

MATHS LMS ASSIGNMENT

NAME: LLEKUNO TAM

TRAF NO: 1A/MUSO1/1A9

DEPT: MECHANICAL ENGINEERING

SIGN: ~~LEKUNO~~

1) The hypotenuse of a right angle triangle is denoted as "c", and the 2 sides are denoted as "a" and "b" is $\pm 1.5\%$, Find the maximum possible error in calculating a) the area of the triangle and;
b) the length of the hypotenuse

Soln

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

$$\frac{dA}{da} = \frac{b}{2} \quad \frac{dA}{db} = \frac{a}{2}$$

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

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

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

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

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

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

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

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

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

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

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

$$\therefore \delta c = \frac{dc}{da} \cdot \delta a + \frac{dc}{db} \cdot \delta b$$

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

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

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

$$\therefore \delta C = 1.5 \text{ per cent of } C$$