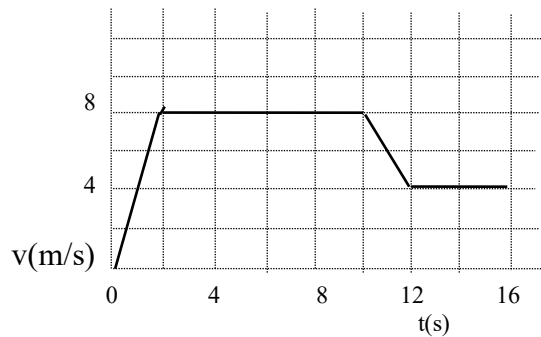


PHY1010 Tutorial Sheet 2 2020/21
Uniformly Accelerated Motion &
Projectiles.

01. The velocity-time graph of a runner is shown in the figure.

(i) How far does the runner go in 16 s? (ii) What is the acceleration of the runner at $t = 2$ s? And at $t = 11$ s? [100 m][4 m/s^2 , -2 m/s^2]



02*. A truck travelling at 22.5 m/s decelerates at 2.27 m/s^2 .

(a) How much time does it take for the truck to stop? [9.91 s]

(b) How far does it travel while stopping? [112 m]

(c) How far does it travel during the third second after the brakes are applied? [16.8 m]

03**A ball is dropped off a high cliff, and 2 s later another ball is thrown vertically downward with an initial speed of 30 ms^{-1} . How long will it take the second ball to overtake the first? [$t = 3.88 \text{ s}$]

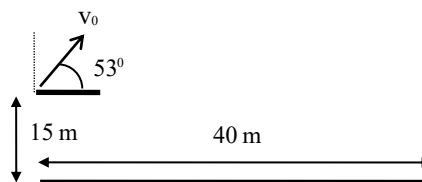
04*. You fire a projectile 35° above horizontal with an initial velocity of 200 m/s.

It lands in a valley 300 m below the launch point. What is the time of flight of the projectile, and what is the range of projectile? [25.8 s , $4.23 \times 10^3 \text{ m}$].

05. A coin is projected at an angle of 53° above the horizontal from a point 15 m above the ground level. It reaches the ground at a horizontal distance of 40 m from the launch point.

Calculate (i) the time it was in air (ii) the velocity with which the coin was projected.

[3.728 s, 17.8 m/s]



06**. A train approaching a station does two successive half-kilometres in 16 and 20 seconds respectively. Assuming the retardation to be uniform, find the further distance the train runs before stopping. [667.4 m]

07**. Suppose you have a car with a maximum acceleration of $a = 6.0 \text{ m/s}^2$ and a maximum deceleration from braking of $a = -8.0 \text{ m/s}^2$. We want to find the minimum time it would take you to start from rest, cover 500 m, and come to a stop at the 500 m mark. You do this by accelerating as much as possible for a part of the 500 m, followed by a period of maximum deceleration to the final stop.

Find the minimum time. [17.1s]

8* **Runway design.** You are designing an airport for small planes. One kind of airplane that might use this airfield must reach a speed before takeoff of at least and can accelerate at (a) If the runway is 150 m long, can this airplane reach the required speed for takeoff? [in this case the $v = 24.5 \text{ m/s}$] (b) If not, what minimum length must the runway have? [193 m]