OLADIPO TOMI ISAAC
17/ENG05/030
MECHATRONICS ENGINEERING
ENG 281 ASSIGNMENT

– The hypotenuse of a right-angle triangle is denoted as 'c', and the other two sides are denoted as 'a' and 'b' is ± 1·5%, find the maximum possible error in calculating;
a) the area of the triangle and,
b) the length of the hypotenuse.

Solution

a) $A = \frac{1}{2}a \cdot b = \frac{a \cdot b}{2}$

$\frac{\partial A}{\partial a} = \frac{b}{2}$, $\frac{\partial A}{\partial b} = \frac{a}{2}$

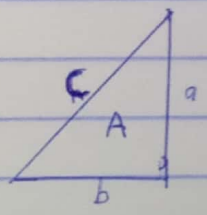
$\delta a = \pm \frac{3a}{200}$, $\delta b = \pm \frac{3b}{200}$

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

$= \frac{b}{2}\left(\pm \frac{3a}{200}\right) + \frac{a}{2}\left(\pm \frac{b}{200}\right)$

$= \pm \frac{a \cdot b}{2}\left[\frac{3}{200} + \frac{3}{200}\right] = \pm A \cdot \frac{3}{100}$

$\therefore \delta A = 3$ percent of A



b) $c = \sqrt{a^2 + b^2} = (a^2 + b^2)^{\frac{1}{2}}$

$\frac{\partial c}{\partial a} = \frac{1}{2}(a^2 + b^2)^{-\frac{1}{2}}(2a)$,

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

$\frac{\partial c}{\partial b} = \frac{1}{2}(a^2 + b^2)^{-\frac{1}{2}}(2b)$

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

$\delta a = \pm \frac{3a}{200}$, $\delta b = \pm \frac{3b}{200}$

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

$\delta c = \frac{a}{\sqrt{a^2 + b^2}} \cdot \left(\pm \frac{3a}{200}\right) + \frac{b}{\sqrt{a^2 + b^2}} \cdot \left(\pm \frac{3b}{200}\right)$

$$= \pm \frac{3}{200} \cdot \sqrt{a^2 + b^2}$$

$$= \pm \frac{3}{200} \cdot C$$

$\delta_C = 1.5$ percent of C