

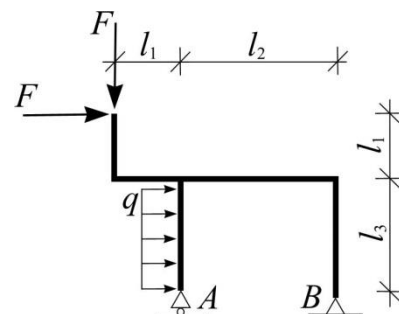
## Complex Structures

*please solve at least 2 of them! Deadline: November 7*

1. The figure shows a simply supported structure with branching and broken segments.

a) Give the system of equilibrium equations of the structure in matrix form using parameters  $F$ ,  $q$ ,  $l_1$ ,  $l_2$  and  $l_3$ !

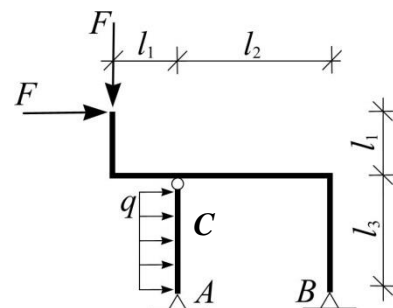
b) Determine the support reactions (directions and magnitudes!) if  $F=5$  kN,  $q=3$  kN/m,  $l_1=1,5$  m,  $l_2=3,0$  m and  $l_3=2,5$  m! Draw a result figure indicating the structure itself, the loads and the reaction forces (directions and magnitudes!) on it!



2. The figure shows a three-hinge structure with broken segments.

a) Determine its support reactions and the connection forces in hinge "C" if  $F=5$  kN,  $q=3$  kN/m,  $l_1=1,5$  m,  $l_2=3,0$  m and  $l_3=2,5$  m! Draw a result figure indicating the structure itself, the loads and the reaction forces on it!

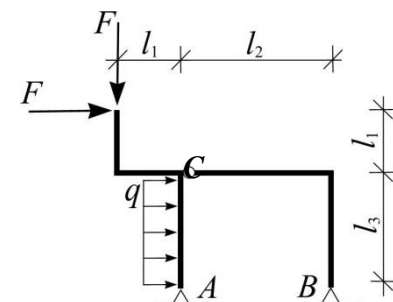
b) Solve the same problem using the matrix method!



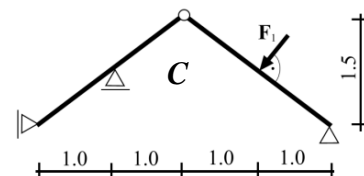
3. The figure shows a three-hinge structure with broken segments.

a) Determine its support reactions and the connection forces in hinge "C" if  $F=5$  kN,  $q=3$  kN/m,  $l_1=1,5$  m,  $l_2=3,0$  m and  $l_3=2,5$  m! Draw a result figure indicating the structure itself, the loads and the reaction forces on it!

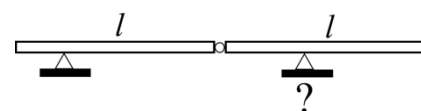
b) Solve the same problem using matrix method!



4. a) Determine the support reactions and the connection forces in hinge "C" if  $F_1=20$  kN! Draw a result figure indicating the structure itself, the loads and the reaction forces on it!



- 5.\* The figure shows two identical bars (same length, same weight) which are connected to each other by a hinge. (This is a "wrong" 3-hinged structure, see lecture notes.) The bar on the left is divided by the support in 1:3 ratio. Where should we put a support under the bar on the right to have equilibrium? [M]



[M]: These examples originate from the exercise book „Moór Ágnes: Középszintű fizikapéldatár” (Cser kiadó)

[SD]: This example originates from Dániel Sipeki (a student).