2D CONCURRENT FORCES:

- all lines of action intersect at a single point
- no moment (torque)/(ROTATION)

EQUILIBRIUM:

Newton's 2nd Law: $F = m \cdot a$

IN a STATIC SYSTEM $a = 0$

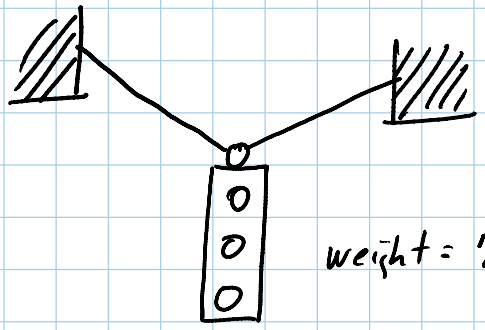
$\therefore F = m \cdot 0 \Rightarrow F = 0$?

$\Sigma F = 0$ IN STATIC EQUILIBRIUM

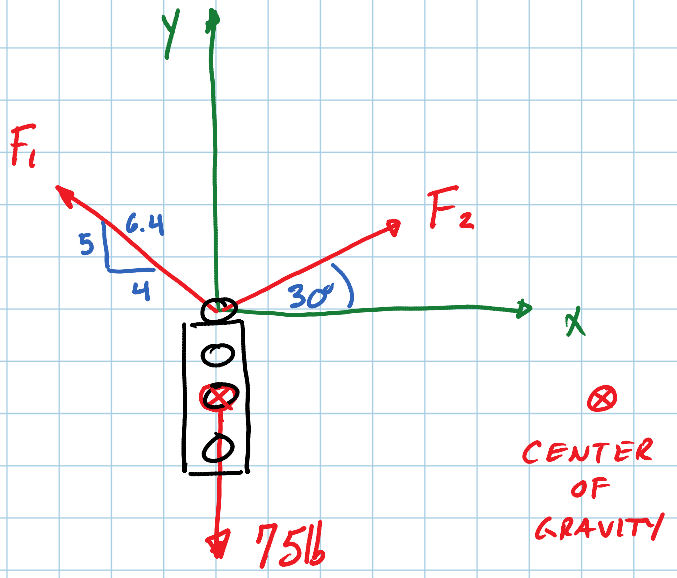
$\Sigma F_x = 0$ if not there is a net force in the x-direction, and the object is moving in the x-direction

$\Sigma F_y = 0$

$\Sigma F_z = 0$



weight = 75lb

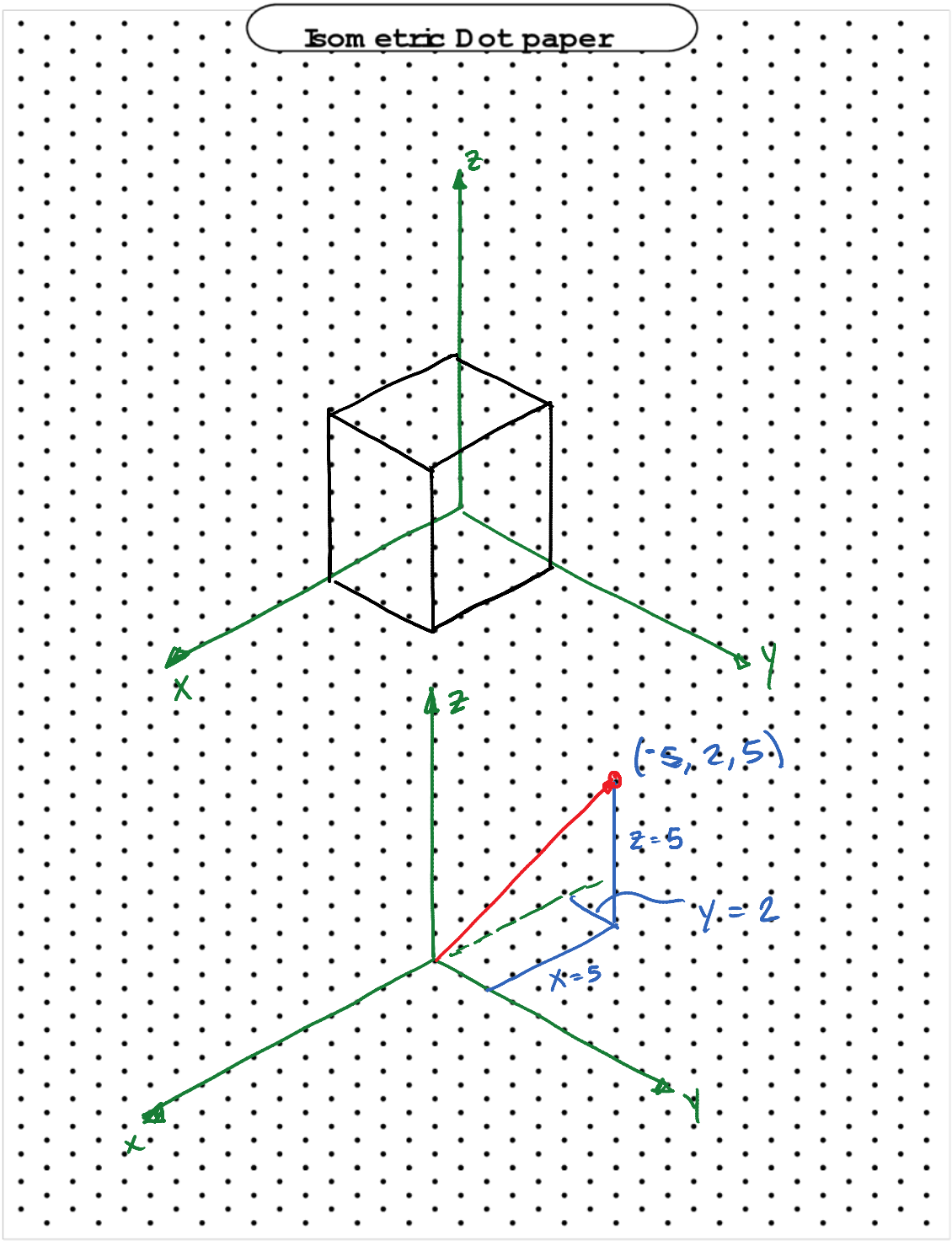


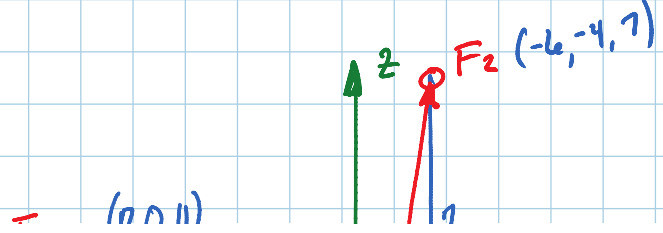
$\Sigma F_x = 0 = F_2 \cdot \cos 30° - F_1 \cdot \cos \theta$

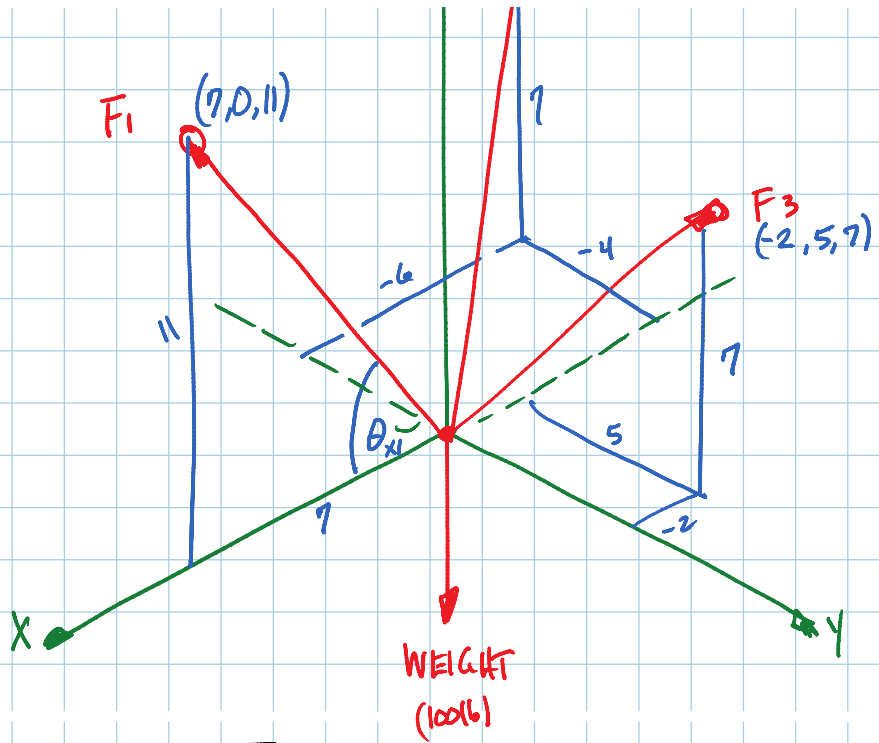
$$0 = F_2 \cdot \cos 30^\circ - F_1 \cdot \frac{4}{6.4}$$

$$\Sigma F_y = 0 = F_2 \cdot \sin 30^\circ + F_1 \cdot 5/6.4 - 75\,lb$$

$$F_2 = 47.4\,lb \qquad F_1 = 65.7\,lb$$


Isometric Dot paper
z
x
y
z
(-5, 2, 5)
z=5
y=2
x=5
x
y


z
F2 (-6,-4,7)



$$L_1 = \sqrt{7^2 + 0^2 + 11^2} = 13.04$$

$$L_2 = \sqrt{-6^2 + -4^2 + 7^2} = 10.05$$

$$L_3 = \sqrt{-2^2 + 5^2 + 7^2} = 8.83$$

$$\Sigma F_x = 0 = F_{1x} + F_{2x} + F_{3x}$$

$$= F_1 \cdot \cos\theta_{x1} + F_2 \cdot \cos\theta_{x2} + F_3 \cdot \cos\theta_{x3}$$

$$0 = F_1 \cdot \frac{7}{13.04} + F_2 \cdot \frac{-6}{10.05} + F_3 \cdot \frac{-2}{8.83}$$

$$\Sigma F_y = 0 = F_1 \frac{0}{13.04} + F_2 \frac{-4}{10.05} + F_3 \frac{5}{8.83}$$

$$\Sigma F_z = 0 = F_1 \frac{11}{13.04} + F_2 \frac{7}{10.05} + F_3 \frac{7}{8.83} \quad -100\,lb$$

$$\begin{bmatrix} 0 \\ 0 \\ 100 \end{bmatrix} lb \begin{bmatrix} 0.537 & -0.597 & -0.227 \\ 0 & -0.398 & 0.566 \\ 0.844 & 0.697 & 0.793 \end{bmatrix}$$

[B] [A]

$$[A]^{-1} \cdot [B] = \begin{bmatrix} F_1 \\ F_2 \\ F_3 \end{bmatrix} = \begin{bmatrix} 57.7 \\ 40.9 \\ 28.8 \end{bmatrix} \text{ lb}$$