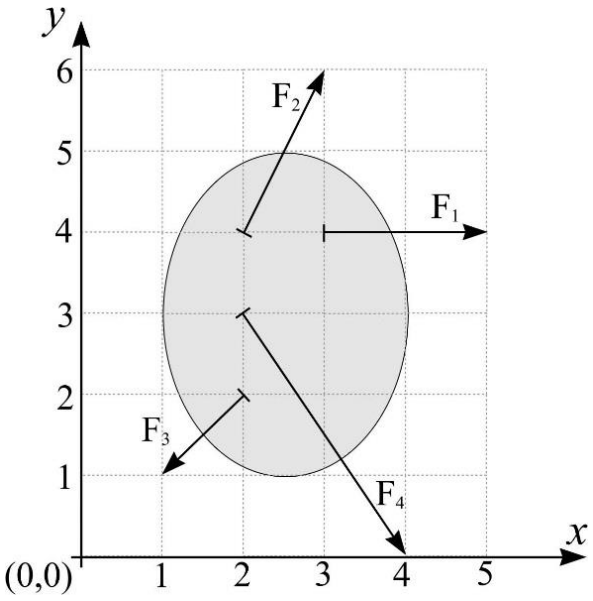
Equilibrium of planar, rigid bodies – 4.

Please note „reduction of force systems" was not part of the lecture. However it is simple and it is written in the lecture notes. So please understand yourself, and then you can solve the excercises.

Please solve excercise 1 and one more excercise for max. point.

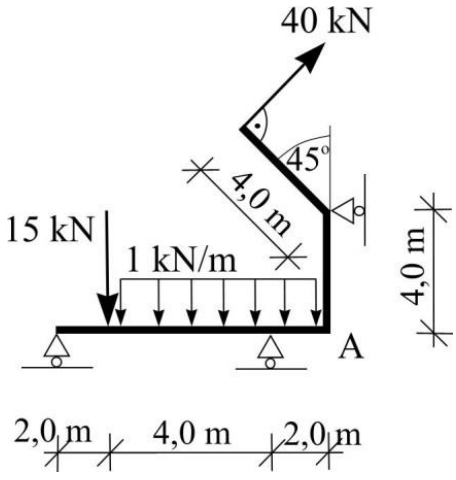
1. Four forces are acting on the ellipse according to the figure. The megnitudes and directions of the forces can be read from the figure the length of one small square corresponds to 1m of distance or 1N of force.



a)Reduce the system of forces to the center of the ellipse and indicate the solution in the figure!

b)Where does the line of action of the resultant of the force system cross the axes *x* and *y*?

c)Determine the equation of the resultant's line of action (the equation has the following form: $y=ax+b$; your task is to find the numbers "a" and "b")!



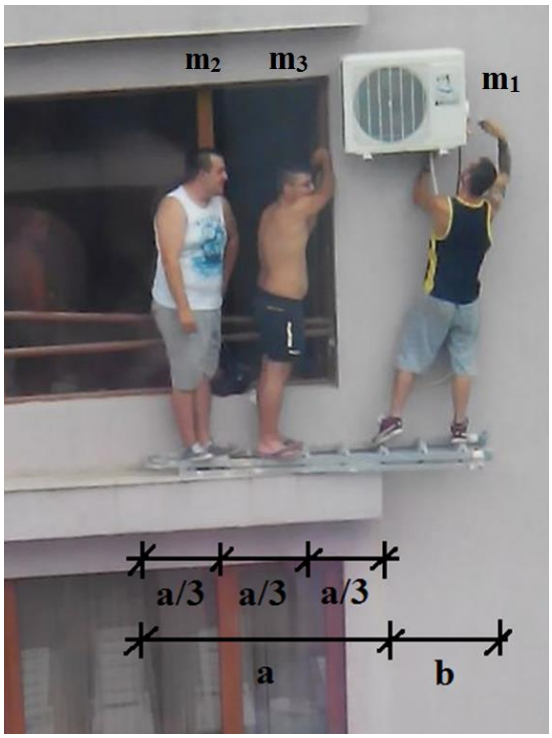
2. Given a beam with broken segments (see the figure on left).

a) Reduce the system of the loads to point A!

b) Where does the resultant of the loads cross the horizontal line going through point A?

c) Determine the support reactions (magnitudes and directions)!

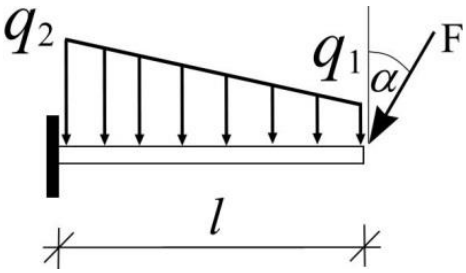
d) Indicate the results in a final figure (it should contain the beam itself, the loads and the support reactions)!



3. The three persons have equal masses ($m_1 = m_2 = m_3$).

[M]: These examples originate from the exercise book „Moór Ágnes: Középiskolai fizikapéldatár" (Cser kiadó)
[SD]:This example originates from Dániel Sipeki (a student).

What is the maximum value of the b/a ratio, for which they do not fall off immediately when the person who is repairing the Air Condition unit lifts his left leg into the air? [SD]



4. A cantilever with the length of l is loaded by a trapezoid distributed load and a skew concentrated load according to the figure. l=2 m, a=30°, F=10 kN, q_1=2 kN/m and q_2=4 kN/m.
   a) Give the equation of the equilibrium in matrix form!
   b) Determine the support reactions of the cantilever (magnitudes and directions)!
   c) Indicate the results in a final figure (it should contain the beam itself, the loads and the support reactions)!

5. A 3 metres long plank is resting on two pieces of stone at its endpoints. At a distance of 1,5 m from one of the endpoints stands a person with a mass of 82 kg. At a distance of 1,1 m from the other endpoint lies a mortar box with a mass of 60 kg. Determine the support reactions of the plank! [M]

[M]: These examples originate from the exercise book „Moór Ágnes: Középiskolai fizikapéldatár" (Cser kiadó)
[SD]:This example originates from Dániel Sipeki (a student).