Yakeen NEET 2.0 2026

Practice Sheet

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Motion in a Plane

Q1 If $\mathrm{x} = 5\mathrm{t} + 3\mathrm{t}^2$ and $\mathrm{y} = 4\mathrm{t}$ are the x and y co-ordinates of a particle at any time t second where x and y are in metre, then the acceleration of the particle
(1) is zero throughout its motion.
(2) is a constant throughout its motion.
(3) depends only on its y component.
(4) varies along both x and y direction.

Q2 The coordinates of a moving particle at any time t are given by $x = \alpha t^3$ and $y = \beta t^3$. The speed of the particle at time 't' is given by
(1) $\sqrt{\alpha^2 + \beta^2}$
(2) $3t\sqrt{\alpha^2 + \beta^2}$
(3) $3t^2\sqrt{\alpha^2 + \beta^2}$
(4) $t^2\sqrt{\alpha^2 + \beta^2}$

Q3 At the top of the trajectory of a projectile, the directions of its velocity and acceleration are:
(1) parallel to each other.
(2) anti-parallel to each other.
(3) inclined to each other at an angle of 45°.
(4) perpendicular to each other.

Q4 The velocity vector of the motion described by the position vector of a particle $\overrightarrow{r} = 2t\hat{\mathbf{i}} + t^2\hat{\mathbf{j}}$ is given by
(1) $\overrightarrow{v} = 2\hat{\mathbf{i}} + 2t\hat{\mathbf{j}}$
(2) $\overrightarrow{v} = 2t\hat{\mathbf{i}} + 2t\hat{\mathbf{j}}$
(3) $\overrightarrow{v} = t\hat{\mathbf{i}} + t^2\hat{\mathbf{j}}$
(4) $\overrightarrow{v} = 2\hat{\mathbf{i}} + t^2\hat{\mathbf{j}}$

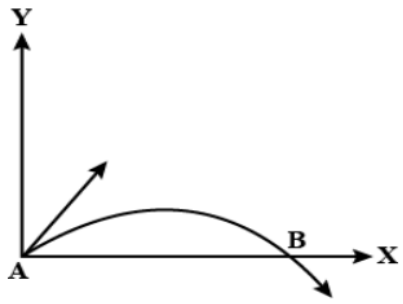
Q5 A particle velocity changes from $\left(2\hat{\mathbf{i}} - 3\hat{\mathbf{j}}\right)\ \mathrm{ms}^{-1}$ to $\left(3\hat{\mathbf{i}} - 2\hat{\mathbf{j}}\right)\ \mathrm{ms}^{-1}$ in 2 s. If its mass is 1 kg, the acceleration (in ms^{-2}) is
(1) $-\left(\hat{\mathbf{i}} + \hat{\mathbf{j}}\right)$
(2) $\left(\hat{\mathbf{i}} + \hat{\mathbf{j}}\right)/2$
(3) zero
(4) $\left(\hat{\mathbf{i}} - \hat{\mathbf{j}}\right)/2$

Q6 A particle is projected at an angle of 45° with a velocity of 9.8 ms^{-1}. The horizontal range will be (Take, g = 9.8 ms^{-2})
(1) 9.8 m
(2) 4.9 m
(3) $\frac{9.8}{\sqrt{2}}$ m
(4) $9.8\sqrt{2}$ m

Q7 A football player throws a ball with a velocity of $50\ \mathrm{m/s}$ at an angle 30° from the horizontal. The ball remains in the air for (Take, g = 10 ms^{-2})
(1) 2.5 s
(2) 1.25 s
(3) 5 s
(4) 0.625 s

Q8 An object is thrown along a direction inclined at an angle of 45° with the horizontal direction. The horizontal range of the particle is equal to
(1) vertical height
(2) twice the vertical height
(3) thrice the vertical height
(4) four times the vertical height

Q9 The velocity of a projectile at the initial point A is $\left(2\hat{\mathbf{i}} + 3\hat{\mathbf{j}}\right)\mathrm{ms}^{-1}$. Its velocity (in ms^{-1}) at point B is



(1) $-2\hat{\mathbf{i}}-3\hat{\mathbf{j}}$
(2) $-2\hat{\mathbf{i}}+3\hat{\mathbf{j}}$
(3) $2\hat{\mathbf{i}}-3\hat{\mathbf{j}}$
(4) $2\hat{\mathbf{i}}+3\hat{\mathbf{j}}$

Q10 The equations of motion of a projectile are given by $\mathrm{x}=\ 36\mathrm{t}\ \mathrm{m}$ and $2\mathrm{y}=96\mathrm{t}\ -9.8\mathrm{t}^2\ \mathrm{m}$. The angle of projection is
(1) $\sin^{-1}\left(\frac{4}{5}\right)$ (2) $\sin^{-1}\left(\frac{3}{5}\right)$
(3) $\sin^{-1}\left(\frac{4}{3}\right)$ (4) $\sin^{-1}\left(\frac{3}{4}\right)$

Q11 If the initial velocity of a projection is doubled, keeping the angle of projection same, the maximum height reached by it will
(1) remain the same
(2) be doubled
(3) become four times
(4) be halved

Q12 Four bodies A, B, C and D are projected with equal speeds having angles of projection 15°, 30°, 45° and 60° with the horizontal respectively. The body having the shortest range is
(1) A (2) B
(3) C (4) D

Q13 **Assertion:** Two particles of different mass, projected with same velocity at same angles. The maximum height attained by both the particles will be same.
Reason: The maximum height of projectile is independent of particle mass.
(1) Assertion is True, Reason is True; Reason is correct explanation for Assertion
(2) Assertion is True, Reason is True; Reason is not correct explanation for Assertion
(3) Assertion is True, Reason is False
(4) Assertion is False, Reason is True

Q14 A ball is projected from the ground with velocity v such that its range is maximum.

	Column-I		Column-II
(A)	Vertical component of velocity at half of the maximum height	(I)	$\frac{v}{2}$
(B)	Velocity at the maximum height	(II)	$\frac{v}{\sqrt{2}}$
(C)	Change in its velocity when it returns to the ground	(III)	$v\sqrt{2}$
(D)	Average velocity when it reaches the maximum height	(IV)	$\frac{v}{2}\sqrt{\frac{5}{2}}$

(1) A - I, B - II, C - III, D - IV
(2) A - II, B - I, C - III, D - IV
(3) A - IV, B - II, C - III, D - I
(4) A - I, B - III, C - II, D - IV

Q15 Which of the following is true regarding projectile motion?
(1) Horizontal velocity of projectile is constant.
(2) Vertical velocity of projectile is constant.
(3) Acceleration is not constant.
(4) Momentum is constant.

Q16 The position of a projectile launched from the origin at t = 0 is given by $\overrightarrow{r}=\left(40\hat{i}+50\hat{j}\right)$ m at t = 2 s. If the projectile was launched at an angle θ with the horizontal, then θ is (take g = 10 ms^{-2})
(1) $\tan^{-1}\frac{2}{3}$ (2) $\tan^{-1}\frac{3}{2}$
(3) $\tan^{-1}\frac{7}{4}$ (4) $\tan^{-1}\frac{4}{3}$

Q17 An aeroplane flying horizontally with a speed of 360 km h^{-1} releases a bomb at a height of $490\ \mathrm{m}$ from the ground. If $\mathrm{g}=9.8\ \mathrm{ms}^{-2}$, it will strike the ground at a horizontal distance of
(1) 10 km (2) 100 km
(3) 1 km (4) 16 km

Q18 A pebble is thrown horizontally from the top of a 20 m high tower with an initial velocity of 10 m/s. The air drag is negligible. The speed of the pebble when it is at the same distance from top as well as base of the tower (g = 10 m/s^2)

(1) $10\sqrt{2}$ m/s (2) $10\sqrt{3}$ m/s
(3) 20 m/s (4) 25 m/s

Q19 The equation of trajectory of a projectile is $y = \sqrt{3}x - \frac{9}{2}x^2$, the angle of its projection with the horizontal is

(1) 90° (2) zero
(3) 60° (4) 30°

Q20 A particle is projected with a velocity v such that its range on the horizontal plane is twice the greatest height attained by it. The range of the projectile is (where g is acceleration due to gravity)

(1) $\frac{4v^2}{5g}$ (2) $\frac{4g}{5v^2}$
(3) $\frac{v^2}{g}$ (4) $\frac{4v^2}{\sqrt{5}g}$

Q21 Rain is falling vertically with a speed of 30 ms^{-1}. A woman rides a bicycle with a speed of $12\ \text{ms}^{-1}$ in east to west direction. In which direction she should hold her umbrella to not get wet?

(1) At an angle of $\tan^{-1}\left(\frac{2}{5}\right)$ with the vertical towards the east
(2) At an angle of $\tan^{-1}\left(\frac{2}{5}\right)$ with the vertical towards the west
(3) At an angle of $\tan^{-1}\left(\frac{5}{2}\right)$ with the vertical towards the east.
(4) At an angle of $\tan^{-1}\left(\frac{5}{2}\right)$ with the vertical towards the west.

Q22 The speed of a projectile at its maximum height is $\frac{\sqrt{3}}{2}$ times of its initial speed 'u' of projection. Its range on the horizontal plane is:

(1) $\frac{\sqrt{3}u^2}{2g}$ (2) $\frac{u^2}{2g}$
(3) $\frac{3u^2}{2g}$ (4) $\frac{3u^2}{g}$

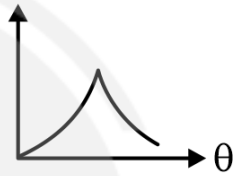
Q23 A body is projected at an angle θ with the vertical with kinetic energy KE. What is the kinetic energy of the particle at the highest point?

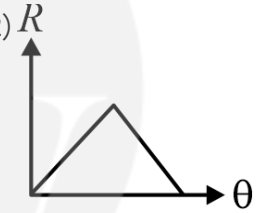
(1) $KE\cos^2\theta$ (2) $KE\sin^2\theta$
(3) $\frac{KE}{2}$ (4) $KE\tan^2\theta$

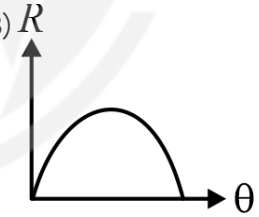
Q24 A projectile is thrown at an angle θ with the horizontal and its range is R_1. It is then thrown at an angle θ with vertical and the range is R_2, then

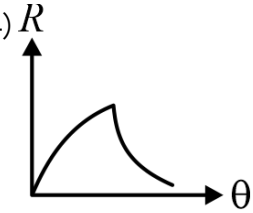
(1) $R_1 = 4\ R_2$
(2) $R_1 = 2\ R_2$
(3) $R_1 = R_2$
(4) $R_1 = 3R_2$

Q25 A particle is projected at an angle θ with horizontal with speed u. The variation of its horizontal range with θ is best represented by

(1) 

(2) 

(3) 

(4) 

Q26 A body is projected horizontally with a velocity of 4 ms^{-1} from the top of a high tower. The velocity of the body after 0.7 s is nearly (Take, g = 10 ms^{-2})

(1) 10 ms^{-1}
(2) 8 ms^{-1}
(3) 19.2 ms^{-1}

(4) 11 ms^{-1}

Q27 A ship X moving due north with speed v observes that another ship Y is moving due west with same speed v. The actual velocity of Y is
(1) $\sqrt{2}v$ towards south-west
(2) $\sqrt{2}v$ towards north-west
(3) $\sqrt{2}v$ towards south-east
(4) v towards north-east

Q28 **Assertion:** Horizontal range is same for angle of projection θ and $(90^\circ - \theta)$.
Reason: Horizontal range is independent of angle of projection.
(1) Assertion is True, Reason is True; Reason is correct explanation for Assertion
(2) Assertion is True, Reason is True; Reason is not correct explanation for Assertion
(3) Assertion is True, Reason is False
(4) Assertion is False, Reason is True

Q29 The speed of boat is 5 kmh^{-1} in still water. It crosses a river of width 1 km along the shortest possible path in 15 min. Then, velocity of river will be
(1) 4.5 kmh^{-1} (2) 3 kmh^{-1}
(3) 1.5 kmh^{-1} (4) 1 kmh^{-1}

Q30 A flag on a bus is fluttering in north direction & wind is blowing in east direction. Then which of the following will be true -
(1) bus is moving in south direction.
(2) bus is moving in north east direction.
(3) bus may be moving in any direction between south & east
(4) bus may be moving in any direction between south & west

Q31 Trajectory of a particle in a projectile motion is given as $y = x - \frac{x^2}{80}$. Here, x and y are in metre. For this projectile motion match the following with $g = 10\ m/s^2$.

Column-I		Column-II	
(A)	Angle of projection	(P)	20 m
(B)	Angle of velocity with horizontal after 4s	(Q)	80 m
(C)	Maximum height	(R)	45°
(D)	Horizontal range	(S)	$\tan^{-1}\left(\frac{1}{2}\right)$

(1) $A \to R,\ B \to R,\ C \to P,\ D \to Q$
(2) $A \to R,\ B \to P,\ C \to Q,\ D \to S$
(3) $A \to S,\ B \to Q,\ C \to P,\ D \to R$
(4) $A \to Q,\ B \to R,\ C \to S,\ D \to P$

Q32 A body executing uniform circular motion has its position vector and acceleration vector :
(1) Along the same direction
(2) In opposite direction
(3) Normal to each other
(4) Not related to each other

Q33 A stationary man observes that the rain is falling vertically downward. When he starts running with a velocity of 12 km h^{-1}, he observes that the rain is falling at an angle 60° with the vertical. The actual velocity of rain is
(1) $12\sqrt{3}\ km\ h^{-1}$
(2) $6\sqrt{3}\ km\ h^{-1}$
(3) $4\sqrt{3}\ km\ h^{-1}$
(4) $2\sqrt{3}\ km\ h^{-1}$

Q34 I. Particle-1 is dropped from a tower and particle-2 is projected horizontal from the same tower, then both the particles reach the ground simultaneously.
II. Both the particles strike the ground with different speeds.
Which of the following statement(s) is/are correct?
(1) Only I
(2) Only II
(3) Both I and II
(4) Neither I nor II

Q35 A boat is sailing with a velocity $\left(3\hat{i} + 4\hat{j}\right)$ with respect to ground and water in river is flowing

with a velocity $\left(-3\hat{i}-4\hat{j}\right)$. Relative velocity of the boat with respect to water is:

(1) $8\hat{j}$

(2) $6\hat{i}$

(3) $6\hat{i}+8\hat{j}$

(4) $-6\hat{i}-8\hat{j}$

Q36 A particle is moving along a circular path of radius 5 m with a uniform speed 5 ms^{-1}. What is the magnitude of average acceleration during the interval in which particle completes half revolution?

(1) $\frac{10}{\pi}ms^{-2}$

(2) $\frac{20}{\pi}ms^{-2}$

(3) 10 ms^{-2}

(4) $\frac{40}{\pi}ms^{-2}$

Q37 Two particles of masses m_1 and m_2 are moving in concentric circles of radii r_1 and r_2 such that their periods are same. Then the ratio of their centripetal acceleration is

(1) $\frac{r_1^2}{r_2^2}$ (2) $\frac{r_2^2}{r_1^2}$

(3) $\frac{r_1}{r_2}$ (4) $\frac{r_2}{r_1}$

Q38 **Assertion:** Centripetal acceleration is always directed towards the centre of rotation of an object undergoing uniform circular motion.
Reason: For uniform circular motion centripetal acceleration is a constant vector.

(1) Assertion is True, Reason is True; Reason is correct explanation for Assertion

(2) Assertion is True, Reason is True; Reason is not correct explanation for Assertion

(3) Assertion is True, Reason is False

(4) Assertion is False, Reason is True

Q39 A ball is thrown from a point with a speed 'v_0' at an elevation angle θ. From the same point and at the same instant, a person starts running with a constant speed $\frac{'v_0'}{2}$ to catch the ball. Will the person be able to catch the ball? If yes, what should be the angle of projection θ?

(1) No (2) Yes, 30°

(3) Yes, 60° (4) Yes, 45°

Q40 **Assertion:** At highest point of a projectile, dot product of velocity and acceleration is zero.
Reason: At highest point, velocity and acceleration are mutually perpendicular.

(1) Assertion is True, Reason is True; Reason is correct explanation for Assertion

(2) Assertion is True, Reason is True; Reason is not correct explanation for Assertion

(3) Assertion is True, Reason is False

(4) Assertion is False, Reason is True

Q41 A ball is thrown up at an angle with the horizontal. Then the total change of momentum by the instant it returns to ground is

(1) acceleration due to gravity $\times$ total time of flight

(2) weight of the ball $\times$ half the time of flight

(3) weight of the ball $\times$ total time of flight

(4) weight of the ball $\times$ horizontal range

Q42 Two projectiles A and B are projected with same speed at an angle 30° and 60° to the horizontal, then which of the following is not valid (where T is total time of flight, H is maximum height and R is horizontal range)?

(1) $H_A = 3H_B$ (2) $T_B = \sqrt{3}T_A$

(3) $R_A = R_B$ (4) $H_B = 3H_A$

Q43 In uniform circular motion speed of particle is $2\ \mathrm{m/s}$ and radius of circle is $2\ \mathrm{m}$, then the value of centripetal and tangential acceleration are respectively

(1) $2\ \mathrm{m/s^2}, 2\ \mathrm{m/s^2}$

(2) $2\ \mathrm{m/s^2}, 1\ \mathrm{m/s^2}$

(3) $0, 2\ \mathrm{m/s^2}$

(4) $2\ \mathrm{m/s^2}, 0$

Q44 From a certain height, two bodies are projected horizontally with velocities $10\ \mathrm{m/s}$ and $20\ \mathrm{m/s}$. They hit the ground in t_1 and t_2 seconds. Then

(1) $t_1 = t_2$

(2) $t_1 = 2t_2$

(3) $t_2 = 2t_1$

(4) $t_1 = \sqrt{2}t_2$

Q45 A particle is moving on a circular track of radius 30 cm with a constant speed of 6 ms^{-1}. Its acceleration is

(1) zero
(2) 120 ms^{-2}
(3) 1.2 ms^{-2}
(4) 36 ms^{-2}

Answer Key

Q1	(2)
Q2	(3)
Q3	(4)
Q4	(1)
Q5	(2)
Q6	(1)
Q7	(3)
Q8	(4)
Q9	(3)
Q10	(1)
Q11	(3)
Q12	(1)
Q13	(1)
Q14	(1)
Q15	(1)
Q16	(3)
Q17	(3)
Q18	(2)
Q19	(3)
Q20	(1)
Q21	(2)
Q22	(1)
Q23	(2)
Q24	(3)
Q25	(3)
Q26	(2)
Q27	(2)
Q28	(3)
Q29	(2)
Q30	(3)
Q31	(1)
Q32	(2)
Q33	(3)
Q34	(3)
Q35	(3)
Q36	(1)
Q37	(3)
Q38	(3)
Q39	(3)
Q40	(1)
Q41	(3)
Q42	(1)
Q43	(4)
Q44	(1)
Q45	(2)