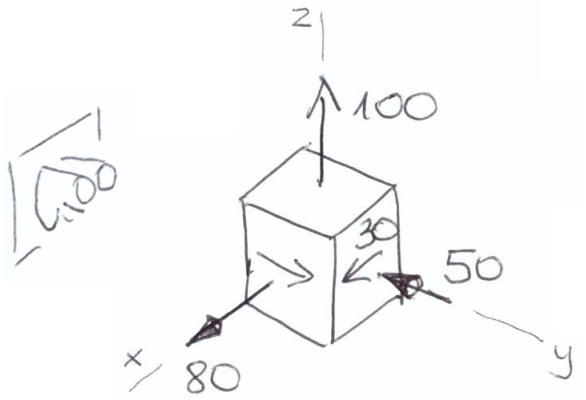
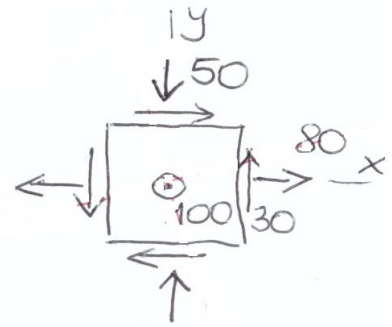


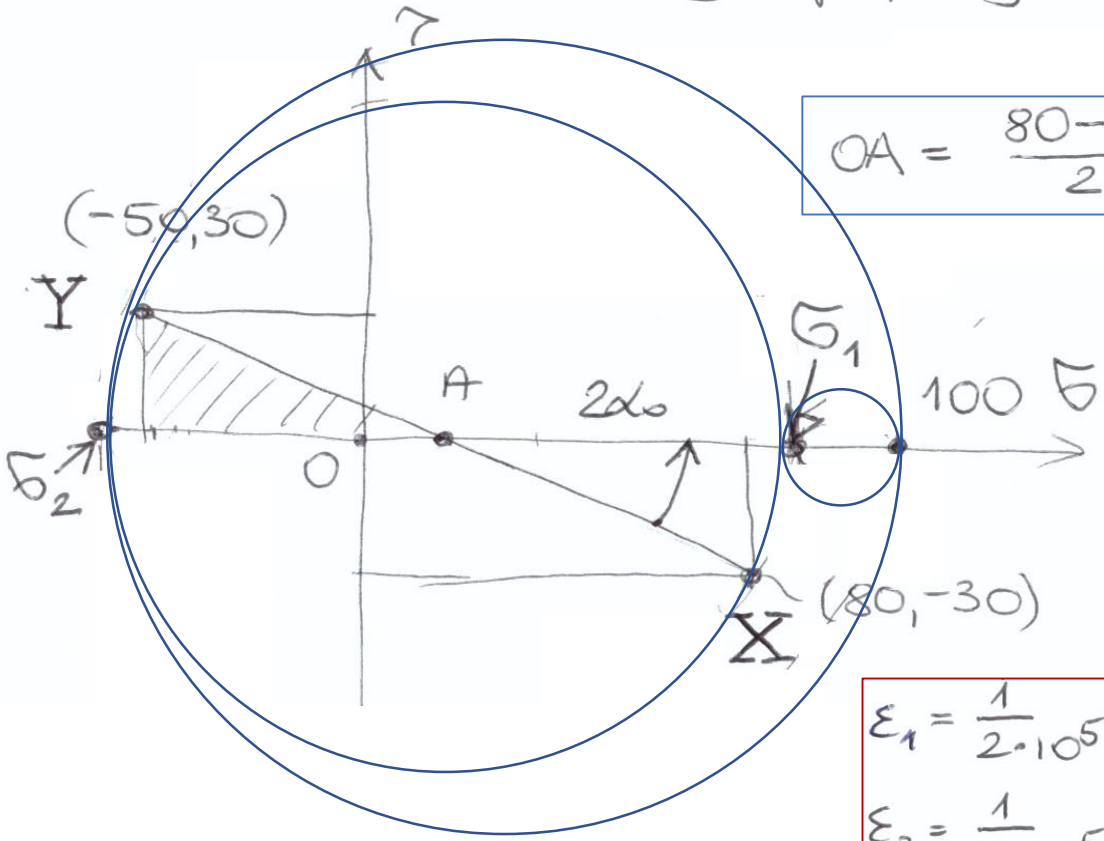
Zad. Dany jest stan naprężenia. Znaleźć $\varepsilon_1, \varepsilon_2, \varepsilon_3$

materiał – stal: $E = 2 \cdot 10^5$ MPa

$\nu = 0.3$

(I) Spójrzmy na kostkę z kierunku z





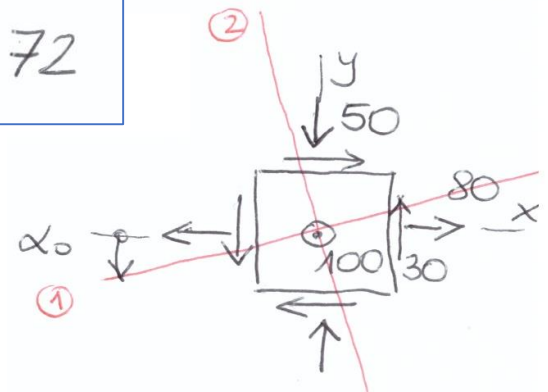
$$OA = \frac{80-50}{2} = 15$$

$$R = \sqrt{\left(\frac{80+50}{2}\right)^2 + 30^2} = 72$$

$$\sigma_1 = OA + R = 87 \text{ MPa}$$

$$\sigma_2 = OA - R = -57 \text{ MPa}$$

$$\alpha_0 = \frac{1}{2} \operatorname{arctg}\left(\frac{30}{\frac{80+50}{2}}\right) = 12{,}5°$$

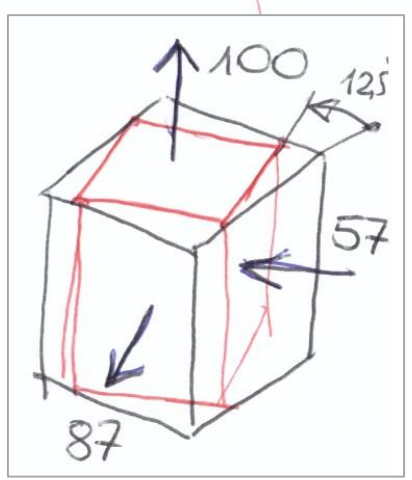


Skorzystamy z prawa Hooke'a

$$\varepsilon_1 = \frac{1}{2 \cdot 10^5}\left[87 - 0.3(-57+100)\right] = 0.37 \cdot 10^{-3}$$

$$\varepsilon_2 = \frac{1}{2 \cdot 10^5}\left[-57 - 0.3(100+87)\right] = -0.56 \cdot 10^{-3}$$

$$\varepsilon_3 = \frac{1}{2 \cdot 10^5}\left[100 - 0.3(87-57)\right] = 0.455 \cdot 10^{-3}$$



II Sposób. Korzystamy najpierw z prawo Hooke'a

$$\varepsilon_x = \frac{1}{2\cdot10^5}\left[80 - 0.3(-50+100)\right] = 0.325\cdot10^{-3}$$

$$\varepsilon_y = \frac{1}{2\cdot10^5}\left[-50 - 0.3(100+80)\right] = -0.52\cdot10^{-3}$$

$$\varepsilon_3 = \varepsilon_z = \frac{1}{2\cdot10^5}\left[100 - 0.3(80-50)\right] = 0.455\cdot10^{-3}$$

$$G = \frac{E}{2(1+\nu)} = \frac{2\cdot10^5}{2(1+0.3)}$$

$$G = 7{,}69\cdot10^4\ MPa$$

$$\gamma_{xy} = \frac{-30}{7{,}69\cdot10^4}$$

$$\gamma_{xy} = -3.9\cdot10^{-4}\ rad$$

Przestrzeń odkształceń

$OA = -0.095\cdot10^{-3}$

$R = 0.465\cdot10^{-3}$

$\varepsilon_1 = 0.37\cdot10^{-3}$

$\varepsilon_2 = -0.56\cdot10^{-3}$