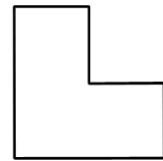


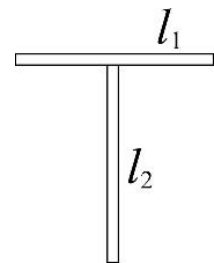
## Equilibrium of planar, rigid bodies - 5.

please solve at least 3 exercises for maximum point. Deadline 30/October

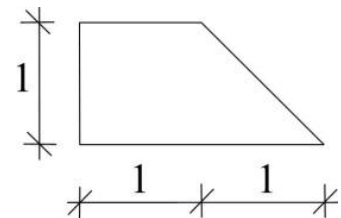
1. Consider a square. The length of its edges is  $a$ . We remove the quarter of the square according to the figure. Determine the centroid of this polygon! [M]



2. The figure shows a T-shaped body, which is constructed from two rigid bars. The bars are homogenous with uniform cross sections and their lengths are:  $l_1=40$  cm and  $l_2=50$  cm. Determine the center of mass of this T-shaped body! [M]

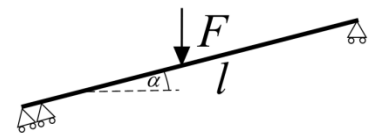


3. Determine the centroid of this polygon!



4. Is it possible that the centroid of a planar polygon is outside of the polygon? If yes, show an example. If not then explain why! (This exercise needs more thinking and less calculation than most others.)

5. Consider the beam shown in the figure. Its length is denoted by  $l$  and the degree of its slope is denoted by  $\alpha$ . We apply force  $F$  on it in the middlepoint. The left endpoint of the beam is supported by a special type of support, which produces reaction force in the direction perpendicular to the beam and also reaction moment.



- Give the system of the equilibrium equations in matrix form, using the parameters  $F, l, \alpha$ !
- Determine the support reactions in the case of  $l=3,0$  m,  $\alpha=30^\circ$  and  $F=10$  kN! Draw a final figure which indicates the beam, the loads and the support reactions (i.e. the balancing forces)!