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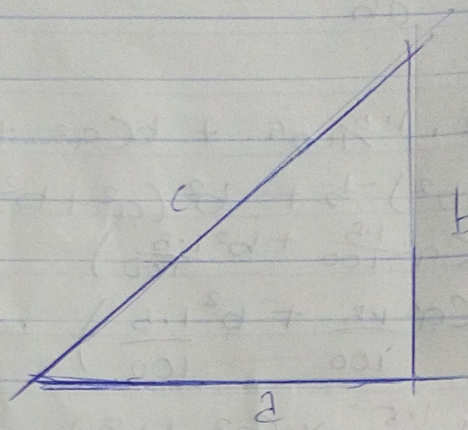
Mechanical Engineering
17/ENG06/051

Solution



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

a)

$$A = \tfrac{1}{2}bh = \tfrac{1}{2}ab$$
$$dA/da = \tfrac{1}{2}b, \quad dA/db = \tfrac{1}{2}a$$
$$dA = \frac{dA}{da}\,da + \frac{dA}{db}\,db.$$
$$dA = \tfrac{1}{2}b \cdot \frac{1.5}{100}a + \tfrac{1}{2}a \cdot \frac{1.5}{100}b$$
$$dA = \tfrac{1}{2}ab\left(1.5/100 + 1.5/100\right)$$
$$= \tfrac{1}{2}ab\,(3/100)$$
$$dA = \pm 3\%\,A$$

b)

$$c^2 = a^2 + b^2$$
$$c = \sqrt{a^2 + b^2}$$
$$c = (a^2+b^2)^{1/2}$$
$$\frac{dc}{da} = \tfrac{1}{2}(a^2+b^2)^{-1/2} \cdot 2a$$
$$dc/da = \tfrac{1}{2}a(a^2+b^2)^{-1/2}$$
$$\frac{dc}{db} = \tfrac{1}{2}(a^2+b^2)^{-1/2} \cdot 2b$$
$$dc/db = b(a^2+b^2)^{-\frac{1}{2}}$$

$$\partial c = \frac{\partial c}{\partial a} \cdot \partial a + \frac{dc}{db} \cdot \partial b$$

$$\partial c = a(a^2+b^2)^{-\frac{1}{2}} \cdot \frac{1.5}{100}a + b(a^2+b^2)^{-\frac{1}{2}} \cdot \frac{1.5}{100} \cdot b$$

$$\partial c = a^2\frac{1.5}{100}(a^2+b^2)^{-\frac{1}{2}} + b^2(a^2+b^2)^{-\frac{1}{2}} \cdot \frac{1.5}{100}$$

$$\partial c = (a^2+b^2)^{-\frac{1}{2}}(a^2\frac{1.5}{100} + b^2\frac{1.5}{100})$$

$$\partial c = (a^2+b^2)^{-\frac{1}{2}}(a^2\frac{1.5}{100} + b^2\frac{1.5}{100})$$

$$\partial c = (a^2+b^2)^{-\frac{1}{2}} \times \frac{1.5}{100} \times (a^2+b^2)$$

$$\partial c = \frac{1.5}{100} \times (a^2+b^2)^1 \times (a^2+b^2)^{-\frac{1}{2}}$$

$$\partial c = \frac{1.5}{100} \times (a^2+b^2)^{1-\frac{1}{2}}$$

$$\partial c = \frac{1.5}{100} \times (a^2+b^2)^{\frac{1}{2}}$$

$$\partial c = \pm 1.5\% c$$