

### Answer on Question#51936 - Physics - Other

A cart is moving horizontally along a straight line with constant speed of 30 m/s. A projectile is fired from the moving cart in such a way that it will return to the cart after the cart has moved 80 m. At what speed (relative to the cart) and at what angle (to the horizontal) must the projectile be fired?

Solution:

In the reference frame of the cart a projectile should be fired vertically upwards, since it won't move horizontally (reference frame of the cart) and will return to the cart. So the projectile must be fired at the angle of  $90^\circ$ . Since it reached the height of  $h = 80\text{m}$ , it's initial speed should be

$$v = \sqrt{2gh}$$

If we put  $g = 10 \frac{\text{m}}{\text{s}^2}$ , we obtain

$$v = \sqrt{2gh} = \sqrt{2 \cdot 10 \frac{\text{m}}{\text{s}^2} \cdot 80\text{m}} = 40 \frac{\text{m}}{\text{s}}$$

Answer:  $v = \sqrt{2gh} = 40 \frac{\text{m}}{\text{s}}$ , angle =  $90^\circ$ .