

Approximation

Notation

T = true value
A = approximating value
E = error

$$\left. \begin{array}{l} T = \text{true value} \\ A = \text{approximating value} \\ E = \text{error} \end{array} \right\} \Rightarrow \begin{array}{l} T = A + E \\ E = T - A \\ |T - A| = |E| \end{array}$$

Ex 1

What if want to approximate T to 2 decimal places.
This means that :

$$|T - A| = |E| < 0.005.$$

Let's look at a chart of possible values for T and A
where $|E| = 0.004$ (so $|E| < 0.005$).

T	A := T - .004	A := T + .004
0.120	0.116	0.124
0.121	0.117	0.125
0.122	0.118	0.126
0.123	0.119	0.127
0.124	0.120	0.128
0.125	0.121	0.129
0.126	0.122	0.130
0.127	0.123	0.131
0.128	0.124	0.132
0.129	0.125	0.133
0.130	0.126	0.134

$$T = A + .004$$

$$T = A - .004$$

Ex 2

T =

$$T = 0.399 \dots 9 \dots 99 \overline{0}$$

$$|E| = 0.000 \dots 0 \dots 01 \overline{0}$$

$$\left. \begin{array}{l} (-) \\ (+) \end{array} \right\} \begin{array}{l} A = T - |E| = 0.399 \dots 9 \dots 98 \overline{0} \\ A = T + |E| = 0.400 \dots 0 \dots 00 \overline{0} \end{array}$$

Ex 3

$$1 = 0.\overline{9}$$