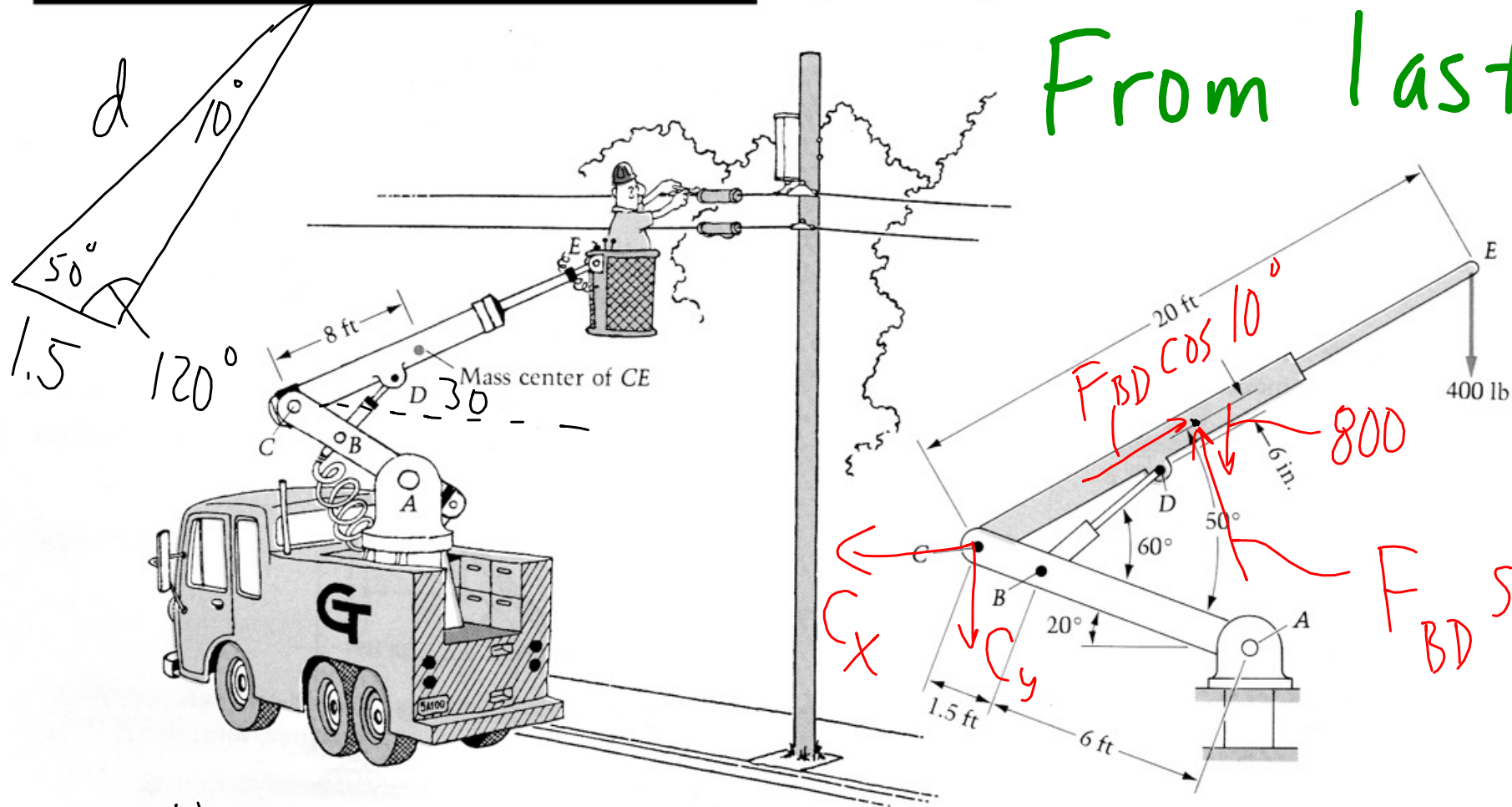


4.186 A worker in a "cherry picker" is installing cable TV equipment. (See Figure P4.186.) If the man plus bucket weigh 400 lb and the extendable member CE weighs 800 lb, find the force in the hydraulic cylinder BD and the pin reactions at C onto the extendable member CE. Neglect the weight of BD.

From last time



$$\frac{\sin 10}{1.5} = \frac{\sin 120}{d} \quad d = 7.48'$$

$$\begin{aligned} \curvearrowright \sum M_c &= F_{BD} \sin 10 (7.48) - 800 (8 \cos 30) \\ &\quad - 400 (20 \cos 30) = 0 \end{aligned}$$

$$F_{BD} = 9600 \text{ lbs}$$

$$\rightarrow \sum F_x = 9600 \cos 40 - C_x = 0 \quad C_x = 7354 \text{ lbs}$$

$$\uparrow \sum F_y = 9600 \sin 40 - C_y - 800 - 400 = 0 \quad C_y = 4970 \text{ lbs}$$

$$F_c = \sqrt{7354^2 + 4970^2} = 8876 \text{ lbs}$$

Assume common steel pin

$$\sigma_{\text{shear, max}} = 36,000 \text{ psi}$$

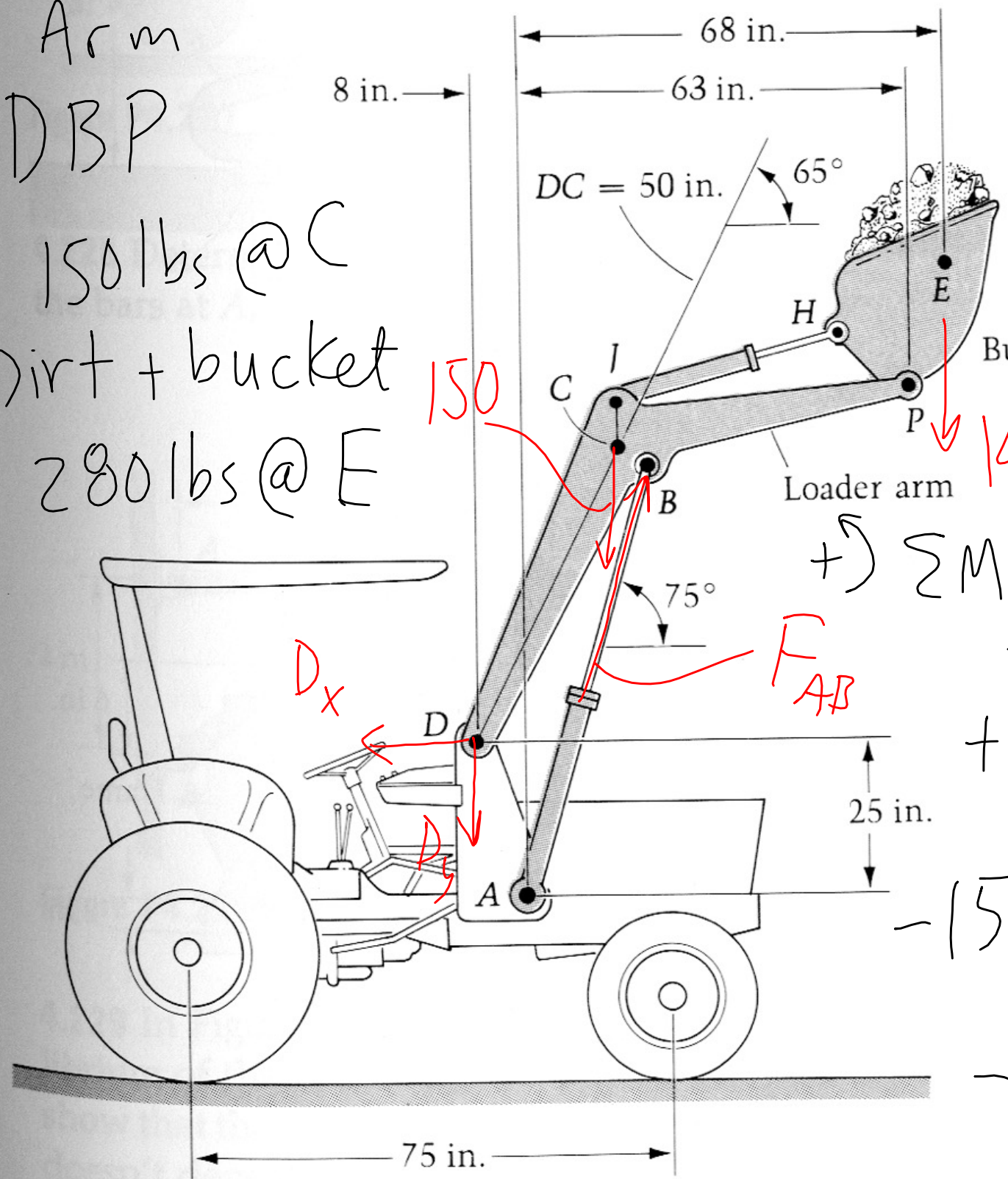
$$\sigma_{\text{shear (double)}} = \frac{8867/2}{\frac{\pi d^2}{4}} < 36000$$

$$d = .396 \text{ ''}$$

Arm
DBP

150 lbs @ C
Dirt + bucket
280 lbs @ E

Find F_{AB} + pin
reactions @ D



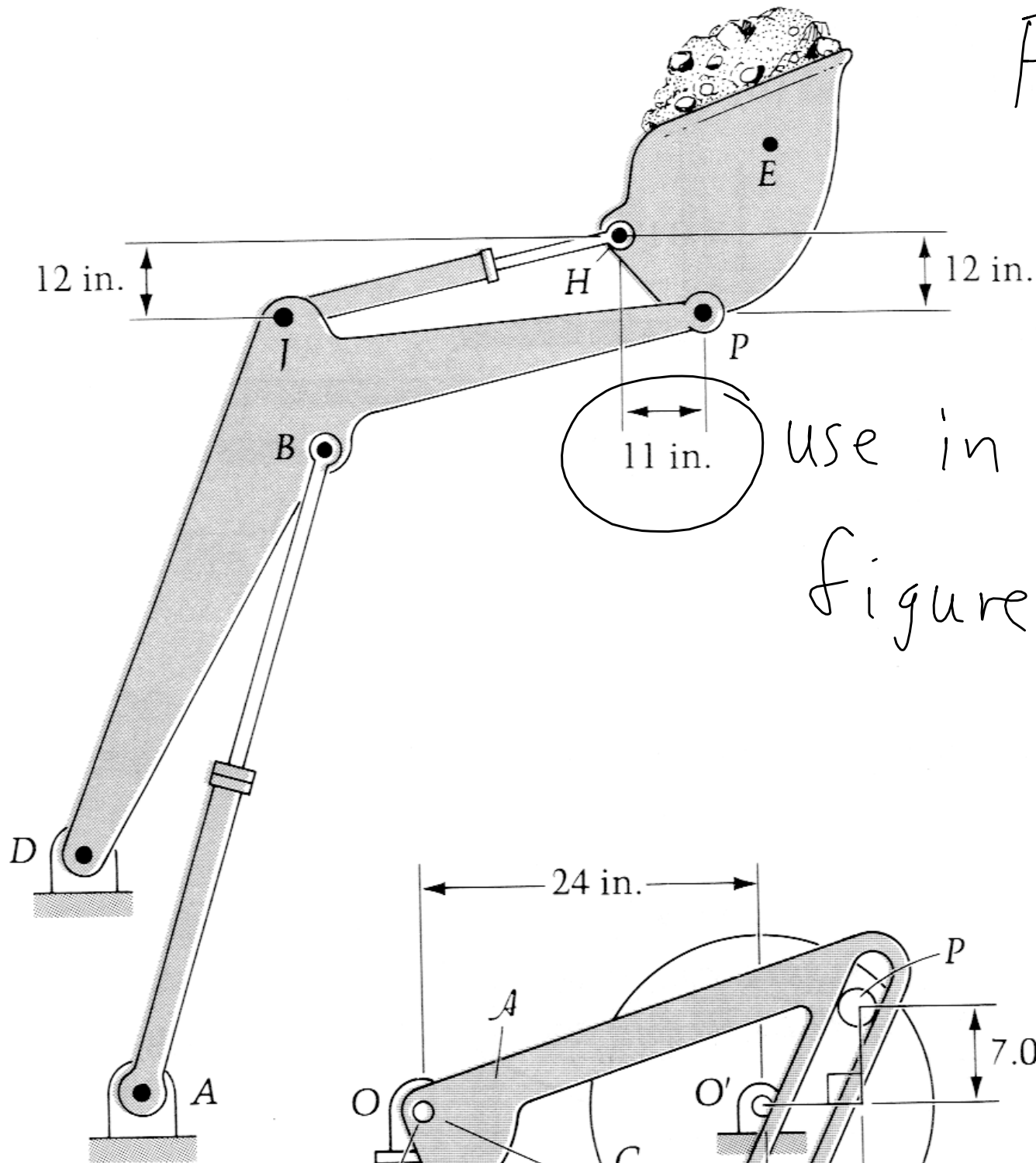
$$+\curvearrowright \sum M_D = (F_{AB} \cos 75)(25) + (F_{AB} \sin 75)(8) - 150(50 \cos 65) - 140(76) = 0$$

$$F_{AB} = 972 \text{ lbs}$$

$$\begin{aligned} \rightarrow \sum F_x &= 972 \cos 75 - D_x = 0 & D_x &= 252 \text{ lbs} \end{aligned}$$

$$\uparrow \sum F_y = 972 \sin 75 - D_y - 150 - 140 = 0$$

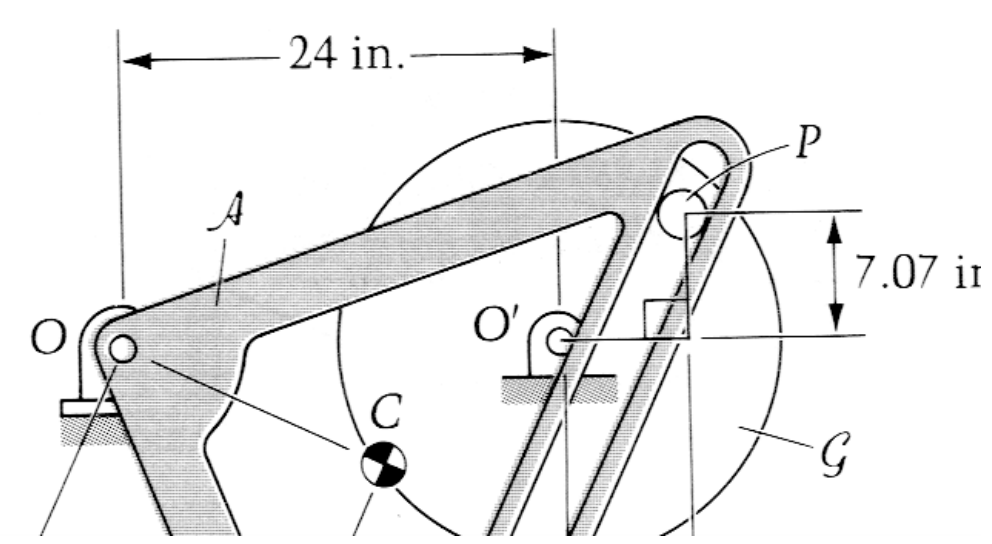
$$D_y = 649 \text{ lbs}$$



$F_{JH} = ?$ $P_x, P_y = ?$

11 in. use in next figure

Figure P4.218



$$DC_x = 50 \cos 65$$

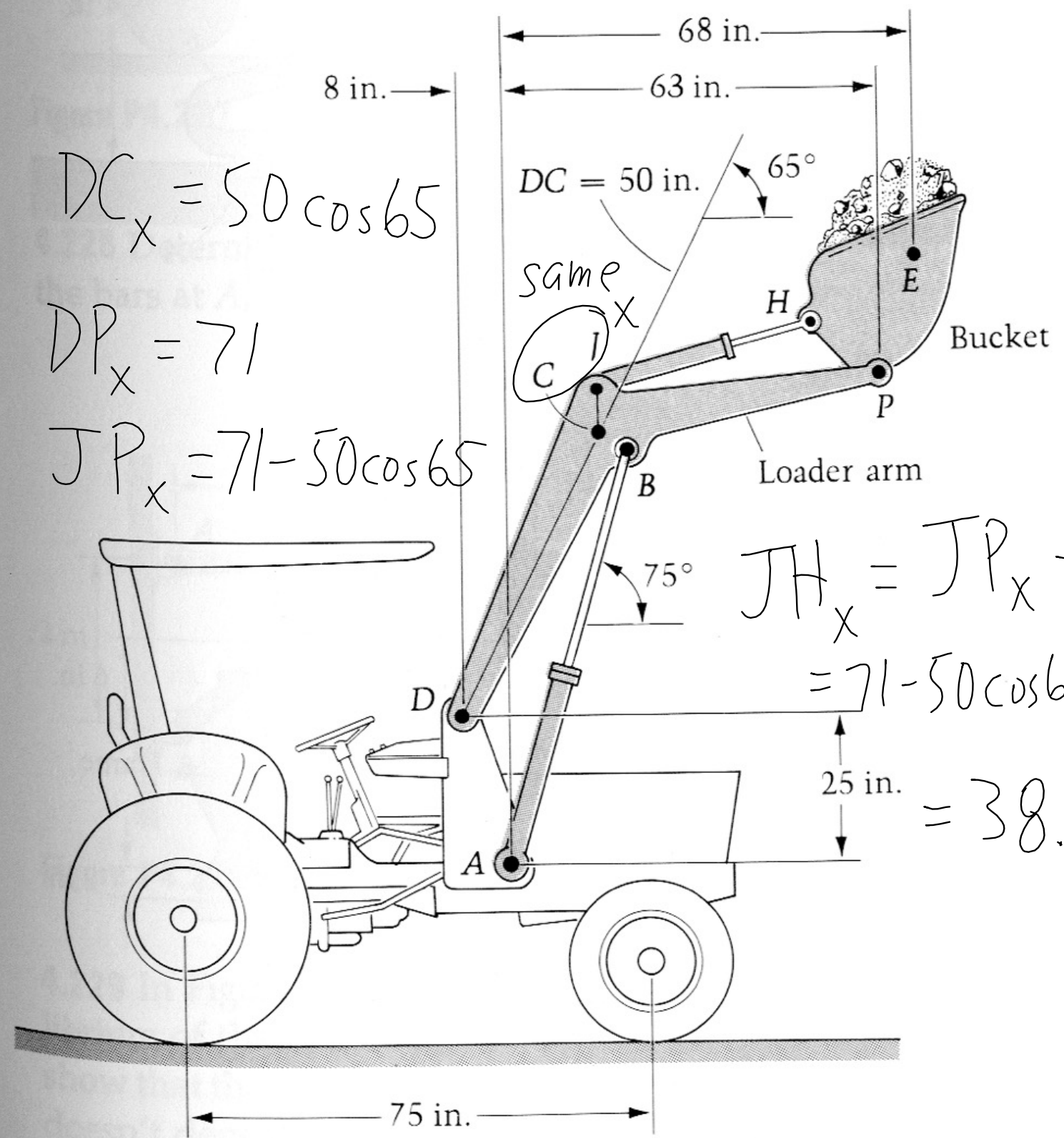
$$DP_x = 71$$

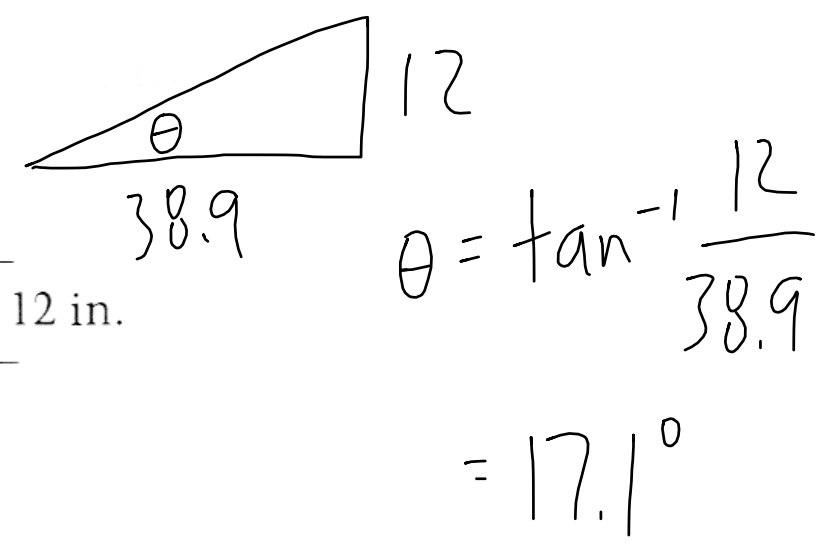
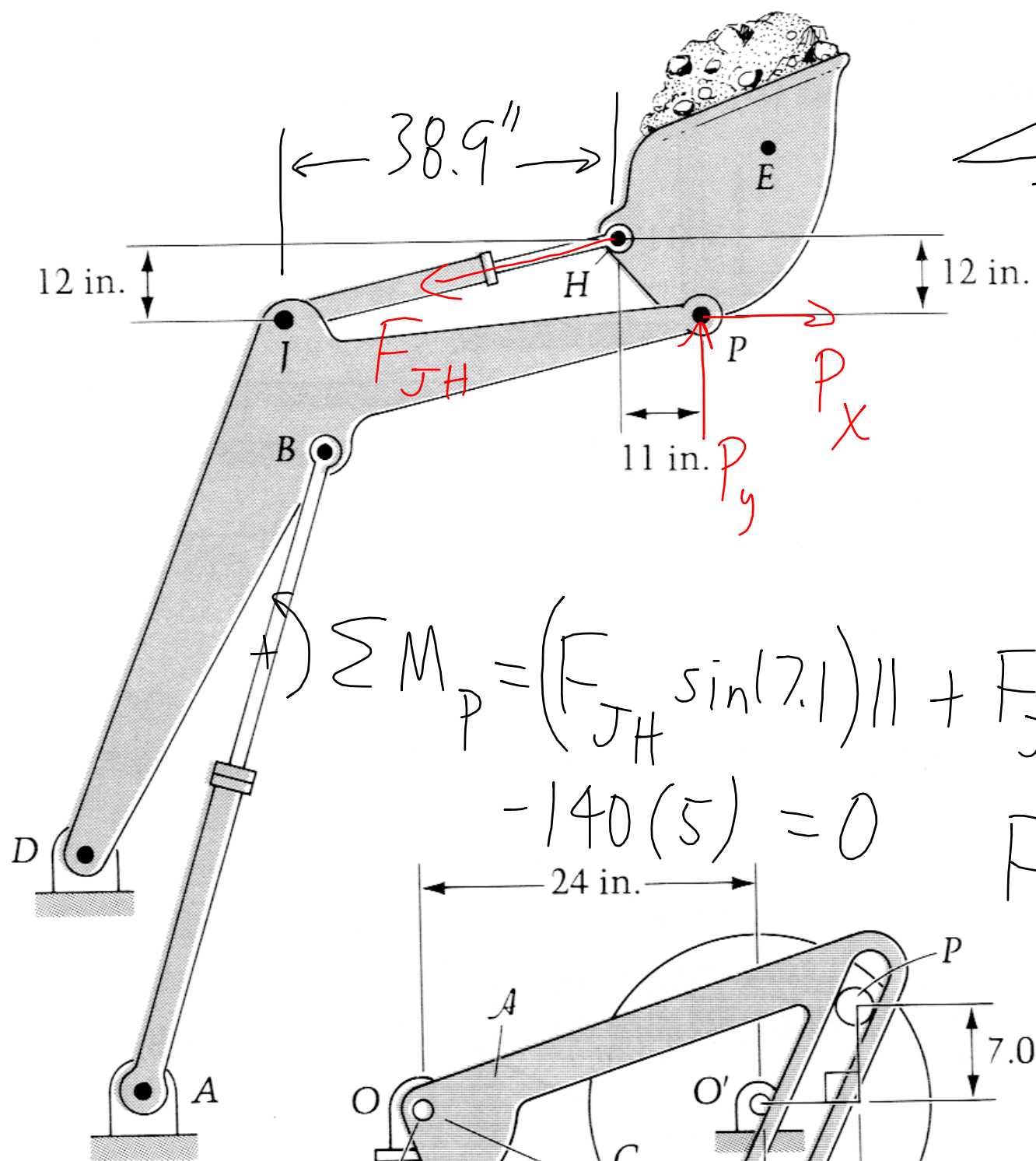
$$JP_x = 71 - 50 \cos 65$$

$$JH_x = JP_x - 11$$

$$= 71 - 50 \cos 65 - 11$$

$$= 38.9''$$





$$\begin{aligned}
 \sum M_P &= (F_{JH} \sin 17.1) 11 + F_{JH} \cos 17.1 (12) \\
 &\quad - 140(5) = 0
 \end{aligned}$$

$$F_{JH} = 47.6 \text{ lbs}$$

$$\sum F_x \Rightarrow P_x = 45.5$$

$$\sum F_y \Rightarrow P_y = 154$$

Figure P4.218