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 $\theta$.

![Diagram of projectile motion](image)

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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