Given: 40-lb Roller of Diameter 8 in.
Thickness of Tile is 0.3 in.
Find: Force $P$ to move Roller onto Tiles if Roller is (a) Pushed ← → (b) Pulled →

Geometry for each case as Roller comes into contact with Tile

(a) Roller Pushed to LEFT (3 - Force Body)

Force must pass through O.

**Force Triangle**

$\alpha = 22.33^\circ$

$180^\circ - 120^\circ - 22.33^\circ = 37.67^\circ$

Law of Sines

\[
\frac{40\text{lb}}{\sin 37.67^\circ} = \frac{P}{\sin 22.33^\circ} \Rightarrow P = \frac{40\text{lb}}{\sin 37.67^\circ} \cdot \sin 22.33^\circ 
\]

(b) Roller Pulled to RIGHT (3 - Force Body)

Forces must pass through C.

**Force Triangle**

$\alpha = 22.33^\circ$

$180^\circ - 60^\circ - 22.33^\circ = 97.67^\circ$

Law of Sines

\[
\frac{40\text{lb}}{\sin 97.67^\circ} = \frac{P}{\sin 22.33^\circ} \Rightarrow P = \frac{40\text{lb}}{\sin 97.67^\circ} \cdot \sin 22.33^\circ 
\]