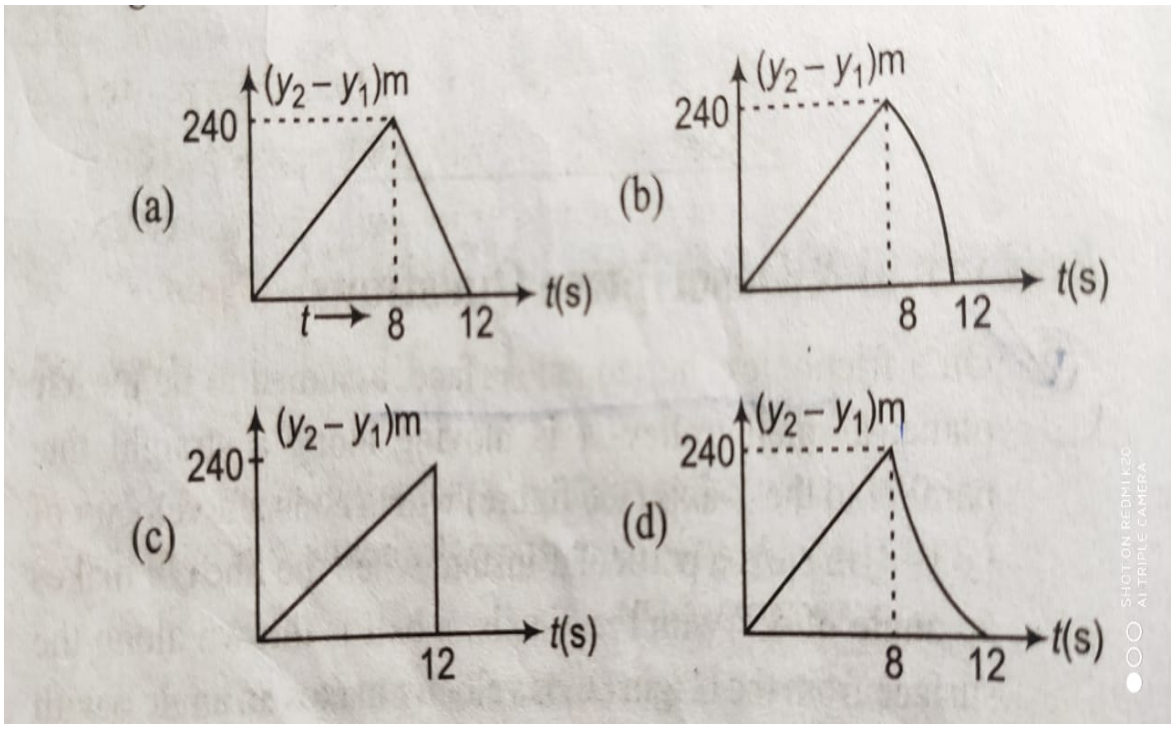
1. From a tower of height H, a particle is thrown vertically upwards with a spped u. The time taken by the particle to hit the ground, is n times that taken by it to reach the highest point of its path. The relation between H, u and n is

   (a) $2gH = n^2u^2$
   (b) $gH = (n-2)^2u^2$
   (c) $2gH = n^2u^2(n-2)$
   (d) $gH = (n-2)^2u^2$

2. Two stones are thrown up simultaneously from the edge of a cliff 240 m high with initial speed of 10 m/s and 40 m/s respectively. Which of the following graphs best represent the variation of the relative position of the second stone with respect to the first? (Assume stones do not rebound after hitting the ground and neglect air resistance, take $g = 10m/s^2$.



3. A particle of mass m moves on the x axis as follows - it starts from rest at $t = 0$ from the point $x = 0$ and comes to rest at $t = 1$ at the point $x = 1$. No other information is available about its motion at intermediate times $(0 < t < 1)$. If α denotes the instantaneous acceleration of the particle, then

   (a) α cannot remain positive for all t in the interval $0 \leq t \leq 1$
   (b) $|\alpha|$ cannot exceed 2 at any point in its path
   (c) $|\alpha|$ must be ≥ 4 at some point or points in its path.
   (d) α must change sign during the motion, but no other assertion can be made with the information given.

4. A train is moving along a straight line with a constant acceleration a. A boy standing in the train throws a ball forward with a speed of $10m/s$, at an angle of 60 degrees to the horizontal. The boy has to move forward by $1.15m$ inside the train to catch the ball back at the initial height. The acceleration of the train in m/s^2 is

   (a) 5

   (b) 1

   (c) 6

   (d) 7

5. A large heavy box is sliding without friction down a smooth plane of inclination θ. From a point P on the bottom of the box, a particle is projected inside the box. The initial speed of the particle with respect to the box is u and the direction of projection makes an angle α with the bottom. If the horizontal displacement as seen by an observer on the ground is zero, find the speed of the box with respect to the ground at the instant when the particle was projected.

   (a) $\frac{ucos(\alpha+\theta)}{cos\theta}$

   (b) $\frac{usin(\alpha+\theta)}{cos\theta}$

   (c) $\frac{ucos^2(\alpha+\theta)}{cos^2\theta}$

   (d) $\frac{usin^2(\alpha+\theta)}{cos^2\theta}$