Example1: A body begins to move from rest with a constant acceleration of 8 m/s² in a straight line. Find:

يبدأ جسم في الحركة من السكون بتسارع ثابت مقداره 8 م/ث² في خط مستقيم. أوجد:

a. The final velocity after five seconds
b. The average velocity during the five-second period
c. The displacement in five seconds

Solution:

a. $v = u + at$

$= 0 + 8 \times 5$

$v = 40\ m/s$

b. $v_{avg} = \frac{u+v}{2}$

$v_{avg} = \frac{0 + 40}{2}$

$v_{avg} = 20\ m/s$

c. $s = \frac{(u+v)}{2} \times t$

$= 20 \times 5$

$s = 100\ m$

or

$s = ut + \frac{1}{2}at^2$

$= 0 + \frac{1}{2} \times 8 \times 5^2$

$s = 100\ m$

Example2: The velocity of a truck increases regularly from 15 km/h to 60 km/h within 20 s. Calculate:

تزداد سرعة الشاحنة بانتظام من 15 كم/ساعة إلى 60 كم/ساعة خلال 20 ثانية. احسب:

a. Average velocity
b. Acceleration
c. Displacement. Use units of meters and seconds

Solution:

a. $u = \left(15\frac{km}{h}\right) \times \left(1000\frac{m}{km}\right) \times \left(\frac{1}{3600}\frac{h}{s}\right) = 4.17\ m/s$

$v = \left(60\frac{km}{h}\right) \times \left(1000\frac{m}{km}\right) \times \left(\frac{1}{3600}\frac{h}{s}\right) = 16.7\ m/s$

$v_{avg} = \frac{u+v}{2} = \frac{4.17+16.7}{2} = 10.4\ m/s$

b. $v = u + at$

$16.7 = 4.17 + (a \times 20)$

$16.7 - 4.17 = 20a$

$12.53 = 20a$

$a = \frac{12.53}{20} = 0.63\ m/s^2$

c. $s = \frac{(u+v)}{2} \times t$

$= \frac{4.17+16.7}{2} \times 20$

$s = 208.7\ m$

or

$s = ut + \frac{1}{2}at^2$

$= (4.17 \times 20) + (\frac{1}{2} \times 0.63 \times 20^2)$

$= 83.4 + 126 = 209.4\ m$

H.W: A ball falls from rest at a height of 50 m above the ground.

a. What is its velocity before it hits the ground directly?
b. How long time it takes to reach the ground?