A projectile trajectory has a maximum height \( h \), a range \( R \). The mass is \( m \) and the initial speed \( v_0 \). The angle between the initial velocity vector and the horizontal direction is \( \theta \).

Determine the angular momentum \( \ell \) at \( P \) with respect to \( O \).

A) \[ \ell = \frac{R m v_{0x}}{2} = \frac{R m v_0 \cos \theta}{2} . \]

B) \[ \ell = R m v_{0y} = R m v_0 \sin \theta . \]

C) \[ \ell = h m v_{0x} = h m v_0 \cos \theta . \]
By inspection, at P the momentum vector is $m v_{0x}$.

It is along the horizontal direction.

The lever arm is the perpendicular distance from O to the momentum vector, which is $h$.

So the angular momentum is $\ell = h m v_{0x}$.

Answer C.

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