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Eng 281

Assignment ②

@ Error percentage = ±1.3%

$$= \frac{\pm 1.3}{100}$$

$$= \pm 0.015$$

Area of triangle $= \frac{1}{2} \times a \times b$

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

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

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

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

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

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

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

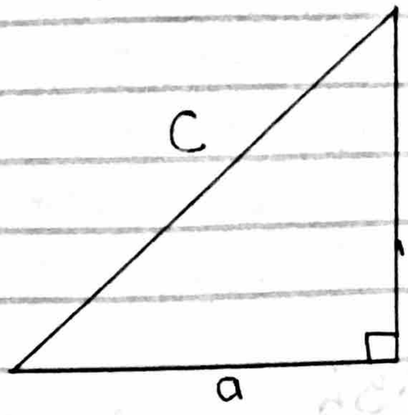
$= A[\pm 0.03]$

$= \pm A0.03$

$= \pm A3\%$

$\therefore dA = \pm A3\%$ or $\pm A0.03$

(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 $= \pm 0.015$

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

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

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

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

$$\therefore \delta C = \frac{a^2}{(a^2+b^2)^{1/2}}(\pm 0.015) + \frac{b^2}{(a^2+b^2)^{1/2}}(\pm 0.013)$$

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

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

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

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

from laws of indices

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

$$= \pm (a^2+b^2)^{1/2}.(0.013)$$

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

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

$$= \pm C 0.015$$

$$= \pm C 1.3\%$$

$$\delta C = \pm C 1.3\% \text{ or } \pm C 0.015$$