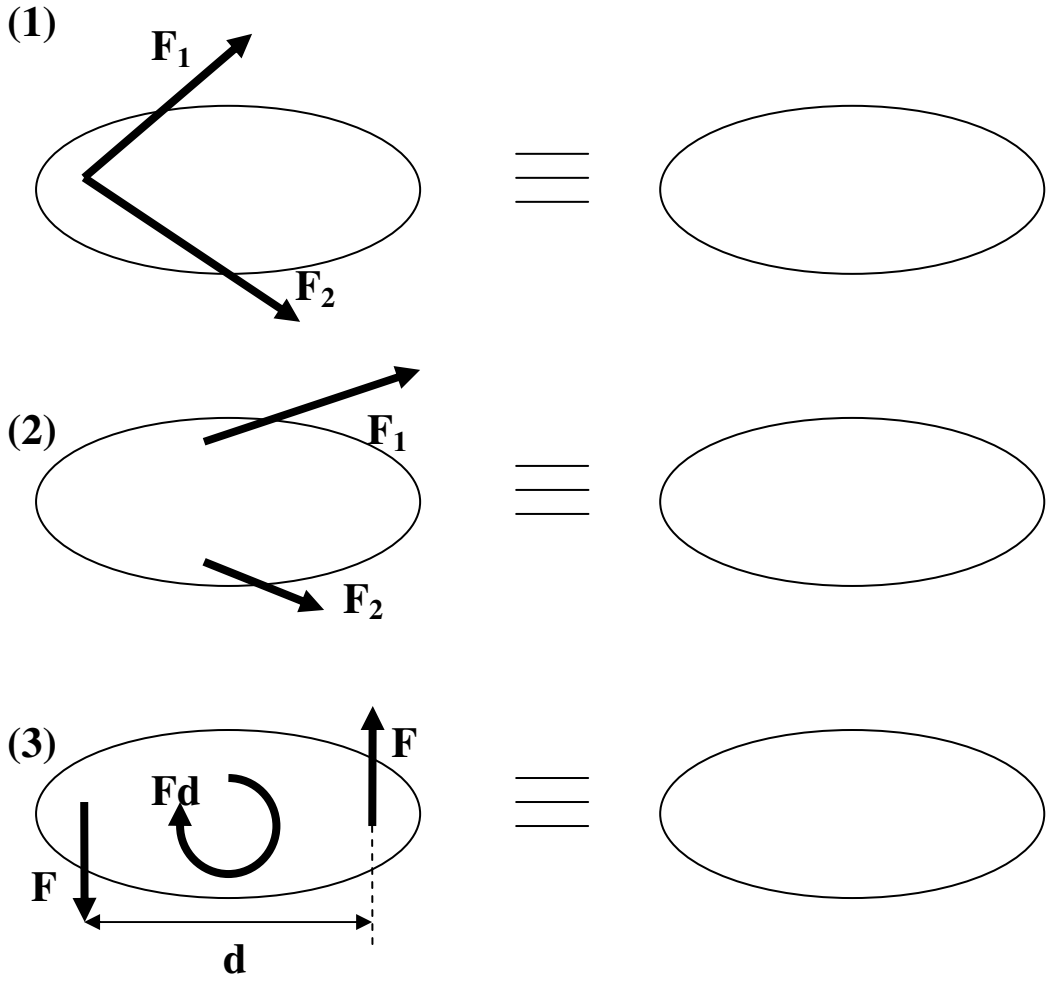
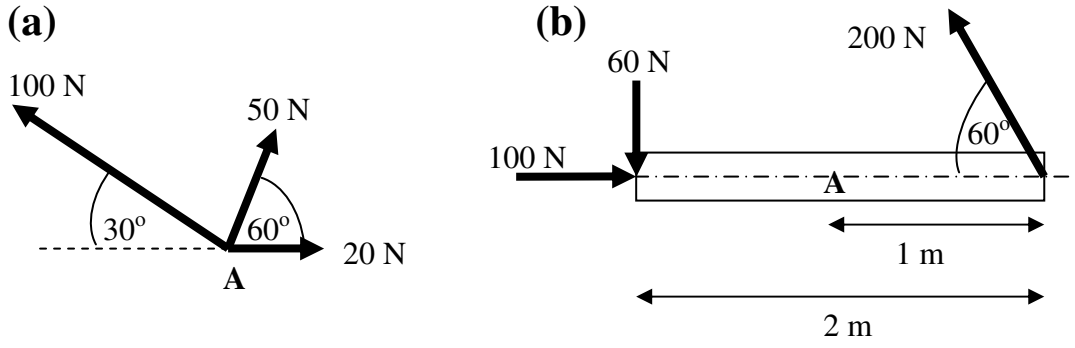
Lecture 2: Exercises

Part 1

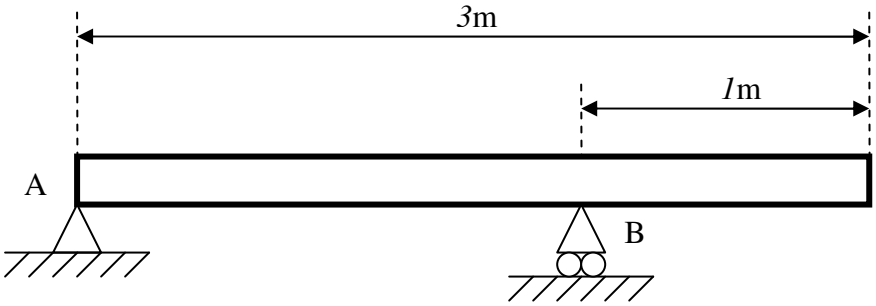
Graphically determine the resultant force of the following systems. Indicate on the diagram when the resultant force and moment are nonexistent.



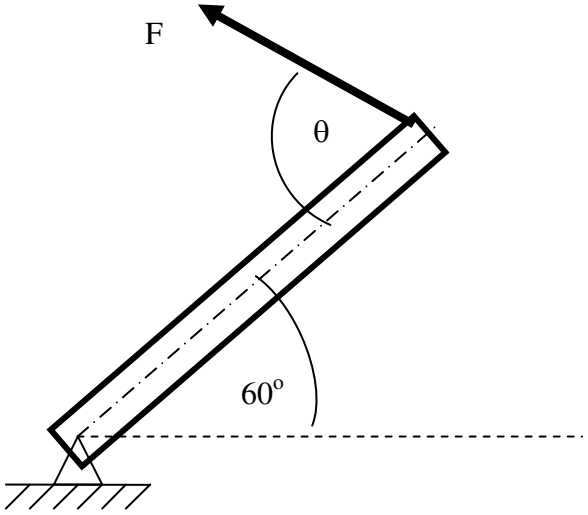
(4) Determine the resultant force and moment at point A. Indicate if the resultant force or moment is zero. Note that forces are not drawn to scale. The bar in (4b) is considered light.



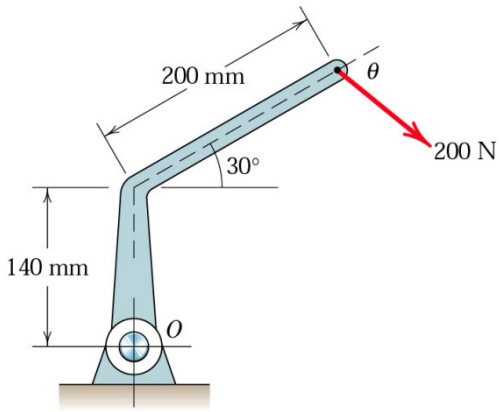
(5) A bar of length *3*m rests in equilibrium on two supports labeled *A* and *B*. The mass of the bar is 20kg. Determine the forces exerted by the two supports.



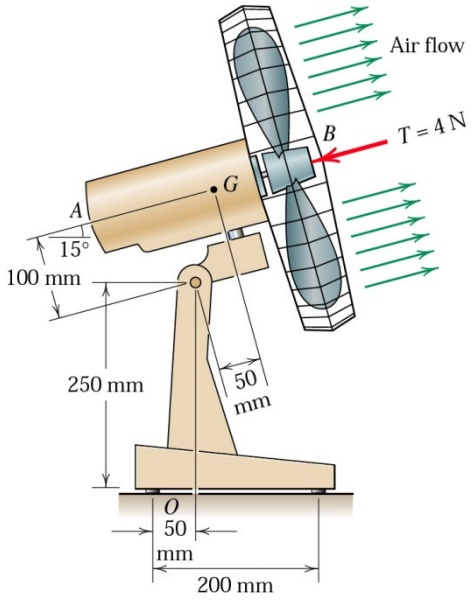
(6) A bar of mass *M* (kg) and of length *L* (meters) is hinged on one end. A force *F* is applied at an angle θ to the bar on the other end to rotate the bar 60^o from horizontal and keep it in equilibrium. Determine (a) the angle θ and (b) the force exerted by the support.



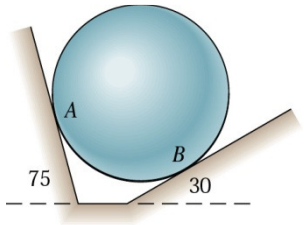
(7) Determine the angle θ which will maximise the moment M_0 of the 200N force about the shaft axis at *O*. Also compute M_0.



(8) Determine the moment $\mathbf{M_0}$ at the rear support (point ***O***) if only two forces are present in the system shown (a) 4-N thrust due to the air flow and (b) the 40-N weight of the motor-fan unit which acts at point ***G***

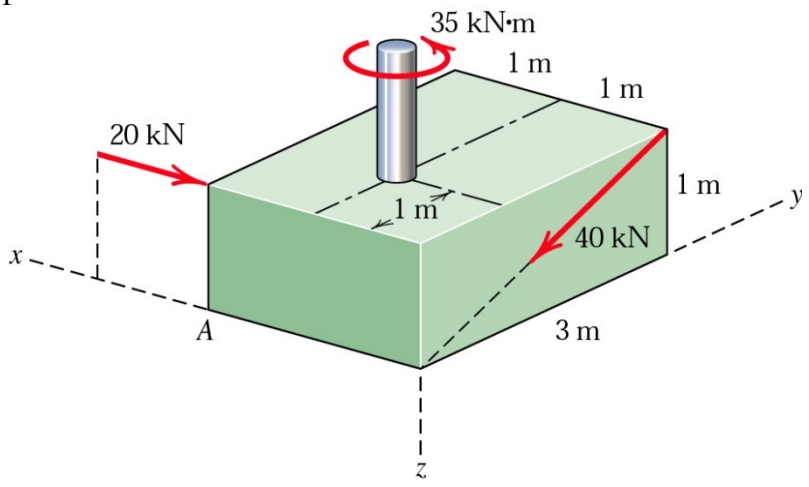


(9) Draw the free body diagram of the ball and determine the contact forces at points A and B.

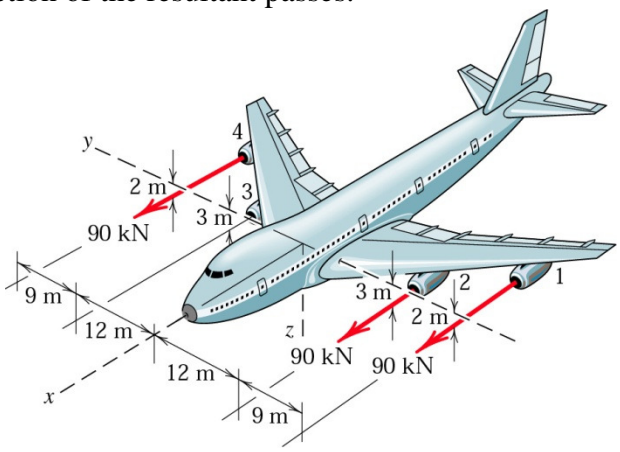


Part 2

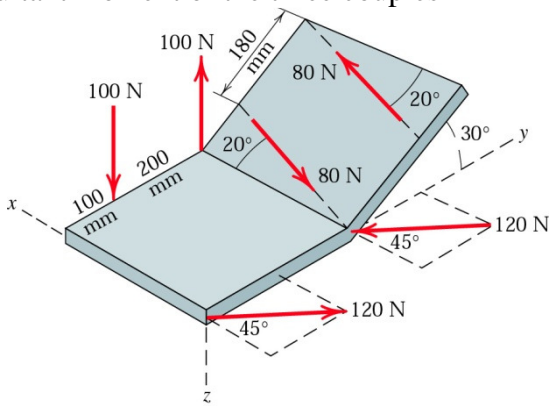
(1) Replace the two forces and a couple by an equivalent force-couple system (wrench) at point A



(2) Determine the resultant force acting on the aircraft when one of the engines has failed as shown in the figure. Specify the y- and z-coordinates of the point through which the line of action of the resultant passes.



(3) Determine the resultant moment of the three couples



(4) Given that $M_x = M_y = 0$ at point O, determine the tension in the cables **AE** and **GF**.