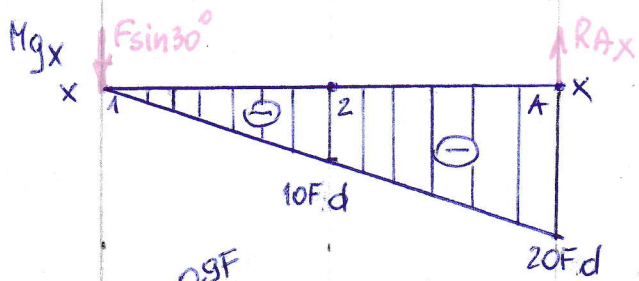
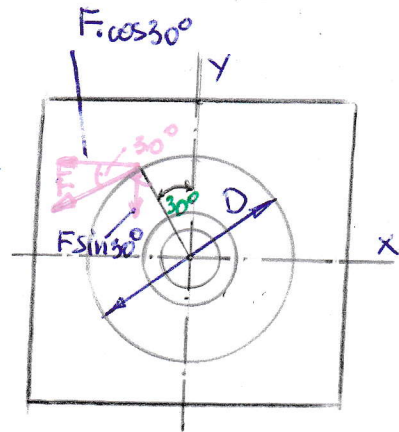
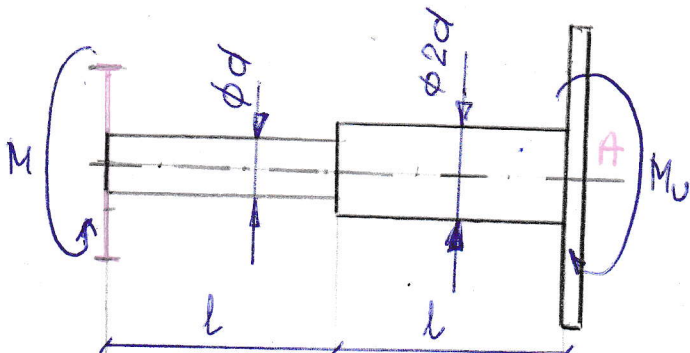


majtrank: Dane:
 $F, l, d, \alpha = 30^\circ, l = 20d, D = 15d$



$$\sum M = 0 \quad M - M_u = 0 \quad M_u = M = F \cdot \frac{D}{2} = F \cdot \frac{15d}{2}$$

$$M_u = \frac{15}{2} F \cdot d = M = M_s = 7,5 F \cdot d$$

$$\sum F_y = 0 \quad R_{Ax} - F \sin 30^\circ = 0 \quad R_{Ax} = F \cdot \frac{1}{2} = \frac{1}{2} F$$

$$M_{g_{x1}} = F \sin 30^\circ \cdot 0 = 0 \quad M_{g_{x2}} = -F \sin 30^\circ \cdot l = -\frac{1}{2} F \cdot 20d$$

$$M_{g_{xA}} = -F \sin 30^\circ \cdot 2l \quad M_{g_{x2}} = -10 F d$$

$$M_{g_{xA}} = -\frac{1}{2} F \cdot 2 \cdot 20d \quad M_{g_{xA}} = -20 F d$$

$$\sum F_x = 0 \quad R_{Ay} - F \cos 30^\circ = 0 \quad \cos 30^\circ = 0,866$$

$$R_{Ay} = F \cdot 0,866 \approx 0,9 F$$

$$M_{g_{y1}} = 0 \quad M_{g_{y2}} = -0,9 F \cdot l = -0,9 F \cdot 20d \quad M_{g_{y2}} = -18 F d$$

$$M_{g_{yA}} = -0,9 F \cdot 2l = -1,8 F \cdot l = -1,8 \cdot F \cdot 20d \quad M_{g_{yA}} = -36 F d$$

$$M_{g_1} = \sqrt{M_{g_{x1}}^2 + M_{g_{y1}}^2} = \sqrt{0^2 + 0^2} = 0 \quad M_{g_2} = \sqrt{M_{g_{x2}}^2 + M_{g_{y2}}^2} = \sqrt{(10 F d)^2 + (18 F d)^2}$$

$$M_{g_2} = \sqrt{100 F^2 d^2 + 324 F^2 d^2} = \sqrt{334 F^2 d^2} \approx 18,3 F d$$

$$M_{g_3} = \sqrt{(20 F d)^2 + (36 F d)^2} = \sqrt{400 F^2 d^2 + 1296 F^2 d^2} = \sqrt{1696 F^2 d^2}$$

$$M_{g_3} = 41,2 F d$$

$$M_z = \sqrt{M_g^2 + 0,75 M_s^2}$$

$$\sigma_{red} = \frac{M_z}{W} \leq k_g W = \frac{\pi \cdot (2d)^3}{32}$$

$$W = \frac{8 \pi d^3}{32} = \frac{\pi d^3}{4}$$

$$M_{z3} = \sqrt{(36 F d)^2 + 0,75 \cdot (7,5 F d)^2}$$

$$M_{z3} = \sqrt{1296 F^2 d^2 + 42,1875 F^2 d^2} = 36,58 F d$$

$$\sigma_{red} = \frac{36,58 F d}{\frac{\pi d^3}{4}} = 36,58 \frac{F}{S} = 36,58 \frac{N}{m^2} = 36,58 \text{ Pa}$$

$\frac{\pi d^2}{4} = S$ - pole przekroju

Jeżeli F będzie w MN to σ_{red} MPa

