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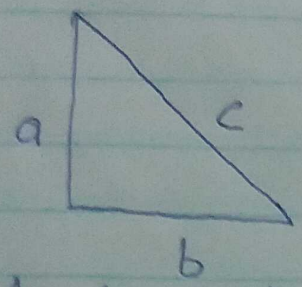
The hypotenuse of a right angled triangle is denoted as C, and the other two sides are denoted as a and b. If the possible error of measuring each of the sides a and b is ±1.5%, find the maximum possible error in calculating
a) The area of the triangle
b) The length of the hypotenuse



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

$\frac{dA}{da} = \frac{1}{2}b \qquad \frac{dA}{db} = \frac{1}{2}a$

% error

$da = 0.015a \qquad db = \pm 0.015b$

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

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

$\frac{ab}{2}(\pm 0.015) + \frac{ab}{2}(\pm 0.015)$

$\pm \frac{ab}{2}(0.015 + 0.015) = \pm \frac{ab}{2}(0.03)$

$\pm 0.03\frac{ab}{2}$ but $\frac{ab}{2} = A$

$\pm 0.03A \Rightarrow 3\%$ of the original

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

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

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

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

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

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

$\delta a = \pm 0.015$

$\delta b = \pm 0.015b$

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

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

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

$\pm \frac{0.015\,[a^2+b^2]}{\sqrt{a^2+b^2}}$

by rationalizing

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

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

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

$\Rightarrow \pm 0.015c$

which is $\pm 1.5\%$ change in hypotenuse