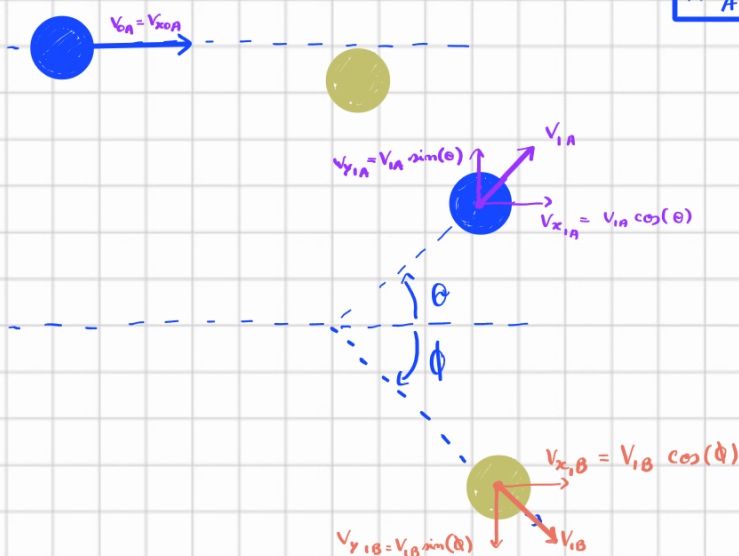


7

a)



$$m_A = m_B$$

$$\left\{ \begin{array}{l} P_{0Ax} + P_{0Ay} = P_{1Ax} + P_{1By} \\ P_{0Ay} + P_{0By} = P_{1Ay} + P_{2By} \\ \frac{1}{2} m v_{0A}^2 + \frac{1}{2} m v_{0B}^2 = \frac{1}{2} m v_{1A}^2 + \frac{1}{2} m v_{1B}^2 \end{array} \right\} \left\{ \begin{array}{l} m v_{x0A} + m v_{x0B} = m v_{x1A} + m v_{x1B} \\ m v_{y0A} + m v_{y0B} = m v_{y1A} + m v_{y1B} \\ v_{0A}^2 = v_{1A}^2 + v_{1B}^2 \end{array} \right\} \left\{ \begin{array}{l} v_{x0A} = v_{x1A} + v_{x1B} \\ v_{y0A} = v_{y1A} + v_{y1B} \end{array} \right.$$

Como  $v_{x0A} = 1$  e  $v_{y0A} = 0$ :

$$\left\{ \begin{array}{l} 1 = v_{1A} \cos(\theta) + v_{1B} \cos(\phi) \\ 0 = v_{1A} \sin(\theta) + v_{1B} \sin(\phi) \\ 1 = v_{1A}^2 + v_{1B}^2 \end{array} \right\} \xrightarrow{\text{elevar tudo ao quadrado}} \left\{ \begin{array}{l} 1 = (v_{1A} \cos(\theta))^2 + 2 v_{1A} v_{1B} \cos(\theta) \cos(\phi) + (v_{1B} \cos(\phi))^2 \\ 0 = (v_{1A} \sin(\theta))^2 + 2 v_{1A} v_{1B} \sin(\theta) \sin(\phi) + (v_{1B} \sin(\phi))^2 \end{array} \right.$$

Segundo as duas primeiras equações:

$$\left\{ \begin{array}{l} 1 = v_{1A}^2 (\cos^2(\theta) + \sin^2(\theta)) + 2 v_{1A} v_{1B} (\cos(\theta) \cos(\phi) + \sin(\theta) \sin(\phi)) + v_{1B}^2 (\cos^2(\phi) + \sin^2(\phi)) \\ 1 = v_{1A}^2 + v_{1B}^2 \end{array} \right. \quad \begin{array}{l} = 1 \\ = \cos(\theta + \phi) \\ = 1 \end{array}$$

$$\left\{ \begin{array}{l} 1 = v_{1A}^2 + 2 v_{1A} v_{1B} \cos(\theta + \phi) + v_{1B}^2 \\ 1 = v_{1A}^2 + v_{1B}^2 \end{array} \right\} \quad \left\{ \begin{array}{l} 1 = \boxed{v_{1A}^2 + v_{1B}^2} + 2 v_{1A} v_{1B} \cos(\theta + \phi) \\ 1 = v_{1A}^2 + v_{1B}^2 \end{array} \right.$$

$$\Rightarrow 1 = 1 + 2 v_{1A} v_{1B} \cos(\theta + \phi) \Leftrightarrow 2 v_{1A} v_{1B} \cos(\theta + \phi) = 0$$

$$\Leftrightarrow \cos(\theta + \phi) = 0$$

Sabendo que  $\phi = 35^\circ$ :  $\cos(35 + \theta) = 0 \Leftrightarrow \cos(35 + \theta) = \cos(90) \Leftrightarrow \theta = 55^\circ$

c) e d) Sabemos:

$$\left\{ \begin{array}{l} 1 = v_{1A} \cos(\theta) + v_{1B} \cos(\phi) \\ 0 = v_{1A} \sin(\theta) + v_{1B} \sin(\phi) \\ 1 = v_{1A}^2 + v_{1B}^2 \end{array} \right.$$

Resolvimos sabendo:  $\theta = 55^\circ$  e  $\phi = 35^\circ$