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19/ENG07/059
Mechatronics Engineering

ASSIGNMENTS

(1) Area of a triangle

$$A = \frac{1}{2}ab$$

$$\delta A = \frac{\delta A}{\delta a} \cdot \delta a + \frac{\delta A}{\delta b} \cdot \delta b$$

$$\therefore = \frac{b}{2} \cdot \delta a + \frac{a}{2} \cdot \delta b$$

$$\delta a = \pm \frac{0.5a}{100} \qquad \delta b = \frac{\pm 0.5b}{100}$$

$$= \frac{b}{2}\left(\frac{\pm 0.5a}{100}\right) + \frac{a}{2}\left(\frac{\pm 0.5b}{100}\right)$$

Factoring out $ab/2$

Therefore, $\frac{ab}{2} \pm \left(\frac{1}{100}\right)$

But Area $= ab/2$

$$\pm A = \frac{1}{100}$$

(2) The length of hypotenuse and length

Recall $h = \sqrt{a^2 + b^2}$

$$\delta h = \frac{\delta h}{\delta a} \cdot \delta a + \frac{\delta h}{\delta b} \cdot \delta b$$

let $h = \sqrt{u}$, where $u = a^2 + b^2$

$\frac{\delta u}{\delta a} = 2a$ $\frac{\delta u}{\delta b} = 2b$

$$\therefore \delta h = \frac{a}{\sqrt{a^2+b^2}}\left(\frac{\pm 1.5a}{100}\right) + \frac{b}{\sqrt{a^2+b^2}}\left(\frac{\pm 1.5b}{100}\right)$$

$$= \frac{\pm 1.5a^2}{100\sqrt{a^2+b^2}} + \frac{\pm 1.5b^2}{100\sqrt{a^2+b^2}}$$

by factorization,

$$\delta h = \frac{\pm 1.5}{100}\left(\frac{a^2+b^2}{\sqrt{a^2+b^2}}\right)$$

$$\delta h = \frac{\pm 1.5}{100}\left(\sqrt{a^2+b^2}\right)$$

but $h = \sqrt{a^2+b^2}$

$\therefore \delta h = \pm 1.5\%$ Ch