3.8 An 11-lb force **P** is applied to a shift lever. The moment of **P** about *B* is clockwise and has a magnitude of 250 lb·in. Determine the value of α.

$20 + 90 = \alpha + 76$

$20 + 90 - 76 = \alpha = 34°$

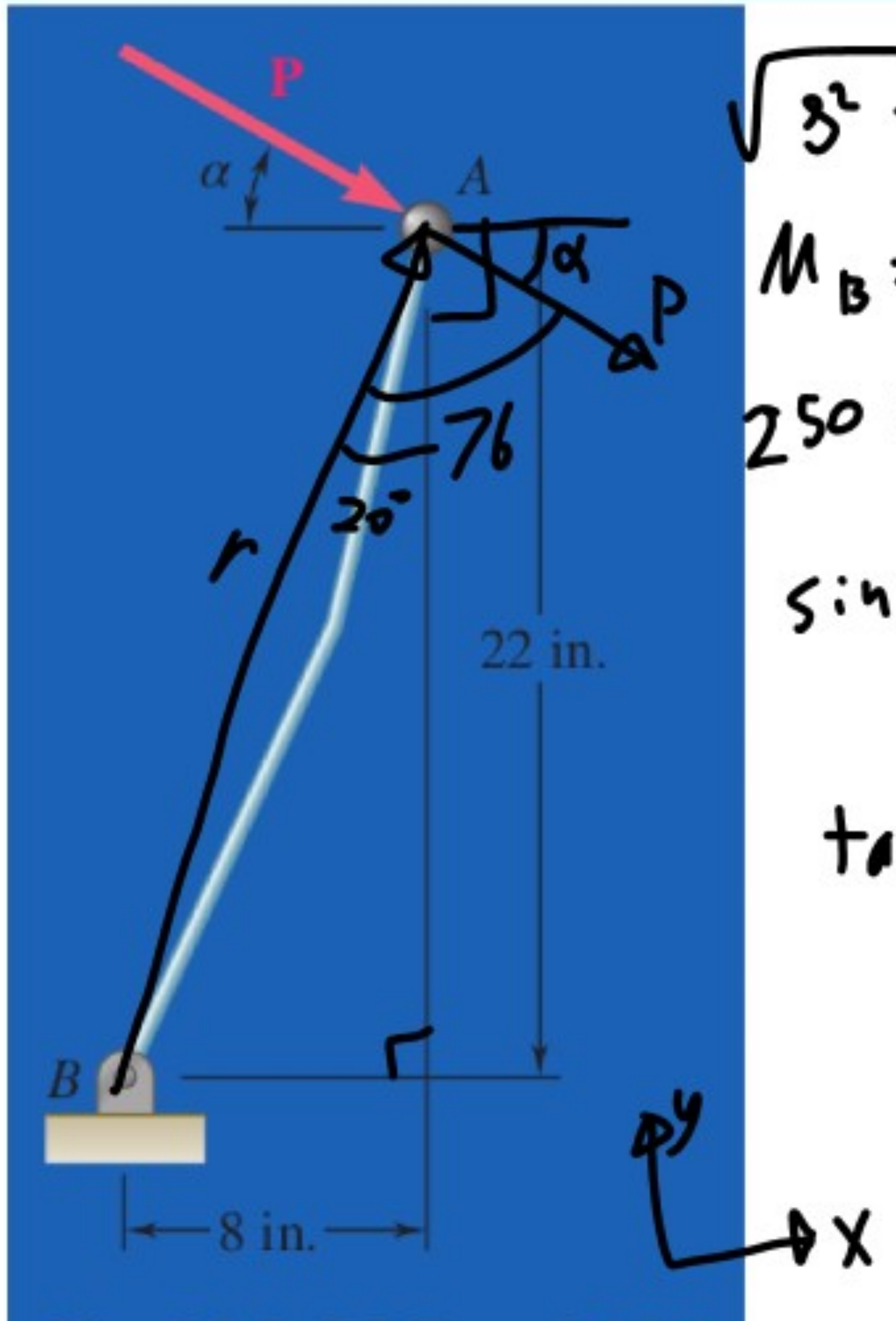


Fig. P3.6, P3.7, and P3.8

$\sqrt{8^2 + 22^2} = 23.4$ in

$M_B = rF\sin\theta$

$250 = 23.4 \cdot 11 \sin\theta$

$\sin^{-1}\left(\frac{250}{23.4 \cdot 11}\right) = \theta = 76°$

$\tan^{-1}\left(\frac{8}{22}\right) = 20°$

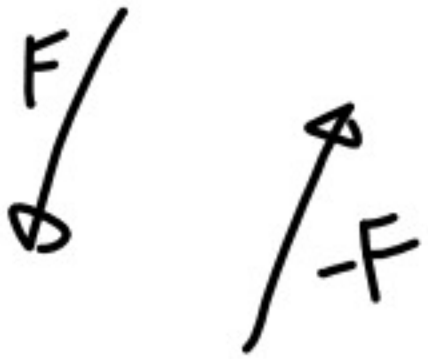
Problem from 9-16 part b

$\vec{P} = -360i + 360j - 180k$ $\qquad$ $\vec{BD} = -0.08i + 0.38j + 0.16k$

$$\vec{BD}\,\frac{\vec{P}\cdot\vec{BD}}{0.18} = (-0.08i + 0.38j + 0.16k)\,\frac{136.8}{0.18} = -60.8i + 288.8j + 121.6k$$

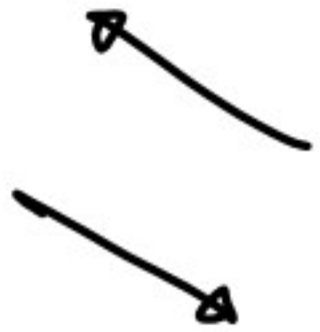
$$\vec{P}\cdot\vec{BD} = 360\cdot 0.08 + 360\cdot 0.38 - 180\cdot 0.16 = 136.8$$

Force Couples

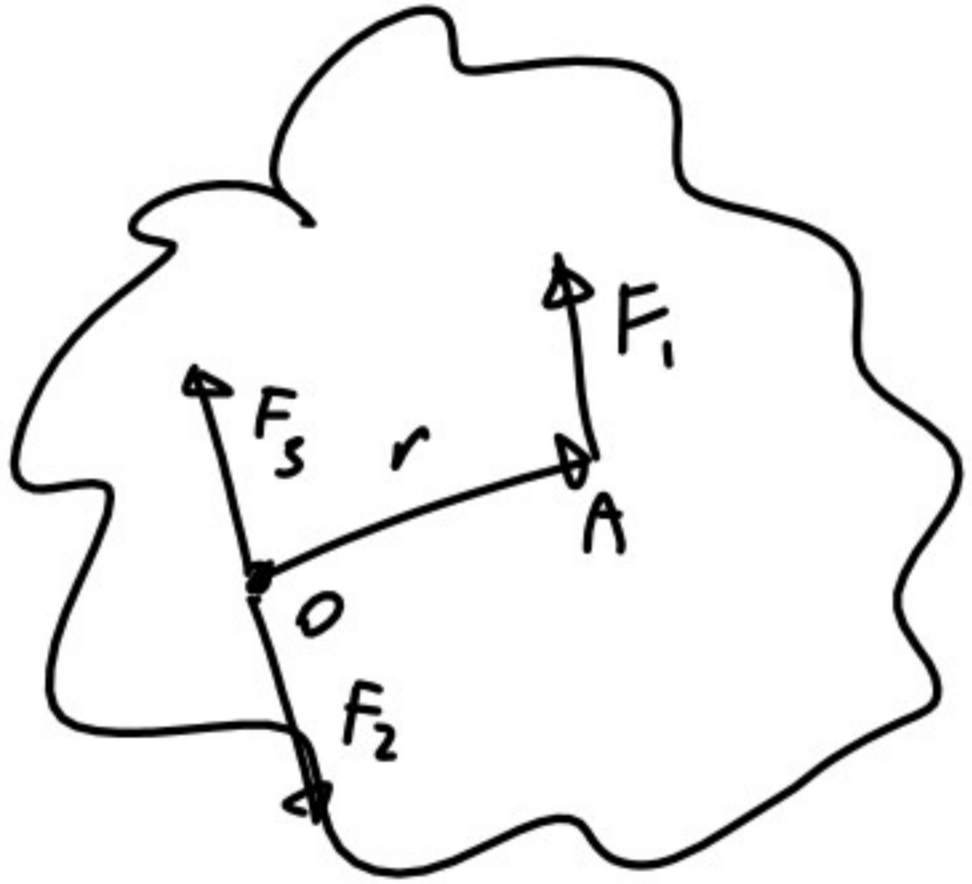


$$M = \vec{r}_A \times F + \vec{r}_B \times (-F) = (\vec{r}_A - \vec{r}_B) \times \vec{F}$$

$$\sum \vec{F} = \vec{0}$$

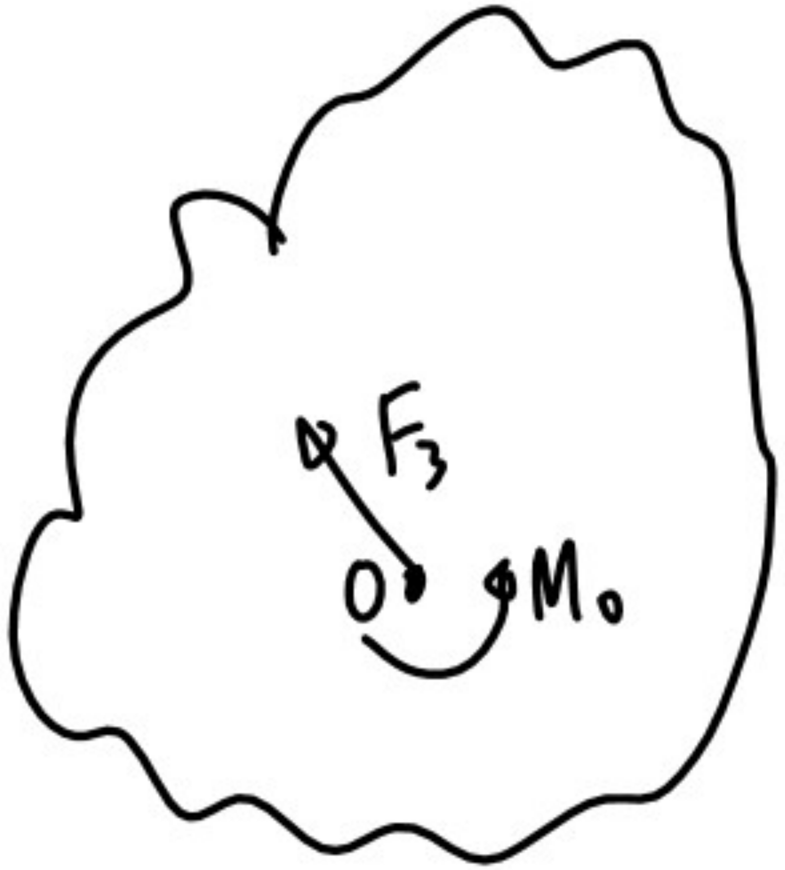


Solve for equivalent couples



$F_1 = F_2 = F_3$

$\vec{M}_0 = (\vec{r}_1 - \vec{r}_0) \times \vec{F}_1 = \vec{r}_1 \times \vec{F}_1$



16×10^3 lbs

A crane column supports a 16-kip load as shown. Replace the load with an equivalent system consisting of an axial force along *AB* and a couple.

SI prefixes

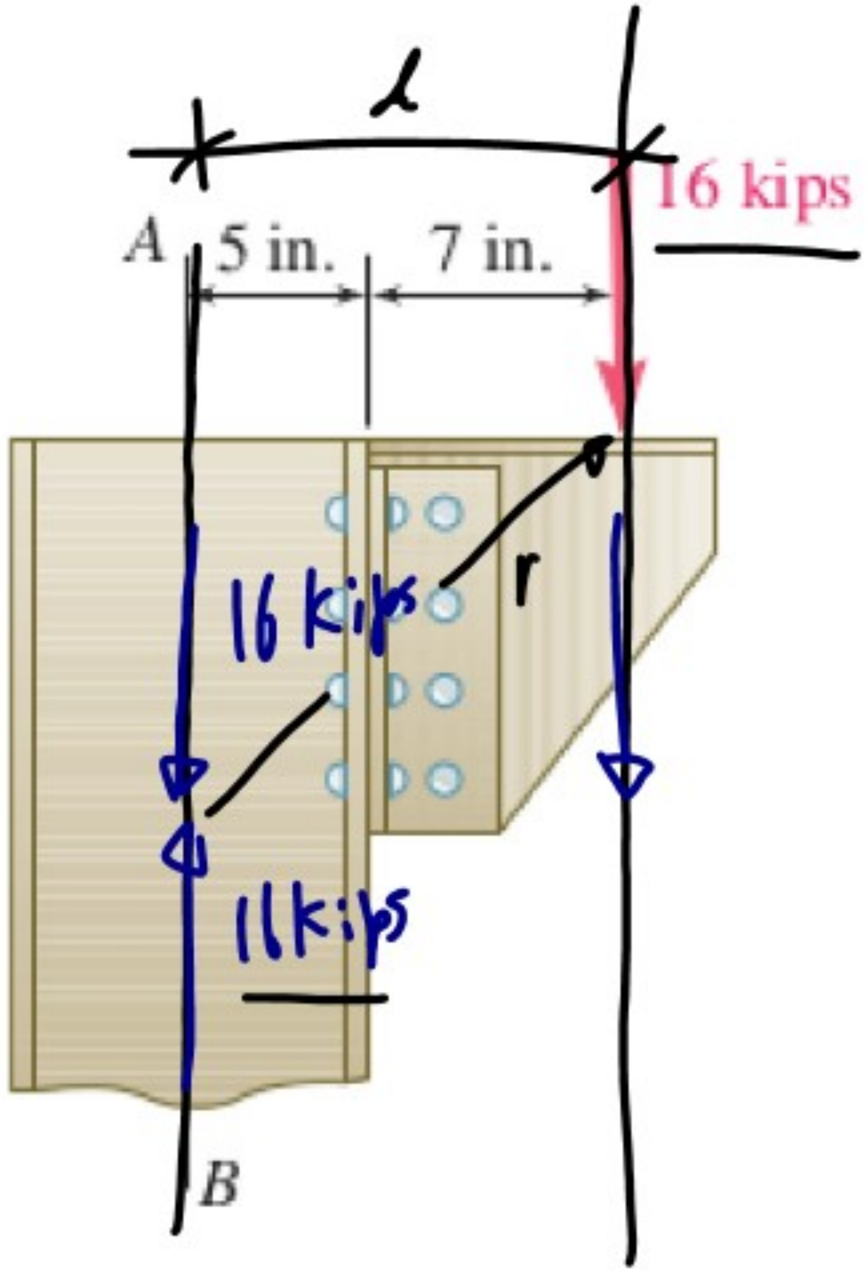
M 1×10^6

k 1×10^3

c 1×10^{-2}

m 1×10^{-3}

μ 1×10^{-6}



1000 lbs = 1 Kip

$M = dF$

$= 12 \text{ in} \cdot 16 \text{ Kips}$

$= 192 \text{ K in-lbs}$