Example 4 A bullet going with speed 350 m/s enters in a concrete wall and penetrates a distance of 5 cm before coming to rest. Find deceleration.

Solution. Here, u = 350 m/s, s = 5 cm, v = 0 m/s and a = ?

By using $v^2 = u^2 - 2as$

$0 = u^2 - 2as$

$u^2 = 2as$ or $a = \frac{u^2}{2s}$

$a = \frac{350 \times 350}{2 \times 0.05} = 12.25 \times 10^5$ m/sec^2

Example 5. A particle moving rectilinearly with constant acceleration is having initial velocity of 10 m/s. After some time, its velocity becomes 30 m/s. Find out velocity of the particle at the mid point of its path?

Solution. Let the total distance be 2x.

$\therefore$ distance upto midpoint = x

Let the velocity at the mid point be v

and acceleration be a.

From equations of motion

$v^2 = 10^2 + 2ax$ ..... (1)

$30^2 = v^2 + 2ax$ ..... (2)

(2) - (1) gives

$v^2 - 30^2 = 10^2 - v^2$ $\Rightarrow$ $v^2 = 500$

$\Rightarrow$ $v = 10\sqrt{5}$ m/s

Example 6 A body travels a distance of 2 m in 2 seconds and 2.2 m in next 4 seconds. What will be the velocity of the body at the end of 7th second from the start.

Solution. Here, case (i) s = 2m, t = 2s

case (ii) t = 2 + 4 = 6s

Let u and a be the initial velocity and uniform acceleration of the body.

we know that, $s = ut + \frac{1}{2}at^2$

Case (i) $2 = u \times 2 + \frac{1}{2}a \times 2^2$

or $1 = u + a$ .... (1)

Case (ii) $4.2 = u \times 6 + \frac{1}{2}a \times 6^2$

or $0.7 = u + 3a$ ... (2)

Subtracting (2) from (1), we get