Answer on Question #48669, Physics, Mechanics | Kinematics | Dynamics

A cart moving horizontal along a straight line with constant speed of 20m/s. A projectile is to be fired from the moving cart so that it returns to the same cart after the cart has moved 60m. The speed with which the projectile must be find with speed to cart is...

A) 5m/s. B)10m/s. C) 15m/s. D) 20m/s

Solution:

The time of cart moving is

$$t = \frac{d}{v} = \frac{60 \text{ m}}{20 \text{ m/s}} = 3 \text{ s}$$

Projectile motion is a form of motion in which an object or particle (called a projectile) is thrown near the earth's surface, and it moves along a curved path under the action of gravity only.

In projectile motion, the horizontal motion and the vertical motion are independent of each other; that is, neither motion affects the other.

To move horizontally with the cart, the projectile must be fired vertically with a flight time $t = 3$ s.

The initial velocity v_0 of projectile must satisfy equation

$$y = v_0 t - \frac{gt^2}{2}$$

with $y = 0$ and $t = 3$ s.

Thus,

$$v_0 = \frac{gt}{2} = 9.8 * \frac{3}{2} = 14.7 \text{ m/s}$$

Answer: $v_0 = 14.7$ m/s