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JEE MAIN MOTION IN A PLANE — PYQS

Max. Marks: 88 **Questions:** 22

Section A (MCQ) — 18 questions

Q.1 Two identical bodies, projected with the same speed at two different angles cover the same horizontal range R. If the time of flight of these bodies are 5 s and 10 s, respectively, then the value of R is _____ m. (Take g = 10 m/s^2)

[JEE Main 2026 (Online) 8th April Evening Shift]

(1) 250 (2) 25 (3) 500 (4) 125

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Q.2 The two projectiles are projected with the same initial velocities at the 15° and 30° with respect to the horizontal. The ratio of their ranges is 1:x. The value of x is

[JEE Main 2026 (Online) 4th April Morning Shift]

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

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Q.3 If x and y coordinates of a projectile as a function of time (t) are given as 24t and 43.6t–4.9t^2, respectively, then the angle (in degrees) made by the projectile with horizontal when t = 2 s is _____.

[JEE Main 2026 (Online) 4th April Evening Shift]

(1) 60 (2) 45 (3) 30 (4) 75

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Q.4 The velocity of a particle is given as $\vec{v} = -x\hat{i} + 2y\hat{j} - z\hat{k}$ m/s. The magnitude of acceleration at point (1, 2, 4) is _____ m/s^2.

[JEE Main 2026 (Online) 2nd April Morning Shift]

(1) $\sqrt{6}$ (2) 9 (3) $\sqrt{33}$ (4) 0

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Q.5 A boy throws a ball into air at 45° from the horizontal to land it on a roof of a building of height H. If the ball attains maximum height in 2 s and lands on the building in 3 s after launch, then value of H is _____ m.
(g = 10 m/s^2)

[JEE Main 2026 (Online) 24th January Morning Shift]

(1) 20 (2) 25 (3) 10 (4) 15

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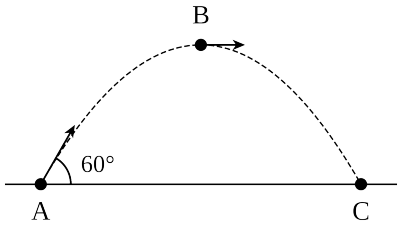
Q.6 An object is projected with kinetic energy K from a point A at an angle 60° with the horizontal. The ratio of the difference in kinetic energies at points B and C to that at point A (see figure), in the absence of air friction is :

[JEE Main 2026 (Online) 23rd January Morning Shift]



(1) 3:4 (2) 1:4 (3) 2:3 (4) 1:2

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Q.7 A projectile is thrown upward at an angle 60° with the horizontal. The speed of the projectile is 20 m/s when its direction of motion is 45° with the horizontal. The initial speed of the projectile is _____ m/s.

[JEE Main 2026 (Online) 22nd January Morning Shift]

(1) $20\sqrt{3}$ (2) $20\sqrt{2}$
(3) 40 (4) $40\sqrt{2}$

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Q.8 A river of width 200 m is flowing from west to east with a speed of 18 km/h. A boat, moving with speed of 36 km/h in still water, is made to travel one-round trip (bank to bank of the river). Minimum time taken by the boat for this journey and also the displacement along the river bank are _____ and _____ respectively.

[JEE Main 2026 (Online) 21st January Evening Shift]

(1) 20 s and 100 m (2) 40 s and 100 m
(3) 40 s and 200 m (4) 40 s and 0 m

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Q.9 Two balls with same mass and initial velocity, are projected at different angles in such a way that maximum height reached by first ball is 8 times higher than that of the second ball. T_1 and T_2 are the total flying times of first and second ball, respectively, then the ratio of T_1 and T_2 is

[JEE Main 2025 (Online) 8th April Evening Shift]

(1) 2:1 (2) $\sqrt{2}:1$

(3) $2\sqrt{2}:1$ (4) 4:1

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Q.10 Two projectiles are fired from ground with same initial speeds from same point at angles (45° + α) and (45° − α) with horizontal direction. The ratio of their times of flights is

[JEE Main 2025 (Online) 7th April Morning Shift]

(1) $\frac{1+\tan\alpha}{1-\tan\alpha}$ (2) $\frac{1+\sin 2\alpha}{1-\sin 2\alpha}$

(3) $\frac{1-\tan\alpha}{1+\tan\alpha}$ (4) 1

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Q.11 A helicopter flying horizontally with a speed of 360 km/h at an altitude of 2 km, drops an object at an instant. The object hits the ground at a point O, 20 s after it is dropped. Displacement of 'O' from the position of helicopter where the object was released is :

(use acceleration due to gravity g = 10 m/s^2 and neglect air resistance)

[JEE Main 2025 (Online) 7th April Evening Shift]

(1) 7.2 km (2) $2\sqrt{5}$ km

(3) $2\sqrt{2}$ km (4) 4 km

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Q.12 If $\vec{L}$ and $\vec{P}$ represent the angular momentum and linear momentum respectively of a particle of mass 'm' having position vector as $\vec{r}=a(\hat{i}\cos\omega t+\hat{j}\sin\omega t)$. The direction of force is

[JEE Main 2025 (Online) 4th April Morning Shift]

(1) Opposite to the direction of $\vec{L}$

(2) Opposite to the direction of $\vec{L}\times\vec{P}$

(3) Opposite to the direction of $\vec{r}$

(4) Opposite to the direction of $\vec{P}$

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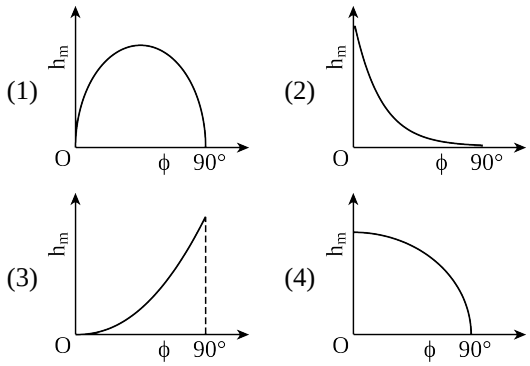
Q.13 The angle of projection of a particle is measured from the vertical axis as φ and the maximum height reached by the particle is h_m. Here h_m as function of φ can be presented as

[JEE Main 2025 (Online) 3rd April Morning Shift]



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Q.14 A particle is projected with velocity u so that its horizontal range is three times the maximum height attained by it. The horizontal range of the projectile is given as $\frac{nu^2}{25g}$, where value of n is: (Given, 'g' is the acceleration due to gravity.)

[JEE Main 2025 (Online) 3rd April Evening Shift]

(1) 6 (2) 12 (3) 18 (4) 24

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Q.15 A river is flowing from west to east direction with speed of 9 km h^{-1}. If a boat capable of moving at a maximum speed of 27 km h^{-1} in still water, crosses the river in half a minute, while moving with maximum speed at an angle of 150° to direction of river flow, then the width of the river is :

[JEE Main 2025 (Online) 2nd April Morning Shift]

(1) 112.5 m (2) 75 m

(3) 300 m (4) $112.5\times\sqrt{3}$ m

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Q.16 Two projectiles are fired with same initial speed from same point on ground at angles of (45° − α) and (45° + α), respectively, with the horizontal direction. The ratio of their maximum heights attained is :

[JEE Main 2025 (Online) 29th January Morning Shift]

(1) $\frac{1+\sin\alpha}{1-\sin\alpha}$ (2) $\frac{1+\sin 2\alpha}{1-\sin 2\alpha}$

(3) $\frac{1-\tan\alpha}{1+\tan\alpha}$ (4) $\frac{1-\sin 2\alpha}{1+\sin 2\alpha}$

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Q.17 The position vector of a moving body at any instant of time is given as $\vec{r} = (5t^2\hat{i} - 5t\hat{j})$ m. The magnitude and direction of velocity at t = 2 s is,

[JEE Main 2025 (Online) 24th January Evening Shift]

(1) $5\sqrt{17}$ m/s, making an angle of $\tan^{-1}4$ with −ve Y axis

(2) $5\sqrt{15}$ m/s, making an angle of $\tan^{-1}4$ with +ve X axis

(3) $5\sqrt{17}$ m/s, making an angle of $\tan^{-1}4$ with +ve X axis

(4) $5\sqrt{15}$ m/s, making an angle of $\tan^{-1}4$ with −ve Y axis

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Q.18 A ball having kinetic energy KE, is projected at an angle of 60° from the horizontal. What will be the kinetic energy of ball at the highest point of its flight?

[JEE Main 2025 (Online) 23rd January Evening Shift]

(1) $\frac{(KE)}{2}$ (2) $\frac{(KE)}{8}$ (3) $\frac{(KE)}{4}$ (4) $\frac{(KE)}{16}$

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Section B (Numerical) — 4 questions

Q.19 A gun mounted on the ground fires bullets in all directions with same speed. The farthest distance the bullets could reach is 6.4 m. The speed of the bullets from the gun is _____ m/s.
(take g = 10 m/s^2)

[JEE Main 2026 (Online) 4th April Evening Shift]

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Q.20 The maximum speed of a boat in still water is 27 km/h. Now this boat is moving downstream in a river flowing at 9 km/h. A man in the boat throws a ball vertically upwards with speed of 10 m/s. Range of the ball as observed by an observer at rest on the bank is _____ cm. (Take g = 10 m/s^2)

[JEE Main 2025 (Online) 29th January Morning Shift]

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Q.21 Two particles are located at equal distance from origin. The position vectors of those are represented by $\vec{A} = 2\hat{i} + 3n\hat{j} + 2\hat{k}$ and $\vec{B} = 2\hat{i} - 2\hat{j} + 4p\hat{k}$, respectively. If both the vectors are at right angle to each other, the value of n^{-1} is _____ .

[JEE Main 2025 (Online) 23rd January Morning Shift]

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Q.22 A particle is projected at an angle of 30° from horizontal at a speed of 60 m/s. The height traversed by the particle in the first second is h_0 and height traversed in the last second, before it reaches the maximum height, is h_1. The ratio $h_0:h_1$ is _____.
[Take, g=10 m/s^2]

[JEE Main 2025 (Online) 22nd January Morning Shift]

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ANSWER KEY

Section A (MCQ) — 18 questions

Ques.	1	2	3	4	5	6	7	8	9	10	11
Ans.	**1**	**2**	**2**	**2**	**4**	**1**	**2**	**3**	**3**	**1**	**3**
Ques.	12	13	14	15	16	17	18				
Ans.	**3**	**4**	**4**	**1**	**4**	**1**	**3**				

Section B (Numerical) — 4 questions

Ques.	19	20	21	22			
Ans.	**8**	**2000**	**3**	**5**			