Answer on Question 50065, Physics, Mechanics | Kinematics | Dynamics

Question:

If the speed of the vehicle increases by $2\frac{m}{s}$, its kinetic energy is doubled, then original speed of the vehicle is

1) $\left(\sqrt{2}+1\right)\frac{m}{s}$,

2) $2\left(\sqrt{2}-1\right)\frac{m}{s}$,

3) $2\left(\sqrt{2}+1\right)\frac{m}{s}$,

4) $\sqrt{2}\left(\sqrt{2}+1\right)\frac{m}{s}$.

Solution:

By the definition, kinetic energy of the vehicle is $KE_1 = \frac{1}{2}mv^2$. From the condition of the question we know, that kinetic energy of the vehicle is doubled, so $KE_2 = 2KE_1$. Therefore, we can write:

$$\frac{1}{2}mv_2^2 = 2\frac{1}{2}mv_1^2.$$

Because the speed of the vehicle increases by $2\frac{m}{s}$, we can write:

$$(v_1+2)^2 = 2v_1^2.$$

Let's take the square root of both sides of equation:

$$v_1 + 2 = \sqrt{2}v_1.$$

Solving this equation for v_1 we obtain the original speed of the vehicle:

$$v_1 = \frac{2}{\sqrt{2}-1}\cdot\frac{\sqrt{2}+1}{\sqrt{2}+1} = \frac{2\left(\sqrt{2}+1\right)}{2-1} = 2\left(\sqrt{2}+1\right)\frac{m}{s}.$$

Answer:

3) $2\left(\sqrt{2}+1\right)\frac{m}{s}$.