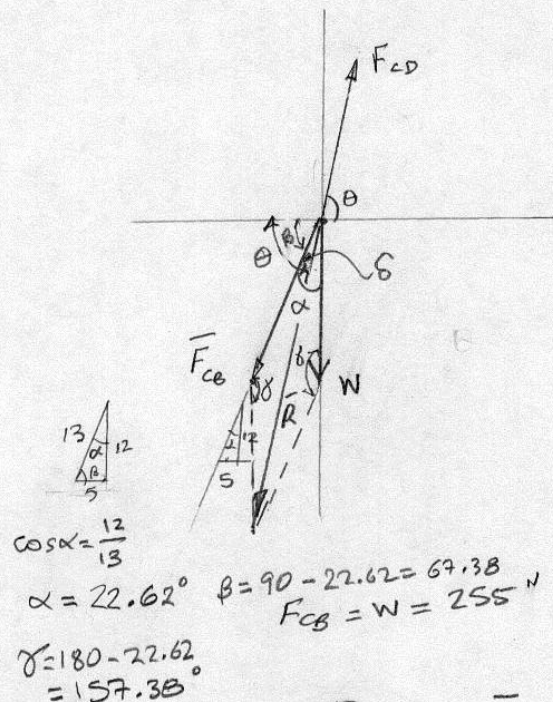
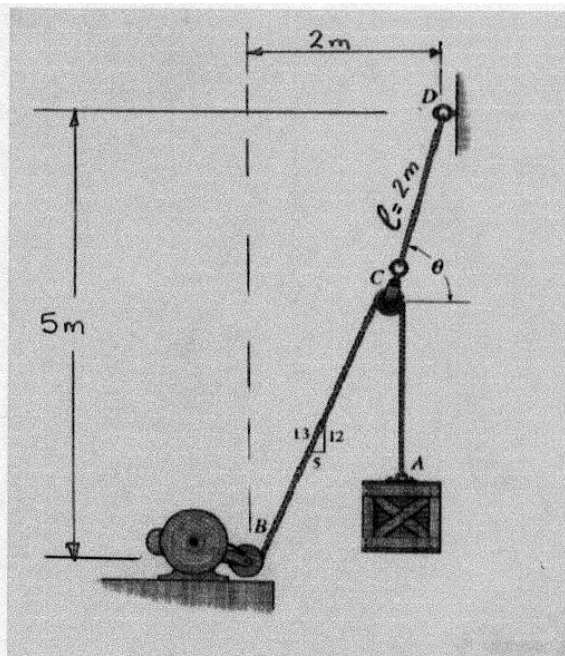


1. A 255 N crate is being hoisted as shown. Determine the angle  $\theta$  for equilibrium using
- Trigonometric laws
  - Rectangular components



NOTE: For equilibrium, the resultant of  $\vec{F}_{CB}$  and  $\vec{W}$ ,  $\vec{R}$ , must be equal and opposite to  $\vec{F}_{CD}$

$$\begin{aligned}
 R^2 &= 255^2 + 255^2 - 2(255)(255)\cos 157.38^\circ \\
 &= 250096 \\
 R &= 500.1 \text{ N}
 \end{aligned}$$

$$\begin{aligned}
 \theta &= \beta + \delta \\
 &= 67.38 + \delta
 \end{aligned}$$

$$\begin{aligned}
 \frac{255}{\sin \delta} &= \frac{R}{\sin \gamma} & \text{or } \frac{255}{\sin \beta} &= \frac{500.1}{\sin 157.38} \\
 \sin \delta &= 0.1961 & \delta &= 11.31^\circ
 \end{aligned}$$

$$\therefore \boxed{\theta = 78.69^\circ}$$

Using rectangular components

$$1) [\Sigma F_x = 0] \quad F_{CD} \cos \theta - F_{CB} \cos \beta = 0$$

$$2) [\Sigma F_y = 0] \quad F_{CD} \sin \theta - F_{CB} \cos \alpha - W = 0$$

From 1)  $F_{CD} \cos \theta - 255 \cos 67.38 = 0$

$$F_{CD} \cos \theta = 98.1 \text{ N} \quad (3)$$

From 2)  $F_{CD} \sin \theta - 255 \cos 22.62 - 255 = 0$

$$F_{CD} \sin \theta = 490.38 \quad (4)$$

$$(4) \div (3)$$

$$\frac{F_{CD} \sin \theta}{F_{CD} \cos \theta} = \frac{490.38}{98.1}$$

$$\tan \theta = 5.0$$

$$\theta = 78.69^\circ \quad (5)$$

Subst (5) in Eq (3) or (4)  $F_{CD} = 500.1 \text{ N} \quad (6)$