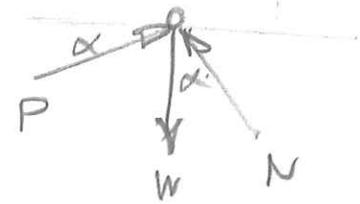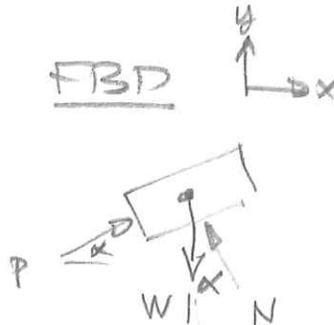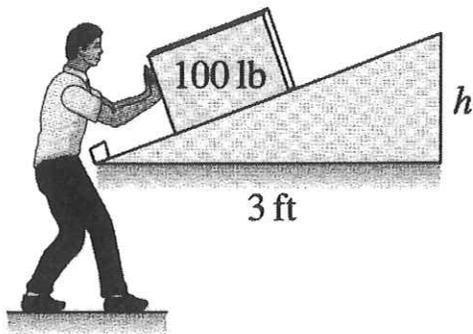Dimension h is to be determined so that a worker can comfortably slide boxes up a frictionless incline.

If worker can apply up to 50 pounds parallel to the incline, and the boxes weigh 100 lb, what is the greatest value h can have?
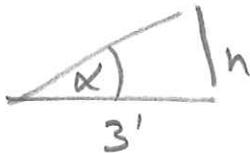

FOR EQUILIBRIUM

$$\underline{\Sigma F_x = 0}$$

$$P_x = N_x$$

$$P \cos \alpha = N \sin \alpha$$

$$N = \frac{P \cos \alpha}{\sin \alpha}$$

$$\underline{\Sigma F_y = 0}$$

$$P_y + N_y = W$$

$$P \sin \alpha + N \cos \alpha = W$$

$$P \sin \alpha + P \frac{\cos^2 \alpha}{\sin \alpha} = W$$

$$P \left(\sin^2 \alpha + \cos^2 \alpha \right) = W \sin \alpha$$

$$\sin \alpha = P/W = {}^{50}/_{100} = \tfrac{1}{2}$$

$$\alpha = 30°$$

$$\frac{h}{3} = TAN\ 30$$

$$h = 3' TAN\ 30 = 1.73\ FT$$

NOTE: EASIER IF YOU USE TIP-TO-TAIL VECTOR ADDITION