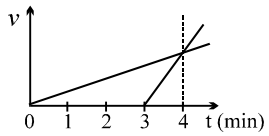
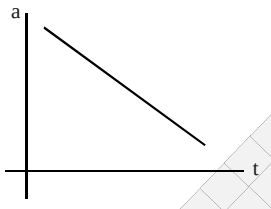
PRACTICE SHEET-10 {KINEMATICS}

Q.1 The drawing shows velocity (v) versus time (t) graphs for two cyclists moving along the same straight segment of a highway from the same point. The second cyclist starts moving at t = 3 min. At what time do the two cyclists meet?



(A) 4 min (B) 6 min
(C) 8 min (D)12 min

Q.2 The acceleration time graph of a body moving in a straight line is shown here.



Statement-1 : Velocity of the body is continuously decreasing over the time interval shown.
Statement-2 : Acceleration of the body is continuously decreasing over the time interval shown.
(A) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.
(B) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1.
(C) Statement-1 is true, statement-2 is false.
(D) Statement-1 is false, statement-2 is true.

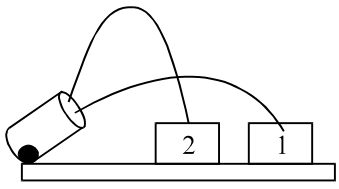
Q.3 A ball is projected from a point at two different angles with same speed u and land at same point in both the cases

(A) the difference between two angles of projection is 90°
(B) the maximum height attained by the ball in both the cases is equal
(C) the sum of maximum heights for the two cases is $u^2/(2g)$
(D) the maximum height attained by the ball in one case must be twice of the maximum height attained by the ball in second case

Q.4 A projectile is fired with a velocity u making an angle θ with the horizontal. What is the magnitude of change in velocity when it is at the highest point ?

(A) u cos θ (B) u (C) u sin θ (D) u cos θ – u

Q.5 Two similar cannon simultaneously fires two identical cannon balls at target 1 and 2 as shown in the figure. If the cannon balls have identical initial speeds, which of the following statements is true?



(A) Target 2 is hit before target 1
(B) Target 1 is hit before target 2
(C) Both are hit at the same time
(D) information is insufficient

Q.6 Two particles were projected one by one with the same initial velocity from the same point on level ground. They follow the same parabolic trajectory and are found to be in the same horizontal level, separated by a distance of 1m, 2 seconds after the second particle was projected. Assume that the horizontal component of their velocities is 0.5 m/s. Which of the following statements will be true about their motion ?

(A) The horizontal range of the parabolic path is 3 m.
(B) The maximum height for the parabolic path is 45 m.
(C) The total time of flight in the parabolic path for each particle = 4s
(D) The horizontal range of the parabolic path is 6 m.

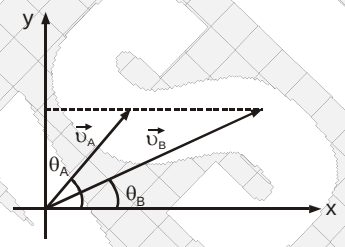
Q.7 A velocity time graph of a particle moving rectilinearly can give which of the following quantities with time

(A) Change in speed
(B) Change in velocity
(C) Distance covered
(D) Change in position

Q.8 Match list I with List II and select the correct answer using the codes given below the lists.

Comprehension (Q.1 to Q.3)

Two particles A & B are projected from the same point in different directions in such a manner that their vertical components of initial velocities are same.



Q.1 Which one of them will have more time of flight ? **[3]**
(A) A
(B) B
(C) Both will have same time of flight
(D) cannot be determined

Q.2 Which one of them will have more range ? **[3]**
(A) A
(B) B
(C) same
(D) cannot be determined

Q.3 Which of the following statements are correct about the motion? **[3]**
(A) Both the bodies have the same maximum height
(B) Both the bodies cross each other at some point of the motion
(C) Both the bodies will have the same velocity at the maximum height
(D) Both the bodies will land at the same place

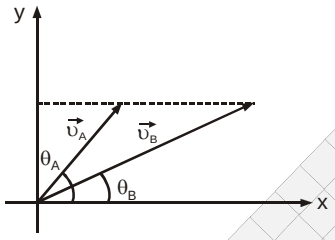
Q.4 An object is moving in the xy plane with the position as a function of time given by $\vec{r} = x(t)\hat{i} + y(t)\hat{j}$. Point O is at $\vec{r} = 0$. The distance of object from O is **definitely** decreasing when **[3]**
(A) $v_x > 0, v_y > 0$
(B) $v_x < 0, v_y < 0$
(C) $xv_x + yv_y < 0$
(D) $xv_x + yv_y > 0$

Q.5 A tennis ball is hit from a height h = 1 m above the level ground at an angle A = 45° towards a wall

PRACTICE SHEET-11 {KINEMATICS}

Comprehension (Q.1 to Q.3)

Two particles A & B are projected from the same point in different directions in such a manner that their vertical components of initial velocities are same.



Q.1 Which one of them will have more time of flight ?

(A) A
(B) B
(C) Both will have same time of flight
(D) cannot be determined

Q.2 Which one of them will have more range ?

(A) A (B) B
(C) same (D) cannot be determined

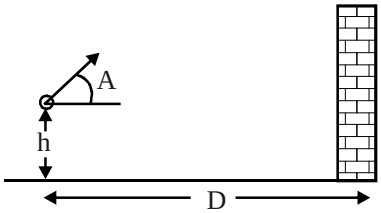
Q.3 Which of the following statements are correct about the motion?

(A) Both the bodies have the same maximum height
(B) Both the bodies cross each other at some point of the motion
(C) Both the bodies will have the same velocity at the maximum height
(D) Both the bodies will land at the same place

Q.4 An object is moving in the xy plane with the position as a function of time given by $\vec{r} = x(t)\hat{i} + y(t)\hat{j}$. Point O is at $\vec{r} = 0$. The distance of object from O is **definitely** decreasing when

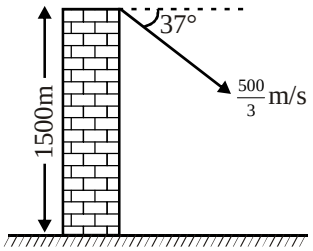
(A) $v_x > 0, v_y > 0$ (B) $v_x < 0, v_y < 0$
(C) $xv_x + yv_y < 0$ (D) $xv_x + yv_y > 0$

Q.5 A tennis ball is hit from a height h = 1 m above the level ground at an angle A = 45° towards a wall that is at a horizontal distance D = 15 m. The ball hits the wall after 1.50 seconds.



At what height above the ground does the ball hit the wall (in m)?

Q.6 A particle is projected from a tower as shown in figure, then the distance from the foot of the tower where it will strike the ground will be : (Round the answer to 2 decimal places, if required)



Q.7 A stone is thrown from the top of a vertical column at a certain angle above the horizontal. It strikes the ground twice as far as it would have struck it if it had been thrown from the bottom of the column with the same initial velocity. In this latter case the stone would fly during a time T = 2 sec. Find the height of the column (in m). (Use : $g = 10\ m/s^2$)

Q.8 At time t = 0, three bees are located at the origin of a coordinate system. From that time onward, the first bee travels at a constant velocity $[v_a, 0, 0]$. The second bee has an initial velocity $[0, v_b, 0]$, and accelerates with a uniform acceleration [0, 0, a]. The third bee flies at a constant velocity, and collides with the second bee at time $t = t_f$.

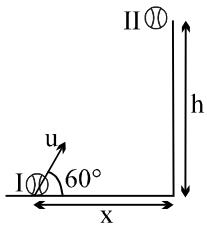
(a) Find the displacement vector $\vec{r}_1(t)$ which describes the position of the first bee as a function of time, valid for times t > 0.

(b) Find the displacement vector $\vec{r}_2(t)$ which describes the position of the second bee as a function of time, valid for t > 0.

(c) Find the velocity vector $\vec{v}_2(t)$ of the second bee as a function of time (for t > 0).

(d) With what speed v_3 does the third bee travel?
Be sure to express all your answers in terms of the given variables, v_a, v_b, a, and t_f .

Q.9 Ball I is thrown towards a tower at an angle of 60° with the horizontal with unknown speed (u). At the same moment ball II is released from the top of tower as shown. Balls collide after two seconds and at the moment of collision, velocity of ball I is horizontal. Find



(a) speed u.

(b) distance of point of projection of ball I from base of tower (x).

(c) height of tower