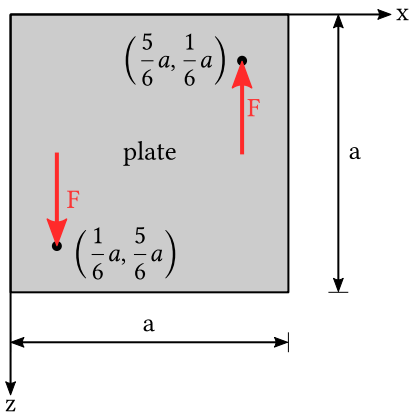
Exercise 1: Forces and moments

18.10.2021 - 22.10.2021

Question 1

The picture below shows a rigid plate. Two forces of equal magnitude F are applied in opposite direction at the indicated points.

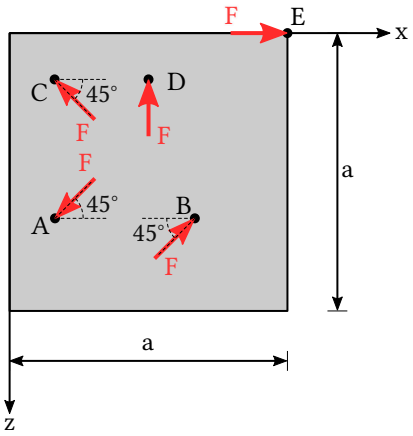


(a) Is the system in static equilibrium?

(b) If you find that the system is not in static equilibrium, then determine the forces that would need to be applied in order to achieve equilibrium!

Question 2

The rigid plate shown below is subjected to five point forces at the indicated points. All forces have the same magnitude F, but their orientation differs. Find the resultant force and moment, and indicate them in the picture!



$A = \left(\frac{1}{6}a, \frac{2}{3}a\right)$

$B = \left(\frac{2}{3}a, \frac{2}{3}a\right)$

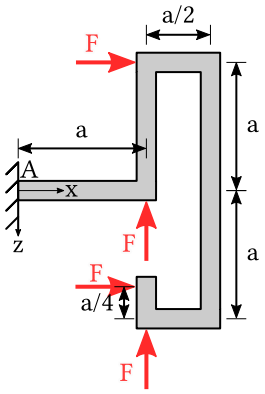
$C = \left(\frac{1}{6}a, \frac{1}{6}a\right)$

$D = \left(\frac{1}{2}a, \frac{1}{6}a\right)$

$E = (a, 0)$

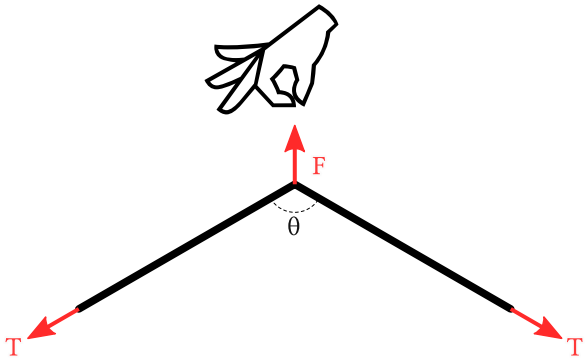
Question 3

A bar with multiple corners is fixed on a wall and loaded by four forces of magnitude F. Sort the forces according to the resulting bending moment about the y-axis in point A, from highest to lowest!



Question 4

A string is plucked with a force F at the middle of the string. Calculate the line tension T that needs to act in the string so that the system is in equilibrium!



Question 5

A rigid body of mass m is suspended from a system of pulleys in the gravitational field of earth (constant acceleration g). Calculate the force F that you need to apply at the left end of the rope to hold the mass in position!