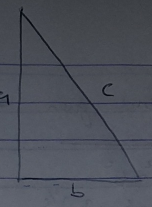
Mbam Oguzie
Mechatronnes
~~A~~ 171ENG05/021
ENG 281 ~~Assignment~~



1. area of a triangle $= \frac{1}{2} \times ab = \frac{ab}{2}$

$A = ab/2$

$\partial A/\partial a = b/2$

$\partial A/\partial b = a/2$

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

$\delta a = \pm 1.5/100\, a$

$= \pm 0.015a$

$\delta b = 1.5/100\, b$

$= \pm 0.015b$

$\delta A = \pm \frac{b}{2} \cdot 0.015a \pm \frac{a}{2} \cdot 0.015b$

$\delta A = \pm ab\,0.0075 \pm ab \cdot 0.0075$

$\delta A = \pm 2(\quad) \quad \delta A = \pm 2ab(0.0075)$

$\delta A = \pm 1.5$

$\delta A = \pm \frac{ab}{2} \cdot 0.015 \pm \frac{ab}{2} \cdot 0.015$

Recall: since $A = ab/2$

$\delta A = \pm A\,0.015 \pm A\,0.015$

$= \pm A(0.03)$

$\delta A = \pm A\,0.03$

The change in area A is $\pm$ 0.03 or 3%

2. length of hypotenus given a and b

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

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

let $a^2+b^2 = u$

$$\frac{dc}{du} = \frac{1}{2}u^{-1/2} = \frac{1}{2\sqrt{u}} = \frac{1}{2\sqrt{a^2+b^2}}$$

$$\frac{\partial u}{\partial a} = 2a$$

$$\frac{\partial u}{\partial b} = 2b$$

$$\frac{\partial c}{\partial u} \times \frac{\partial u}{\partial a} = \frac{\partial c}{\partial a} = \frac{1}{2\sqrt{a^2+b^2}} \times 2a$$

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

$$\frac{\partial c}{\partial u} \times \frac{\partial u}{\partial b} = \frac{\partial c}{\partial b} = \frac{1}{2\sqrt{a^2+b^2}} \times 2b$$

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

$$\delta a = \pm 1.5\% \, a$$

$$= \pm 0.015 a$$

$$\delta b = \pm 1.5\% \, b$$

$$= \pm 0.015 b$$

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

$$= \pm \frac{a}{\sqrt{a^2+b^2}} \cdot 0.015a \pm \frac{b}{\sqrt{a^2+b^2}} \cdot 0.015b$$

$$= \pm \frac{a^2 \cdot 0.015}{\sqrt{a^2+b^2}} + \frac{b^2 \cdot 0.015}{\sqrt{a^2+b^2}}$$

$$= \pm (a^2 + b^2) \left(\frac{0.015}{\sqrt{a^2 + b^2}} \right)$$

If $\sqrt{a^2 + b^2} = c$

$a^2 + b^2 = c^2$

$$\therefore z = \pm c^2 \cdot \frac{0.015}{c}$$

$= \pm c \cdot 0.015$

$= \pm 1.5\%$ of c

The change in length of the hypotenuse, c is $\pm 1.5\%$