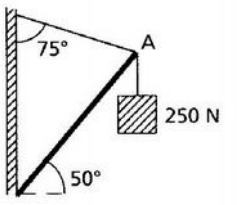
Forces at a point in equilibrium – Tutorial

1. A rigid rod is hinged to a vertical support and held at 50° to the horizontal by means of a cable when a mass weighing 250N is suspended, as shown.
Consider the equilibrium of the forces acting at point A.

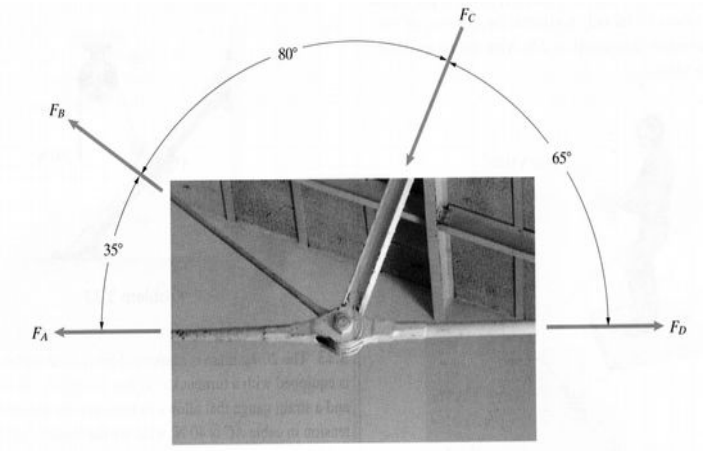


Calculate:
   (i) the tension in the cable, *(177N)*
   (ii) the compression in the rod. *(265N)*

2. The structural joint shown is in equilibrium.
F_A = 1000N, F_D = 5000N.

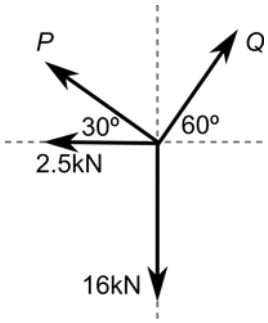
Calculate F_B and F_C.

(3680N, 2330N)

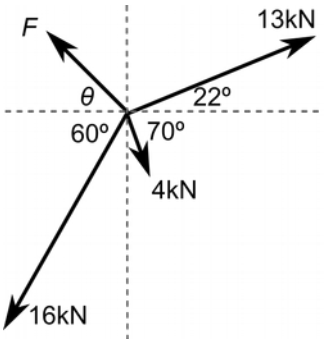


3. The four forces shown are in equilibrium.
Use the fact that the sum of x and y components are zero to calculate *P* and *Q*.
(hint: rotate the axes so that P and Q only act along one of the axes)

(5.8kN, 15.1kN)



4. These four forces are in equilibrium.
   (a) Write the equations representing the fact that:
      (i) the sum of the x-components is zero
      (i.e. components to left = components to right),
      (i) the sum of the y-components is zero.
   (b) Rearrange the equations to find expressions for:
      (i) $F\sin\theta$, (ii) $F\cos\theta$.
   (c) Use the equations to calculate θ and *F*.
      (67°, 14kN)



5. A 20kg mass is suspended from three cables, AB, AC, AD, as shown.

   (a) Calculate the angles with the horizontal at B, C, D.

   (b) The tension in cable AC is 40N. Calculate the tensions in cables AB and AD.

   (129N, 75N)