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17/ENG02/032
Computer Engineering

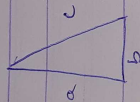
ENG 281

Assignment

The hypotenuse of a right-angled is denoted 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 and;
- The length of the hypotenuse.

solution



area of a triangle $= \frac{1}{2}ab$

$$\frac{\partial A}{\partial b} = \frac{\partial}{\partial b} \left(\frac{1}{2}ab \right) = \frac{1}{2}a$$

$$\frac{\partial A}{\partial a} = \frac{1}{2}b$$

$$\frac{\partial A}{\partial b} = \pm 1.5\% \times b = \pm 1.5\% \times 100 = \pm 1.5$$

$$= \pm 1.5$$

$$\frac{\partial A}{\partial a} = \pm 1.5\% \times a = \pm 1.5\% \times 200 = \pm 3$$

$$\text{Recall } h = \sqrt{a^2 + b^2}$$

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

$$A = (a^2 + b^2)^{1/2} \quad b = u^{1/2}$$

$$\text{let } u = a^2 + b^2$$

$$\frac{\partial h}{\partial a} = \frac{\partial h}{\partial u} \times \frac{\partial u}{\partial a}$$

$$\frac{\partial h}{\partial b} = \frac{\partial h}{\partial u} \times \frac{\partial u}{\partial b}$$

$$\frac{1}{2} u^{-1/2} \times 2a = \frac{1}{2} u^{-1/2} \times 2b$$

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

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