Practicing using numbers with uncertainties.

Use the following numbers with uncertainties to do the following operations.

A = 35.75 ± 0.08 B = 568.25 ± 0.02 C = 84.85 ± 0.01 D = 105.71 ± 0.05

1. A+B+C

$$\begin{array}{r} 35.75 \pm 0.08 \\ 568.25 \pm 0.02 \\ 84.85 \pm 0.01 \\ \hline 688.85 \pm 0.11 \end{array}$$

$\boxed{688.9 \pm 0.1}$

2. B-D

$$\begin{array}{r} 568.25 \pm 0.02 \\ -\ 105.71 \pm 0.05 \\ \hline 462.54 \pm 0.07 \end{array}$$

$\boxed{462.54 \pm 0.07}$

3. ABC $= (35.75)(568.25)(84.85)$

$= 1723722.47$

$\boxed{(1.724 \pm 0.004) \times 10^6}$

$$\Delta ABC = \left(\frac{\delta A}{A} + \frac{\delta B}{B} + \frac{\delta C}{C}\right) ABC$$

$$= \left(\frac{0.08}{35.75} + \frac{0.02}{568.25} \quad \frac{0.01}{84.85}\right) 1723722.447$$

$= 4121.0981$ 1 sig. fig

$= 4000$

4. $\frac{BD}{A} = \frac{(568.25)(105.71)}{35.75}$

$= 1680.271538$

$\boxed{1680 \pm 5}$

$$\Delta \frac{BD}{A} = \left(\frac{\delta B}{B} + \frac{\delta D}{D} + \frac{\delta A}{A}\right) \frac{BD}{A}$$

$$= \left(\frac{0.02}{568.25} + \frac{0.05}{105.71} + \frac{0.08}{35.75}\right) 1680.271538$$

$= 4.6139$

$= 5$

5. $\frac{B+D}{A^2}$

$$\begin{array}{r} B+D = 568.25 \pm 0.02 \\ +\ 105.71 \pm 0.05 \\ \hline 673.96 \pm 0.07 \end{array}$$

$\frac{B+D}{A^2} = \frac{673.96}{35.75^2}$

$= 0.527329$

$$\Delta \frac{B+D}{A^2} = \left(\frac{\delta B+D}{B+D} + \frac{\delta A}{A} + \frac{\delta A}{A}\right) \frac{B+D}{A^2}$$

$$= \left(\frac{0.07}{673.96} + \frac{0.08}{35.75} + \frac{0.08}{35.75}\right) 0.527329$$

$= 0.00241485$

$= 0.002$

$\boxed{0.527 \pm 0.002}$ or $(5.27 \pm 0.02) \times 10^{-1}$