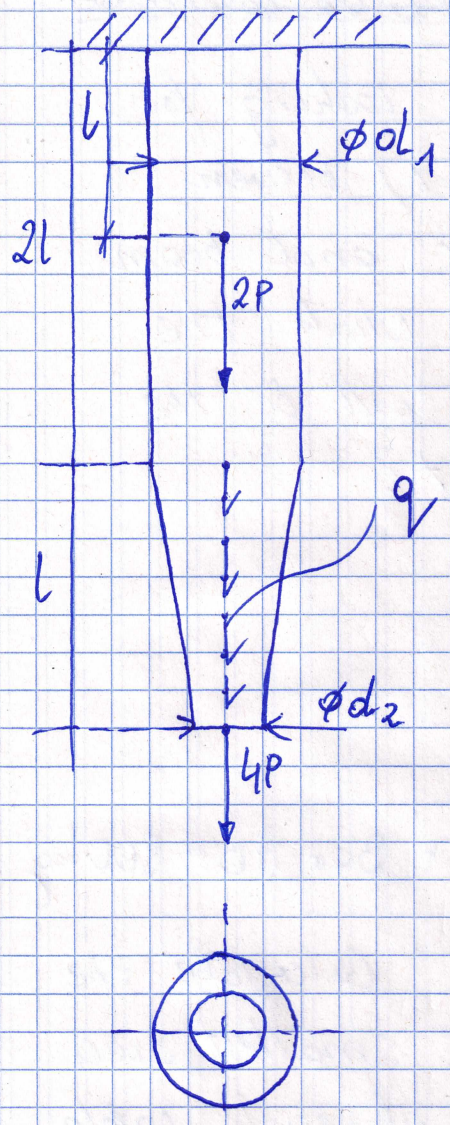
Tension / Compression

ex. 1



$E = 210\ GPa$

$d_1 = 50\ mm$

$d_2 = 40\ mm$

$q = 500\ \frac{N}{mm}$

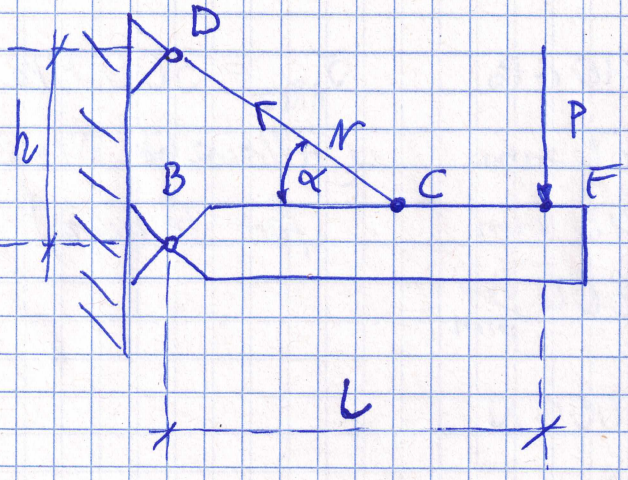
$P = 2000\ N$

$l = 30\ cm$

$\sigma_{Allow} = 500\ MPa$ (Allowable Stress for tension)

Please, determine the stresses acting on the bar, make a graph (stress vs length) and check if the presented bar will not brake under assumed loading conditions?

ex. 2.

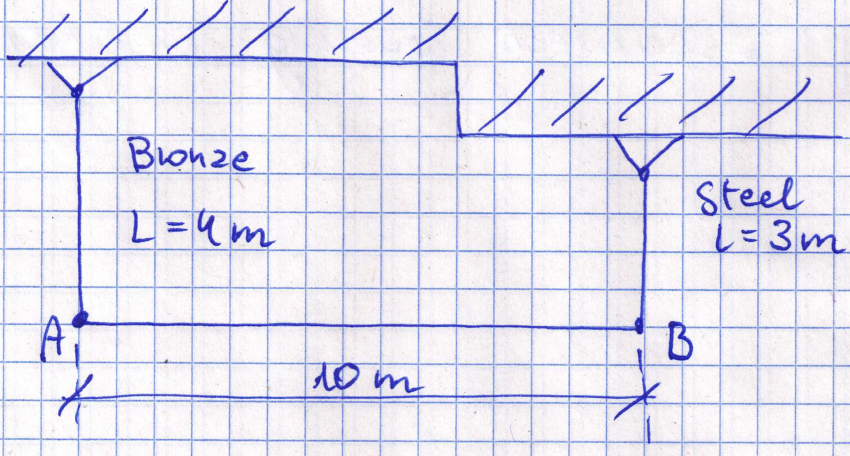


Data: $h, L, P, \gamma^*, \sigma^*_{Allow}$

* γ and σ_{allow} → for bar DC
  - flexible connector

* We are looking for α (angel) between bar DC and beam FC at which the weight will be the smallest?

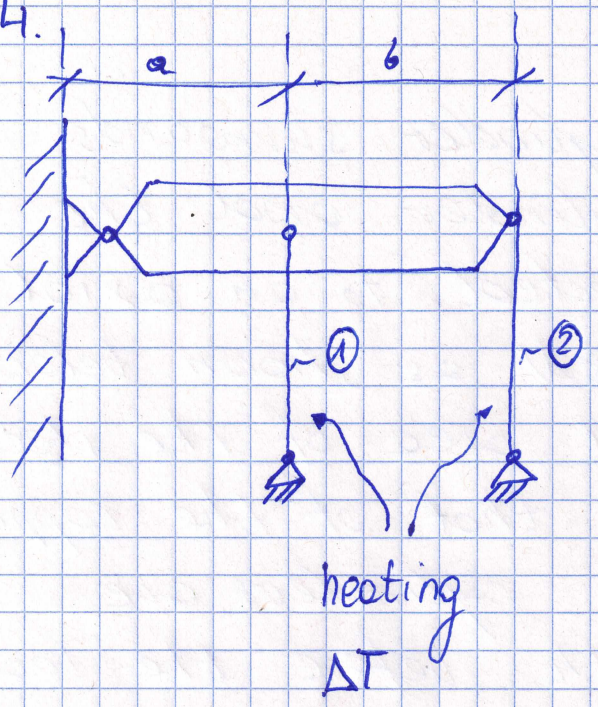
ex. 3.



* Bar AB = 800 kg

Calculate the smallest area of each cable if the stress is not to exceed 90 MPa in bronze and 120 MPa in steel.

ex. 4.



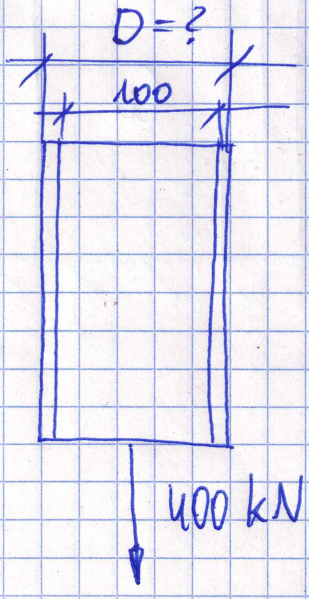
bar 1 → E_1, A_1, l_1, α_1

bar 2 → E_2, A_2, l_2, α_2

$\sigma_{1,2} = ?$

ex. 5

A hollow steel tube with an inside diameter of 100 mm must carry a tensile load of 400 kN. Determine the outside diameter of the tube if the stress is limited to 120 MN/m^2.



ex. 6.

A hollow steel cylinder surrounds a solid copper cylinder and the assembly is subjected to an axial loading of 200 kN as shown below. The cross-sectional area of the steel is 20 cm², while that of the copper is 60 cm². Both cylinders are the same length before the load is applied. Determine the temperature rise of an entire system required to place all of the load on the copper cylinder. The cover plate at the top of assembly is rigid.

For copper $E = 100$ GPa, $\alpha = 1{,}7 \times 10^{-6}$/°C

for steel $E = 200$ GPa, $\alpha = 12 \times 10^{-6}$/°C.