m = 100 g
\( \dot{\theta}_0 = 12 \text{ rad/sec} \) constant
d = 0.2 m

Find a) \( F_x \) & \( F_y \) on Pin B
b) \( P \) & \( Q \) on Pin by OC & DE

\[ \text{FBD} = \text{MAD} \]

\[ 2F_x \cdot 0 - P \sin \theta = 0 \]

\[ 4F_y \cdot -mg + P \cos \theta = mg \]

2 eq, 3 unknowns \((P, Q, a_y)\)
Use kinematics.
We have 2 coordinate systems here x/y & r/θ.

We know that pin can only accelerate upward, i.e. ax = 0.

We also knew expressions for any planar motion in terms of r/θ coordinates. Namely we know:

\[ a_r = \ddot{r} - r \dot{\theta}^2 \]

\[ a_\theta = r \ddot{\theta} + 2 \dot{r} \dot{\theta} \]

(See section on r/θ coords.)

We need to relate ȧr, ȧθ, & ȧϕ. Here's how they look:
From this diagram

\[ x: a - c_0 \cos \theta = a_0 \sin \theta \]

\[ y: ay = a_0 \cos \theta + ar \sin \theta \]

Use the second relationship:

\[-mg + P \cos \theta = m(a_0 \cos \theta + ar \sin \theta)\]

\[ P = mg + m[(r\ddot{\theta} + 2\dot{\theta}^2) \cos \theta + (\ddot{r} - r \dot{\theta}^2) \sin \theta]\]

\[ \dot{\theta} \text{ constant, so } \ddot{\theta} = 0.\]

From trigonometry, \(-\cos \theta = \hat{d}\)

\[ r = \frac{d}{\cos \theta}\]

\[ \dot{r} = \frac{d}{\cos^2 \theta} (+ \sin \theta) \dot{\theta}\]

\[ \ddot{r} = -2d (-\sin \theta) \dot{\theta} \sin \theta \dot{\theta} + \text{etc.} \]

\[ \frac{\cos \theta}{\cos^3 \theta} \]

It's a mess but keep going.
With $P$, use $E^x$ to get $Q$.

With $P$ and $Q$ (you know directions from FBD on $D$), can get $F$, total force on $B$. Knowing $F$, you can split it up into $F_x$ & $F_y$.