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Course: ENG 281

Matic: 17/ENG03/002

Dept: Civil Eng

$$\begin{aligned} \text{a) Error percentage} &= \pm 1.5\% \\ &= \pm \frac{1.5}{100} \end{aligned}$$

$$= \pm 0.015$$

$$\begin{aligned} \text{Area of triangle} &= \frac{1}{2} a \times b \\ &= \frac{ab}{2} \end{aligned}$$

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

$$= \frac{b}{2} [\pm 0.015a] + \frac{a}{2} [\pm 0.015b]$$

$$= \frac{ab}{2} [\pm 0.015] + \frac{ab}{2} [\pm 0.015]$$

$$\text{but } A = \frac{ab}{2}$$

$$\therefore dA = A [\pm 0.015] + A [\pm 0.015]$$

$$= A [\pm 0.015 + (\pm 0.015)]$$

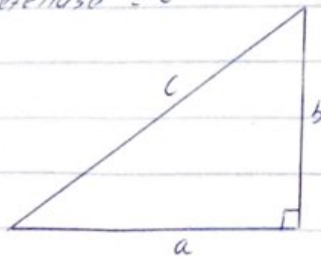
$$= A [\pm 0.03]$$

$$= \pm A \cdot 0.03$$

$$= \pm A 3\%$$

$$\therefore dA = \pm A 3\% \text{ or } \pm A \cdot 0.03$$

b) Length of hypotenuse = c



From Pythagoras theorem

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

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

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

Possible error = ± 0.015

$$dc = \frac{dc}{da} \cdot da + \frac{dc}{db} \cdot db$$

$$\frac{dc}{da} \cdot da = \frac{1}{2} (a^2 + b^2)^{-1/2} \cdot (2a) \cdot (\pm 0.015a)$$

$$= (a^2 + b^2)^{-1/2} \cdot a \cdot (\pm 0.015a)$$

$$= \frac{a}{(a^2 + b^2)^{1/2}} \cdot (\pm 0.015a)$$

$$= \frac{a^2}{(a^2 + b^2)^{1/2}} \cdot (\pm 0.015)$$

$$\frac{dc}{db} \cdot db = \frac{1}{2} (a^2 + b^2)^{-1/2} \cdot (2b) \cdot (\pm 0.015b)$$

$$= (a^2 + b^2)^{-1/2} \cdot b \cdot (\pm 0.015b)$$

$$= \frac{b}{(a^2 + b^2)^{1/2}} \cdot (\pm 0.015b)$$

$$= \frac{b^2}{(a^2 + b^2)^{1/2}} \cdot (\pm 0.015)$$

$$= \pm \frac{b^2}{(a^2 + b^2)^{1/2}} \cdot (0.015)$$

$$(a^2 + b^2)^{1/2}$$

$$\therefore dc = \frac{a^2}{(a^2 + b^2)^{1/2}} (\pm 0.015) + \frac{b^2}{(a^2 + b^2)^{1/2}} (\pm 0.015)$$

$$= \pm \frac{a^2 (0.015)}{(a^2 + b^2)^{1/2}} + \pm \frac{b^2 (0.015)}{(a^2 + b^2)^{1/2}}$$

$$= \pm \frac{a^2 (0.015) + b^2 (0.015)}{(a^2 + b^2)^{1/2}}$$

$$(a^2 + b^2)^{1/2}$$

$$= \pm \frac{a^2 + b^2 (0.015)}{(a^2 + b^2)^{1/2}}$$

$$(a^2 + b^2)^{1/2}$$

$$= \pm \frac{(a^2 + b^2)}{(a^2 + b^2)^{1/2}} (0.015)$$

from laws of indices

$$dC = \pm (a^2 + b^2)^{1 - 1/2} (0.015)$$

$$= \pm (a^2 + b^2)^{1/2} \cdot (0.015)$$

$$\text{but } (a^2 + b^2)^{1/2} = C$$

$$\therefore dC = \pm C \cdot 0.015$$

$$= \pm 0.015$$

$$= \pm 1.5\%$$

$$dC = \pm 1.5\% \text{ or } \pm 0.015$$