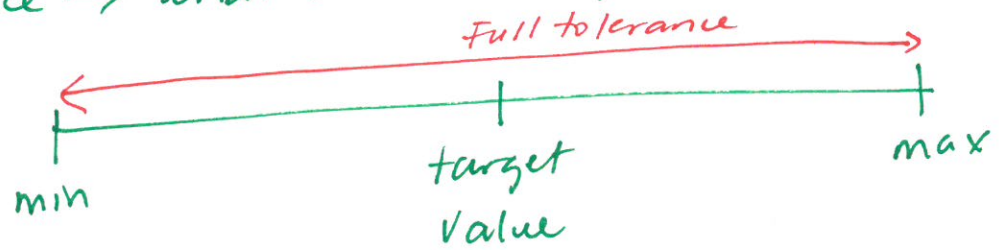
$unc = 0.05$ $\quad$ $unc = 0.05$

$(12.5 + 5.7) \pm (0.05 + 0.05)$

18.2 ± 0.1

Accuracy → how close is the measurement to the real measurement.

Tolerance → what are the acceptable values?

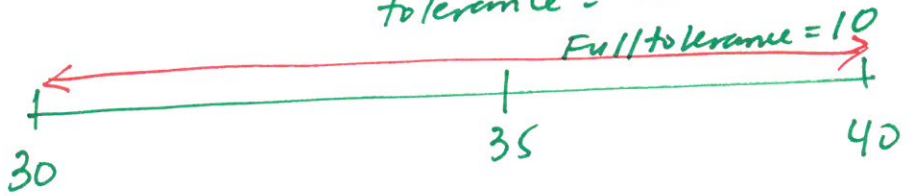


Ex: 35 ± 5 cm

min = 35 − 5 = 30

max = 35 + 5 = 40

tolerance = 10

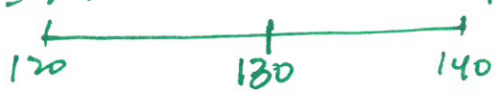


Ex: min = 120 cm

max = 140 cm

target value = 130 cm

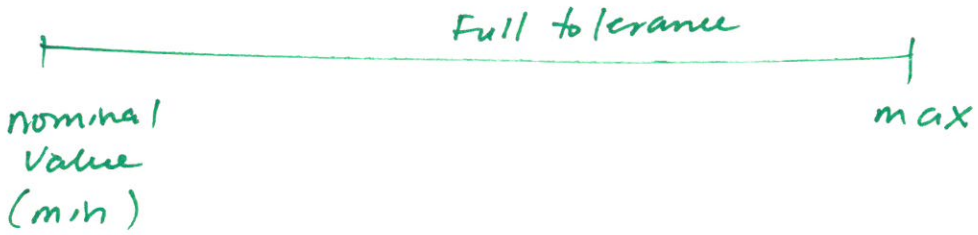
tolerance = 20 cm



Recording Acceptable Values.

1) nominal value $\pm$ half tolerance.

2) nominal value $^{+\text{tolerance}}_{-0}$
(is the min.)



3) nominal value $^{+0}_{-\text{tolerance}}$

4) max
min