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Assignment

The hypotenuse of a right-angled triangle is denoted as ~~c~~ as c and the other two sides are denoted as a and b . If the possible error of measuring each of a and b is $\pm 1.5\%$, find the maximum possible error in calculating

- The area of the triangle.
- The length of the hypotenuse

Soln

$$A = \frac{1}{2}bh$$

$$A = \frac{1}{2}axb$$

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

$$\delta A = \frac{b}{2} \left(\frac{\pm 1.5a}{100} \right) + \frac{a}{2} \left(\frac{\pm 1.5b}{100} \right)$$

$$= \pm \frac{ab}{2} (0.15) + \frac{ab}{2} (0.15)$$

$$= \pm A (0.30) = \pm 30\% A$$

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

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

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

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

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

$$= \frac{a^2 + b^2}{\sqrt{a^2 + b^2}} \left(\pm \frac{1.5}{100} \right)$$

$$= \sqrt{a^2 + b^2} \left(\pm \frac{1.5}{100} \right)$$

$$= \sqrt{a^2 + b^2} (\pm 1.5\%)$$

$$= \pm 1.5\% C$$