$$s(t) = -5t^2 + 30t + 80$$

In general, an object moving through the air can be treated as a point mass instead of an extended object. A physics student knows that the mass of a large exoplanet is 250 times the mass of the Earth. He wants to simulate throwing an object directly upward in the air on the exoplanet with an initial velocity, v_0, of 30 m/s from an initial height, s_0, of 80 m with gravitational acceleration, a, of 10 m/s^2. The position, s, above the ground, can be expressed as a function of time, t. The object reaches its maximum height at a time $t_1 = v_0/a$. The velocity of the object in the vertical direction, at any time, t, can be represented as $v(t) = 30 - 10t$. What is the velocity of the object in m/s at a time $t_2 = 4.5$ seconds after the object reaches its maximum height?

A) -47 m/s

B) -46 m/s

C) -45 m/s

D) -44 m/s

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Solution

$t_1 = \frac{v_0}{a}$	Write second equation.
$t_1 = \frac{30}{10}$	Evaluate for $v_0 = 30$, $a = 10$.
$t_1 = 3$	Simplify.
$t = t_1 + t_2$	Define time required equation.
$t = 3 + 4.5$	Evaluate for $t_1 = 3$, $t_2 = 4.5$.
$t = 7.5$	Add.
$v(t) = 30 - 10t$	Write third equation.
$v(7.5) = 30 - 10(7.5)$	Substitute $t = 7.5$.
$v(7.5) = -45$	Simplify.
Ⓒ	Answer.