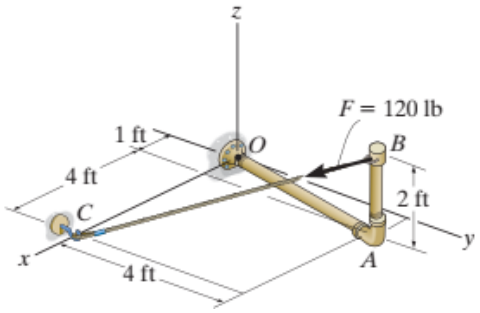
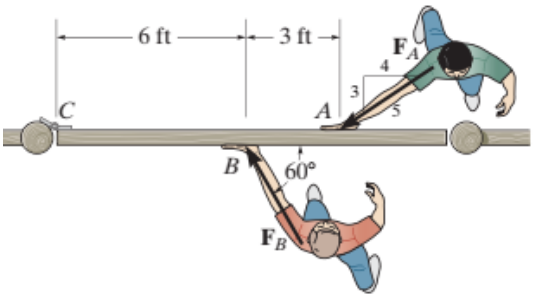
**Static Assignment 2**

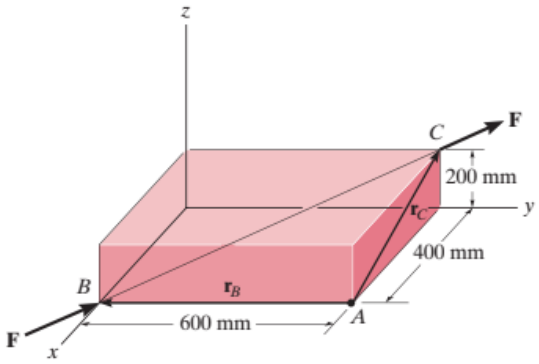
1. Determine the moment of force F about point O. Express the result as a Cartesian vector.



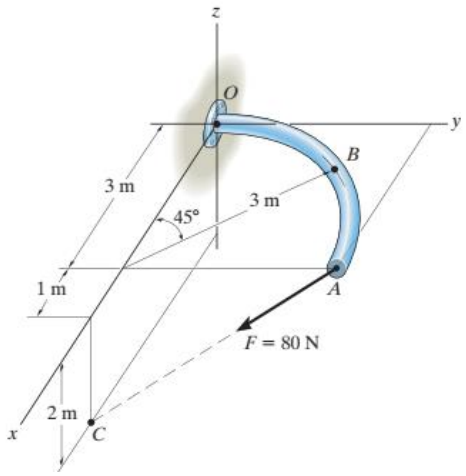

2. Two boys push on the gate as shown. If the boy at B exerts a force of $F_B = 30\,lb$, determine the magnitude of the force $F_A$ the boy at A must exert in order to prevent the gate from turning. Neglect the thickness of the gate.



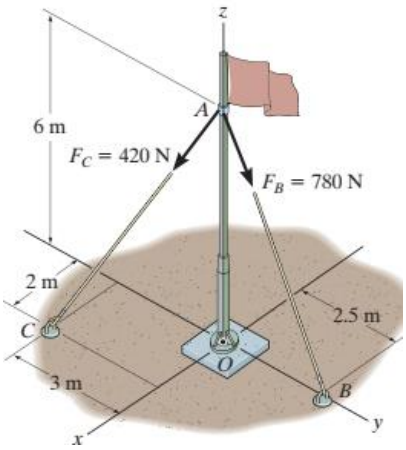

3. A force F having a magnitude of F = 100 N acts along the diagonal of the parallelepiped. Determine the moment of F about point A.



4. The curved rod lies in the x–y plane and has a radius of 3 m. If a force of F = 80 N acts at its end as shown, determine the moment of this force about point B.

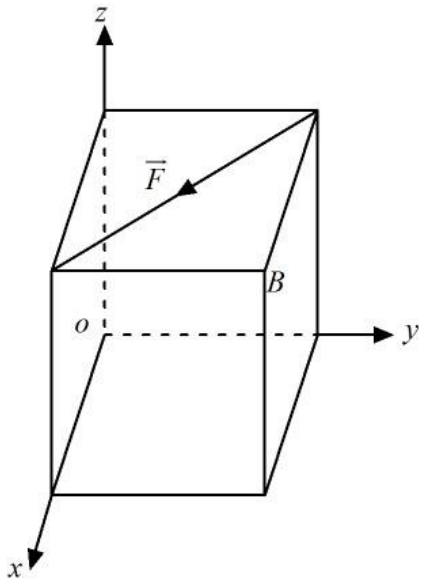



5. Determine the resultant moment produced by force $F_B$ and $F_C$ about point O. Express the result as a Cartesian vector.



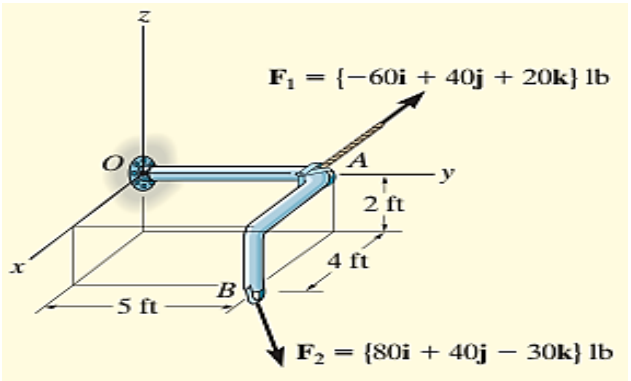
6. A force is acted on a cube as shown in fig., length of its side is a, Find the moment of the force about O, and about y-axis, and abut a diameter OB.

(Ans: $\overrightarrow{M_O} = \frac{Fa}{\sqrt{2}}(1,1,-1), M_y = \frac{Fa}{\sqrt{2}}, M_{OB} = \frac{Fa}{\sqrt{6}}$)

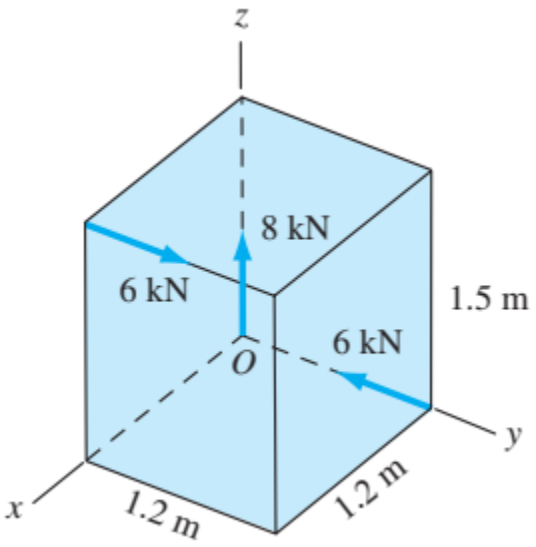



7. Three forces act on the rod shown in fig. Determine the resultant moment they create about the flange at $O$ , where: $\overrightarrow{F_1} = (-60,40,20)$ ; $\overrightarrow{F_2}(0,50,0)$ at point A ; $\overrightarrow{F_3} = (80,40,-30)$ at B

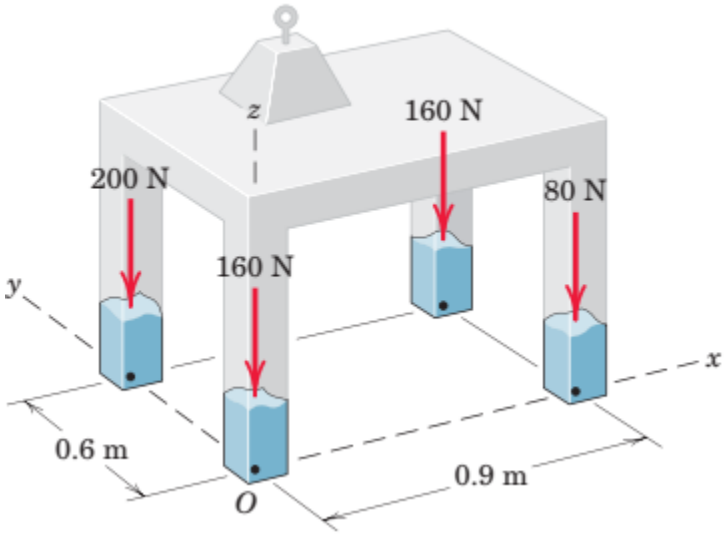
(Ans: $\overrightarrow{M_O} = (30\hat{i} - 40j + 60k)$)



8. (a) Replace the force system shown by an equivalent force-couple system with the force acting at point *O*. (b) Determine the equivalent wrench, and find the coordinates of the point where the axis of the wrench crosses the *xy*-plane.




9. A table exerts the four forces shown on the floor surface. Reduce the force system to a force–couple system at point O. Show that R is perpendicular to Mo. Then replace this system by a single force and find its position.




**Rules**

1. $\boldsymbol{M = \vec{r} \times \vec{F} = \begin{vmatrix} i & j & k \\ r_x & r_y & r_z \\ F_x & F_y & F_z \end{vmatrix}}$ vector formula. $\vec{F}$ given force in given form, and r vector from moment point to any point on the **line of action of the force.**
2. $\boldsymbol{M = Fd}$ , scalar formula $\boldsymbol{d}$ **is the** ***moment arm*** **or** ***perpendicular distance*** **from the moment point** $\boldsymbol{O}$ **to the line of action of the force.**
3. $\boldsymbol{M = M_x i + M_y j + M_z k}$**, where** $\boldsymbol{M_x}$ **is the moment of forces about x axis,** $\boldsymbol{M_y}$ **moment of given forces about y axis.**