NAME: OTTUN CLEMENT IFEOLUWA

MATRIC NO: 17/ENG04/065

DEPT: ELECTRICAL ENGR

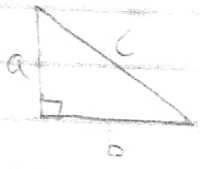
DATE: 21ST - OCTOBER - 2018

The hypotenuse of a right-angled triangle is denoted as c, and the other two sides are denoted as a and b. If the possible error of measuring each of 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.

Answer.



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

$$\frac{dA}{da} = \frac{b}{2}$$

$$\frac{dA}{db} = \frac{a}{2}$$

$$dA = \frac{dA}{da}da + \frac{dA}{db}db$$

$$da = \pm\frac{1.5a}{100}, \quad db = \pm\frac{1.5b}{100}$$

$$dA = \frac{b}{2}\left[\pm\frac{1.5a}{100}\right] + \frac{a}{2}\left[\pm\frac{1.5b}{100}\right]$$

$$= \pm\frac{ab}{2}\left(\left[\frac{1.5}{100}\right] + \left[\frac{1.5}{100}\right]\right)$$

$$= \pm\frac{ab}{2}\left[\frac{1.5 + 1.5}{100}\right]$$

$$= \pm\frac{ab}{2}\left[\frac{3}{100}\right] = \pm A.\frac{3}{100}$$

$\therefore dA = 3\%$ of A

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

$$dC = \frac{dC}{da} da + \frac{dC}{db} db$$

$$\frac{dC}{da} = \frac{1}{2}(a^2 + b^2)^{-\frac{1}{2}}(2a) = \frac{a}{\sqrt{a^2 + b^2}}$$

$$\frac{dC}{db} = \frac{1}{2}(a^2 + b^2)^{-\frac{1}{2}}(2b) = \frac{b}{\sqrt{a^2 + b^2}}$$

$$da = \pm \frac{1.5a}{100}, \quad db = \pm \frac{1.5b}{100}$$

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

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

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

$dC = 1.5\%$ of C.