

Q1. JEE Main 2026 (22 January Shift 2)

Given below are two statements:

Statement I: A satellite is moving around earth in the orbit very close to the earth surface. The time period of revolution of satellite depends upon the density of earth.

Statement II: The time period of revolution of the satellite is $T = 2\pi\sqrt{\frac{R_e}{g}}$ (for satellite very close to the earth surface), where R_e radius of earth and g acceleration due to gravity.

In the light of the above statements, choose the correct answer from the options given below :

- (1) Both Statement I and Statement II are true
- (2) Statement I is false but Statement II is true
- (3) Statement I is true but Statement II is false
- (4) Both Statement I and Statement II are false

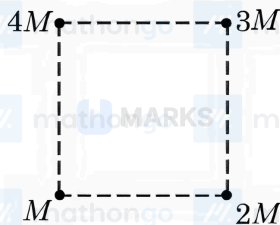
Q2. JEE Main 2026 (22 January Shift 1)

The escape velocity from a spherical planet A is 10 km/s. The escape velocity from another planet B whose density and radius are 10% of those of planet A , is _____ m/s.

- (1) 1000
- (2) $1000\sqrt{2}$
- (3) $200\sqrt{5}$
- (4) $100\sqrt{10}$

Q3. JEE Main 2026 (22 January Shift 1)

Net gravitational force at the center of a square is found to be F_1 when four particles having mass $M, 2M, 3M$ and $4M$ are placed at the four corners of the square as shown in figure and it is F_2 when the positions of $3M$ and $4M$ are interchanged. The ratio $\frac{F_1}{F_2}$ is $\frac{\alpha}{\sqrt{5}}$. The value of α is _____.



- (1) $2\sqrt{5}$
- (2) 3
- (3) 1
- (4) 2

Q4. JEE Main 2026 (21 January Shift 1)

Initially a satellite of 100 kg is in a circular orbit of radius $1.5R_E$. This satellite can be moved to a circular orbit of radius $3R_E$ by supplying $\alpha \times 10^6$ J of energy. The value of α is _____. (Take Radius of Earth $R_E = 6 \times 10^6$ m and $g = 10 \text{ m/s}^2$)

- (1) 150
- (2) 1000
- (3) 500
- (4) 100

Q5. JEE Main 2026 (24 January Shift 1)

Three masses 200 kg, 300 kg and 400 kg are placed at the vertices of an equilateral triangle with sides 20 m. They are rearranged on the vertices of a bigger triangle of side 25 m and with the same centre. The work done in this process ____ J. (Gravitational constant $G = 6.7 \times 10^{-11} \text{ N m}^2/\text{kg}^2$)

(1) 2.85×10^{-7}

(2) 4.77×10^{-7}

(3) 1.74×10^{-7}

(4) 9.86×10^{-6}

ANSWERS AND SOLUTIONS

1. (1) 2. (4) 3. (4) 4. (2) 5. (3)

1. (1) Statement I: For a satellite very close to Earth's surface, $T = 2\pi\sqrt{\frac{R_e}{g}}$ where $g = \frac{GM}{R_e^2} = \frac{4\pi G\rho R_e}{3}$.

Substituting: $T = 2\pi\sqrt{\frac{3}{4\pi G\rho}}$.

This shows period depends on Earth's density ρ . Statement I is TRUE.

Statement II: Given directly as $T = 2\pi\sqrt{\frac{R_e}{g}}$, which is the standard formula.

Statement II is TRUE.

Both statements are true.

2. (4) Escape velocity $v_e = R\sqrt{\frac{8\pi G\rho}{3}} \propto R\sqrt{\rho}$.

Planet B: $\rho_B = 0.1\rho_A$, $R_B = 0.1R_A$.

$$\frac{v_B}{v_A} = \frac{0.1R_A\sqrt{0.1\rho_A}}{R_A\sqrt{\rho_A}} = 0.1\sqrt{0.1} = \frac{1}{10\sqrt{10}}.$$

$$v_B = 10 \times \frac{1}{10\sqrt{10}} = \frac{1}{\sqrt{10}} \text{ km/s} = \frac{1000}{\sqrt{10}} = 100\sqrt{10} \text{ m/s}.$$

3. (4) Let $k = \frac{G}{r^2\sqrt{2}}$ where $r = a/\sqrt{2}$.

Net field at center has components along x and y .

Config 1 (original):

$$g_x = k(-M + 2M + 3M - 4M) = 0,$$

$$g_y = k(-M - 2M + 3M + 4M) = 4kM.$$

$$F_1 = 4kM.$$

Config 2 (3M and 4M swapped):

$$g_x = k(-M + 2M + 4M - 3M) = 2kM,$$

$$g_y = k(-M - 2M + 4M + 3M) = 4kM.$$

$$F_2 = kM\sqrt{4 + 16} = 2\sqrt{5}kM.$$

$$\frac{F_1}{F_2} = \frac{4}{2\sqrt{5}} = \frac{2}{\sqrt{5}} \Rightarrow \alpha = 2.$$

4. (2) Total energy of satellite in orbit: $E = -\frac{GMm}{2r} = -\frac{gR_E^2 m}{2r}$

$$E_1 = -\frac{gR_E^2 m}{2(1.5R_E)} = -\frac{gR_E m}{3}$$

$$E_2 = -\frac{gR_E^2 m}{2(3R_E)} = -\frac{gR_E m}{6}$$

$$\text{Energy supplied} = E_2 - E_1 = -\frac{gR_E m}{6} + \frac{gR_E m}{3} = \frac{gR_E m}{6}$$

$$= \frac{10 \times 6 \times 10^6 \times 100}{6} = 10^9 \text{ J} = 1000 \times 10^6 \text{ J}$$

$$\alpha = 1000$$

5. (3) Work done equals negative change in gravitational potential energy.

For three masses in an equilateral triangle, gravitational PE is $U = -G\left(\frac{m_1 m_2}{r_{12}} + \frac{m_2 m_3}{r_{23}} + \frac{m_1 m_3}{r_{13}}\right)$.

Initial configuration (side 20 m):

$$U_i = -\frac{G}{20}(200 \times 300 + 300 \times 400 + 200 \times 400) \\ = -\frac{260000G}{20} = -13000G$$

Final configuration (side 25 m):

$$U_f = -\frac{G}{25}(260000) = -10400G$$

Work done:

$$W = -(U_f - U_i) = -10400G + 13000G$$

$$= 2600G = 2600 \times 6.7 \times 10^{-11} \\ = 1.742 \times 10^{-7} \text{ J} \approx 1.74 \times 10^{-7} \text{ J}$$