1. Determine (a) the x, y, and z components of the 50 lb. force.
   
   (b) the angles $\theta_x$, $\theta_y$, and $\theta_z$ that the 50 lb. force forms with the coordinate axes. SKETCH the location of the angles $\theta_x$, $\theta_y$, $\theta_z$ and the x, y, and z components of the 400 N force.

\[
F_x = 22.66 \text{ lb}
\quad F_y = 43.30 \text{ lb}
\quad F_z = -10.57 \text{ lb}
\]

\[
\cos \theta_x = \frac{F_x}{F} = \frac{22.66}{50} = 0.4532 \quad \text{and} \quad \theta_x = 63.05^\circ
\]

\[
\cos \theta_y = \frac{F_y}{F} = \frac{43.30}{50} = 0.8660 \quad \text{and} \quad \theta_y = 30.00^\circ
\]

\[
\cos \theta_z = \frac{F_z}{F} = \frac{-10.57}{50} = -0.2113 \quad \text{and} \quad \theta_z = 102.20^\circ
\]

Note that you should have seen by inspection that $\theta_y = 30^\circ$.

Checks (not required)

\[F = \sqrt{22.66^2 + 43.30^2 + 10.57^2} = 50.00 \text{ lb}
\]

\[
\cos^2 63.05^\circ + \cos^2 30.00^\circ + \cos^2 102.20^\circ = 0.2054 + 0.7500 + 0.0447 = 1.0001
\]
Find the resultant of the system shown and the point of application of its line of action on line AC and line CD.

\[ \begin{align*}
27\text{ N}\cdot\text{m} & \quad \text{(Resultant)} \\
120\text{ N} & \quad \text{Force 1} \\
360\text{ N} & \quad \text{Force 2}
\end{align*} \]
2. Find the resultant of the system shown and the point of application of its line of action on line AC and line CD.

\[ 240 \]
\[ \Rightarrow 320 \]
\[ 240x = 30,000 \]
\[ x = 125 \]

Same as \[ \Rightarrow 75 \]

in other solution

\[ -240(200) + 320y = -30,000 \]
\[ y = \frac{16,000}{320} = 50 \text{ mm} \]
3. Knowing that the tension in cable AB is 1,800 lb., determine the moment of the force exerted on the plate at E about corner D.

\[ \vec{T}_{DA} = 4\hat{z} \]
\[ \vec{A}\vec{B} = -4\hat{x} + 4\hat{y} - 7\hat{k} \]
\[ AB = \sqrt{4^2 + 4^2 + 7^2} = 9 \]
\[ \vec{T}_{AB} = \frac{T_{AB}}{9} \]
\[ \vec{T}_{AB} = \frac{1800}{9} \]
\[ (-4\hat{x} + 4\hat{y} - 7\hat{k}) \]
\[ \vec{T}_{AB} = 200 \]
\[ (-4\hat{x} + 4\hat{y} - 7\hat{k}) \]

\[ \vec{M}_D = \vec{r}_{DA} \times \vec{T}_{AB} \]

\[ \begin{vmatrix}
  \hat{x} & \hat{y} & \hat{k} \\
  0 & 0 & 0 \\
  -4 & 4 & -7 \\
\end{vmatrix} = 800 \begin{vmatrix}
  -4 & -7 \\
  4 & 4 \\
\end{vmatrix} = 800 \left( 7\hat{y} + 4\hat{k} \right) \]

\[ \vec{M}_D = 5600\hat{y} + 3200\hat{k} \text{ lb-ft} \]
1. Determine (a) the x, y, & z components of the 50lb. force.
   (b) the angles $\theta_x$, $\theta_y$, and $\theta_z$ that the 500 lb. force forms with the coordinate axes.
   SKETCH the location of the angles $\theta_x$, $\theta_y$, & $\theta_z$ and the x, y, & z components of the 50 lb. force.
2. Find the resultant of the system shown and the point of application of its line of action on line AC and line CD.
3. Knowing that the tension in cable AB is 1,800 lb., determine the moment of the force exerted on the plate at A about corner D.