Quiz02 – 1:30 class

$\nu > 0$

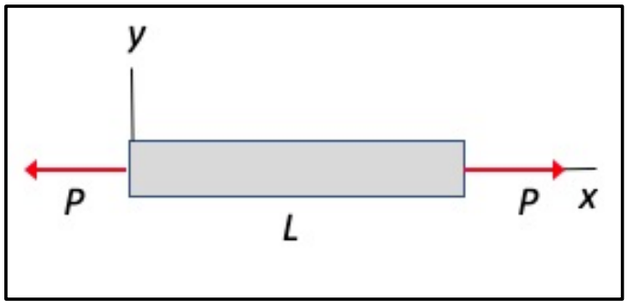
Conceptual question 2.1

A rectangular cross-section rod (made up of a material with an elastic modulus of E and Poisson's ratio ν) has undeformed dimensions of L, h and b, with L > h > b. As a result of the tensile axial load P being applied to the ends of the rod, the dimensions of the rod change by amounts of ΔL, Δh and Δb, respectively. Circle the correct answer below:

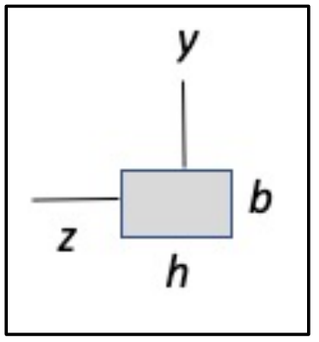
a) $|\Delta h| > |\Delta b|$

b) $|\Delta h| = |\Delta b|$

c) $|\Delta h| < |\Delta b|$



rod



cross-section

$$\varepsilon_x = \frac{P}{AE} = \frac{P}{bhE} \Rightarrow \Delta L = \varepsilon_x L = \frac{PL}{bhE}$$

$$\varepsilon_y = -\nu\varepsilon_x = -\frac{P\nu}{bhE} \Rightarrow \Delta b = \varepsilon_x b = -\frac{P\nu}{hE}$$

$$\varepsilon_z = -\nu\varepsilon_z = -\frac{P\nu}{bhE} \Rightarrow \Delta h = \varepsilon_z h = -\frac{P\nu}{bE}$$

Since $h > b \Rightarrow |\Delta h| > |\Delta b|$