$$\delta A = \pm \frac{ab}{2}\left[\frac{3}{200} + \frac{3}{200}\right] = \pm A\left[\frac{3}{100}\right]$$

$$\delta A = \pm A\frac{3}{100}$$

$\therefore \delta A = 3$ percent of A

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

$$\delta h = \frac{\partial h}{\partial a}\delta a + \frac{\partial h}{\partial b}\delta b$$

$$\frac{\partial h}{\partial b} = a(a^2+b^2)^{-1/2} = \frac{a}{\sqrt{a^2+b^2}}$$

$$\frac{\partial h}{\partial b} = b(a^2+b^2)^{1/2} = \frac{b}{\sqrt{a^2+b^2}}$$

$$\delta a = \left(\frac{\pm 1.5}{100}\right)\cdot\left(\frac{\pm 3}{200}\right)$$

$$\delta b = \left(\frac{\pm 1.5}{100}\right)\cdot\left(\frac{\pm 3}{200}\right)$$

$$\delta h = \frac{a}{\sqrt{a^2+b^2}}\cdot\left(\frac{\pm 3a}{200}\right) + \frac{b}{\sqrt{a^2+b^2}}\cdot\left(\frac{\pm 3b}{200}\right)$$

$$= \frac{a^2}{\sqrt{a^2+b^2}}\cdot\left(\frac{\pm 3}{200}\right) + \frac{b^2}{\sqrt{a^2+b^2}}\left(\frac{\pm 3}{200}\right)$$

$$= \frac{\pm 3}{200}\left(\frac{a^2+b^2}{\sqrt{a^2+b^2}}\right)$$

$$= \frac{\pm 3}{200}\sqrt{a^2+b^2} \quad \text{Recall } \sqrt{a^2+b^2} = \frac{(a^2+b^2)}{\sqrt{a^2+b^2}}$$

$$= \pm 300\frac{3}{200}(h)$$

$\delta h = 0.05$ percent of h.

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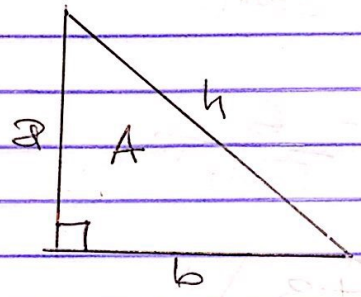
1. The hypotenuse of a right angle triangle is denoted ~~by~~ as c and the other two sides are denoted as a and b. If the possible error for measuring each a and b is ±1.5%. Find the maximum possible error in calculating:

a) the area of triangle.

b) the length of the hypotenuse.

Solution



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

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

$$\frac{\partial A}{\partial a} = \frac{b}{2}, \quad \frac{\partial A}{\partial b} = \frac{a}{2}$$

$$\delta a = \frac{\pm 1.5}{100} + \frac{3}{200} \qquad \delta b = \frac{1.5}{100} + \frac{3}{200}$$

$$\delta A = \left(\frac{b}{2}\right)\cdot\left(\frac{\pm 3a}{300}\right) + \left(\frac{a}{2}\right)\cdot\left(\frac{\pm 3b}{200}\right)$$