

PHYSICS · JEE MAIN

Gravitation

Chapter-wise previous year questions, with answer key

105

PYQS

2020–2025

PAPERS

7

TOPICS

Kepler's Laws

Newton's Law of Gravitation

Gravitational Field and Potential

Escape Velocity

Satellites and Orbital Motion

Variation of g

Orbital Velocity and Satellites

- 1 Attempt each question on paper first — they're grouped by topic, newest papers first.
- 2 Check yourself against the answer key at the end.
- 3 Got one wrong? Tap “Step-by-step solution” under it for the full working.

Stuck on a question?

Every question has a free step-by-step solution on PrepWiser — tap “Step-by-step solution” under it.

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Kepler's Laws · 10 PYQs

Q1 JEE Main 2025 · 7 Apr · Shift 2

Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A): The radius vector from the Sun to a planet sweeps out equal areas in equal intervals of time and thus areal velocity of planet is constant.

Reason (R): For a central force field the angular momentum is a constant.

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

- (A) (A) is not correct but (R) is correct
- (B) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
- (C) Both (A) and (R) are correct and (R) is the correct explanation of (A)
- (D) (A) is correct but (R) is not correct

[Step-by-step solution ► prepwiser.in/questions/3LOzUv3mBU](https://www.prepwiser.in/questions/3LOzUv3mBU)

Q2 JEE Main 2025 · 23 Jan · Shift 2

If a satellite orbiting the Earth is 9 times closer to the Earth than the Moon, what is the time period of rotation of the satellite? Given rotational time period of Moon = 27 days and gravitational attraction between the satellite and the moon is neglected.

- (A) 3 days
- (B) 27 days
- (C) 81 days
- (D) 1 day

[Step-by-step solution ► prepwiser.in/questions/nGWfFpj1tg](https://www.prepwiser.in/questions/nGWfFpj1tg)

Q3 JEE Main 2024 · 1 Feb · Shift 2

A light planet is revolving around a massive star in a circular orbit of radius R with a period of revolution T . If the force of attraction between planet and star is proportional to $R^{-3/2}$ then choose the correct option :

- (A) $T^2 \propto R^{7/2}$
- (B) $T^2 \propto R^3$
- (C) $T^2 \propto R^{5/2}$
- (D) $T^2 \propto R^{3/2}$

[Step-by-step solution ► prepwiser.in/questions/PW9PWogOV4](https://www.prepwiser.in/questions/PW9PWogOV4)

Q4 JEE Main 2024 · 29 Jan · Shift 2

A planet takes 200 days to complete one revolution around the Sun. If the distance of the planet from Sun is reduced to one fourth of the original distance, how many days will it take to complete one revolution :

- (A) 20
- (B) 50
- (C) 100
- (D) 25

[Step-by-step solution ► prepwiser.in/questions/8Mjnc-hRTh](https://www.prepwiser.in/questions/8Mjnc-hRTh)

Q5 JEE Main 2023 · 25 Jan · Shift 2

Every planet revolves around the sun in an elliptical orbit :-

- A. The force acting on a planet is inversely proportional to square of distance from sun.
- B. Force acting on planet is inversely proportional to product of the masses of the planet and the sun.
- C. The Centripetal force acting on the planet is directed away from the sun.
- D. The square of time period of revolution of planet around sun is directly proportional to cube of semi-major axis of elliptical orbit.

Choose the correct answer from the options given below :

- (A) C and D only
- (B) B and C only
- (C) A and D only
- (D) A and C only

[Step-by-step solution ► prepwiser.in/questions/ngyqdUSzPi](https://www.prepwiser.in/questions/ngyqdUSzPi)

Q6 JEE Main 2023 · 24 Jan · Shift 2

If the distance of the earth from Sun is 1.5×10^6 km. Then the distance of an imaginary planet from Sun, if its period of revolution is 2.83 years is :

- (A) 6×10^6 km
- (B) 3×10^7 km
- (C) 6×10^7 km
- (D) 3×10^6 km

[Step-by-step solution ► prepwiser.in/questions/viXKRu_Iy_](https://www.prepwiser.in/questions/viXKRu_Iy_)

Q7 JEE Main 2022 · 28 Jun · Shift 1

Two planets A and B of equal mass are having their period of revolutions T_A and T_B such that $T_A = 2T_B$. These planets are revolving in the circular orbits of radii r_A and r_B respectively. Which out of the following would be the correct relationship of their orbits?

- (A) $2r_A^2 = r_B^3$
- (B) $r_A^3 = 2r_B^3$
- (C) $r_A^3 = 4r_B^3$
- (D) $T_A^2 - T_B^2 = \frac{\pi^2}{GM} (r_B^3 - 4r_A^3)$

[Step-by-step solution ► prepwiser.in/questions/6CmoRDp8va](https://www.prepwiser.in/questions/6CmoRDp8va)

Q8 JEE Main 2022 · 24 Jun · Shift 2

The distance between Sun and Earth is R. The duration of year if the distance between Sun and Earth becomes 3R will be :

- (A) $\sqrt{3}$ years
- (B) 3 years
- (C) 9 years
- (D) $3\sqrt{3}$ years

[Step-by-step solution ► prepwiser.in/questions/osRE5RsFLx](https://www.prepwiser.in/questions/osRE5RsFLx)

Q9 JEE Main 2021 · 25 Jul · Shift 1

The minimum and maximum distances of a planet revolving around the sun are x_1 and x_2 . If the minimum speed of the planet on its trajectory is v_0 then its maximum speed will be :

- (A) $\frac{v_0 x_1^2}{x_2}$
- (B) $\frac{v_0 x_2^2}{x_1}$
- (C) $\frac{v_0 x_1}{x_2}$
- (D) $\frac{v_0 x_2}{x_1}$

[Step-by-step solution ► prepwiser.in/questions/0Z7KSpsro0](https://www.prepwiser.in/questions/0Z7KSpsro0)

Q10 JEE Main 2021 · 26 Feb · Shift 1

A planet revolving in elliptical orbit has :

- A. a constant velocity of revolution.
- B. has the least velocity when it is nearest to the sun.
- C. its areal velocity is directly proportional to its velocity.
- D. areal velocity is inversely proportional to its velocity.
- E. to follow a trajectory such that the areal velocity is constant.

Choose the correct answer from the options given below :

- (A) D only
- (B) E only
- (C) C only
- (D) A only

[Step-by-step solution ► prepwisar.in/questions/N5UFQQgP1G](https://www.prepwisar.in/questions/N5UFQQgP1G)

Newton's Law of Gravitation · 5 PYQs

Q11 JEE Main 2025 · 3 Apr · Shift 1

Three identical spheres of mass m , are placed at the vertices of an equilateral triangle of length a . When released, they interact only through gravitational force and collide after a time $T = 4$ seconds. If the sides of the triangle are increased to length $2a$ and also the masses of the spheres are made $2m$, then they will collide after _____ seconds.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisar.in/questions/bxtCc3G68A](https://www.prepwisar.in/questions/bxtCc3G68A)

Q12 JEE Main 2024 · 4 Apr · Shift 2

A 90kg body placed at $2R$ distance from surface of earth experiences gravitational pull of :
(R = Radius of earth, $g = 10\text{ms}^{-2}$)

- (A) 300 N
- (B) 225 N
- (C) 100 N
- (D) 120 N

[Step-by-step solution ► prepwisar.in/questions/G9lxabZXlG](https://www.prepwisar.in/questions/G9lxabZXlG)

Q13 JEE Main 2024 · 27 Jan · Shift 1

The acceleration due to gravity on the surface of earth is g . If the diameter of earth reduces to half of its original value and mass remains constant, then acceleration due to gravity on the surface of earth would be :

- (A) $g/4$
- (B) $2g$
- (C) $g/2$
- (D) $4g$

[Step-by-step solution ► prepwisar.in/questions/q9gn0jdO2W](https://www.prepwisar.in/questions/q9gn0jdO2W)

Q14 JEE Main 2023 · 15 Apr · Shift 1

Two identical particles each of mass ' m ' go round a circle of radius a under the action of their mutual gravitational attraction. The angular speed of each particle will be :

(A) $\sqrt{\frac{Gm}{2a^3}}$

(B) $\sqrt{\frac{Gm}{a^3}}$

(C) $\sqrt{\frac{Gm}{8a^3}}$

(D) $\sqrt{\frac{Gm}{4a^3}}$

[Step-by-step solution ► prepwiser.in/questions/1hX6djPLiI](https://www.prepwiser.in/questions/1hX6djPLiI)

Q15 JEE Main 2022 · 27 Jun · Shift 1

Given below are two statements :

Statement I : The law of gravitation holds good for any pair of bodies in the universe.

Statement II : The weight of any person becomes zero when the person is at the centre of the earth.

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

(A) Both Statement I and Statement II are true

(B) Both Statement I and Statement II are false

(C) Statement I is true but Statement II is false

(D) Statement I is false but Statement II is true

[Step-by-step solution ► prepwiser.in/questions/qkjfOA-MTa](https://www.prepwiser.in/questions/qkjfOA-MTa)

Gravitational Field and Potential · 11 PYQs

Q16 JEE Main 2025 · 4 Apr · Shift 1

Given below are two statements : one is labelled as **Assertion A** and the other is labelled as **Reason R**

Assertion A : The kinetic energy needed to project a body of mass m from earth surface to infinity is $\frac{1}{2}mgR$, where R is the radius of earth.

Reason R : The maximum potential energy of a body is zero when it is projected to infinity from earth surface.

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

(A) **A** is false but **R** is true

(B) Both **A** and **R** are true and **R** is the correct explanation of **A**

(C) **A** is true but **R** is false

(D) Both **A** and **R** are true but **R** is NOT the correct explanation of **A**

[Step-by-step solution ► prepwiser.in/questions/AYkzqd_Qxx](https://www.prepwiser.in/questions/AYkzqd_Qxx)

Q17 JEE Main 2025 · 3 Apr · Shift 1

A particle is released from height S above the surface of the earth. At certain height its kinetic energy is three times its potential energy. The height from the surface of the earth and the speed of the particle at that instant are respectively.

- (A) $\frac{S}{4}, \frac{3gS}{2}$
 (B) $\frac{S}{2}, \frac{3gS}{2}$
 (C) $\frac{S}{4}, \sqrt{\frac{3gS}{2}}$
 (D) $\frac{S}{2}, \sqrt{\frac{3gS}{2}}$

[Step-by-step solution ► prepwiser.in/questions/nTO7w_GhS](https://www.prepwiser.in/questions/nTO7w_GhS)

Q18 JEE Main 2024 · 30 Jan · Shift 1

The gravitational potential at a point above the surface of earth is $-5.12 \times 10^7 \text{ J/kg}$ and the acceleration due to gravity at that point is 6.4 m/s^2 . Assume that the mean radius of earth to be 6400 km . The height of this point above the earth's surface is :

- (A) 1600 km (B) 1200 km
 (C) 540 km (D) 1000 km

[Step-by-step solution ► prepwiser.in/questions/4OUXcXL3MQ](https://www.prepwiser.in/questions/4OUXcXL3MQ)

Q19 JEE Main 2023 · 11 Apr · Shift 2

If V is the gravitational potential due to sphere of uniform density on it's surface, then it's value at the center of sphere will be:-

- (A) $\frac{3V}{2}$ (B) $\frac{V}{2}$
 (C) $\frac{4}{3}V$ (D) V

[Step-by-step solution ► prepwiser.in/questions/zfMpS-GHZb](https://www.prepwiser.in/questions/zfMpS-GHZb)

Q20 JEE Main 2023 · 30 Jan · Shift 2

An object is allowed to fall from a height R above the earth, where R is the radius of earth. Its velocity when it strikes the earth's surface, ignoring air resistance, will be

- (A) $\sqrt{\frac{gR}{2}}$ (B) $\sqrt{gR}$
 (C) $\sqrt{2gR}$ (D) $2\sqrt{gR}$

[Step-by-step solution ► prepwiser.in/questions/U24hkVL3NS](https://www.prepwiser.in/questions/U24hkVL3NS)

Q21 JEE Main 2023 · 30 Jan · Shift 1

If the gravitational field in the space is given as $(-\frac{K}{r^2})$. Taking the reference point to be at $r = 2 \text{ cm}$ with gravitational potential $V = 10 \text{ J/kg}$. Find the gravitational potential at $r = 3 \text{ cm}$ in SI unit (Given, that $K = 6 \text{ Jcm/kg}$)

- (A) 9 (B) 11
 (C) 10 (D) 12

[Step-by-step solution ► prepwiser.in/questions/CghP9Stona](https://www.prepwiser.in/questions/CghP9Stona)

Q22 JEE Main 2022 · 29 Jul · Shift 2

An object of mass 1kg is taken to a height from the surface of earth which is equal to three times the radius of earth. The gain in potential energy of the object will be [If, $g = 10\text{ms}^{-2}$ and radius of earth = 6400km]

(A) 48 MJ

(B) 24 MJ

(C) 36 MJ

(D) 12 MJ

[Step-by-step solution ► prepwisser.in/questions/foByUgOulj](https://www.prepwisser.in/questions/foByUgOulj)

Q23 JEE Main 2021 · 26 Aug · Shift 1

Inside a uniform spherical shell :

(1) the gravitational field is zero

(2) the gravitational potential is zero

(3) the gravitational field is same everywhere

(4) the gravitational potential is same everywhere

(5) all of the above

Choose the most appropriate answer from the options given below :

(A) (1), (3) and (4) only

(B) (5) only

(C) (1), (2) and (3) only

(D) (2), (3) and (4) only

[Step-by-step solution ► prepwisser.in/questions/HqK4VkBwUs](https://www.prepwisser.in/questions/HqK4VkBwUs)

Q24 JEE Main 2021 · 16 Mar · Shift 2

If one wants to remove all the mass of the earth to infinity in order to break it up completely.

The amount of energy that needs to be supplied will be $\frac{x}{5} \frac{GM^2}{R}$ where x is _____ (Round off to the Nearest Integer) (M is the mass of earth, R is the radius of earth, G is the gravitational constant)

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/ehJug-d3AT](https://www.prepwisser.in/questions/ehJug-d3AT)

Q25 JEE Main 2020 · 4 Sep · Shift 1

On the x-axis and at a distance x from the origin, the gravitational field due a mass distribution is given by $\frac{Ax}{(x^2+a^2)^{3/2}}$ in the x-direction. The magnitude of gravitational potential on the x-axis at a distance x, taking its value to be zero at infinity, is:

(A) $A(x^2 + a^2)^{3/2}$

(B) $A(x^2 + a^2)^{1/2}$

(C) $\frac{A}{(x^2+a^2)^{1/2}}$

(D) $\frac{A}{(x^2+a^2)^{3/2}}$

[Step-by-step solution ► prepwisser.in/questions/FpzgCDUixF](https://www.prepwisser.in/questions/FpzgCDUixF)

Q26 JEE Main 2020 · 8 Jan · Shift 2

An asteroid is moving directly towards the centre of the earth. When at a distance of $10R$ (R is the radius of the earth) from the earth's centre, it has a speed of 12 km/s . Neglecting the effect of earth's atmosphere, what will be the speed of the asteroid when it hits the surface of the earth (escape velocity from the earth is 11.2 km/s)? Give your answer to the nearest integer in km/s ____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/VMqH7Ojajs](https://www.prepwiser.in/questions/VMqH7Ojajs)

Escape Velocity · 19 PYQs

Q27 JEE Main 2025 · 28 Jan · Shift 2

Earth has mass 8 times and radius 2 times that of a planet. If the escape velocity from the earth is 11.2 km/s , the escape velocity in km/s from the planet will be:

- (A) 8.4
- (B) 11.2
- (C) 5.6
- (D) 2.8

[Step-by-step solution ► prepwiser.in/questions/ryZ4M57_as](https://www.prepwiser.in/questions/ryZ4M57_as)

Q28 JEE Main 2024 · 6 Apr · Shift 1

To project a body of mass m from earth's surface to infinity, the required kinetic energy is (assume, the radius of earth is R_E , g = acceleration due to gravity on the surface of earth):

- | | |
|------------------------|--------------|
| (A) $\frac{1}{2}mgR_E$ | (B) $4mgR_E$ |
| (C) mgR_E | (D) $2mgR_E$ |

[Step-by-step solution ► prepwiser.in/questions/iBYg3f6OfK](https://www.prepwiser.in/questions/iBYg3f6OfK)

Q29 JEE Main 2024 · 31 Jan · Shift 2

The mass of the moon is $\frac{1}{144}$ times the mass of a planet and its diameter is $\frac{1}{16}$ times the diameter of a planet. If the escape velocity on the planet is v , the escape velocity on the moon will be :

- | | |
|--------------------|-------------------|
| (A) $\frac{v}{4}$ | (B) $\frac{v}{6}$ |
| (C) $\frac{v}{12}$ | (D) $\frac{v}{3}$ |

[Step-by-step solution ► prepwiser.in/questions/mpjIn-0iDt](https://www.prepwiser.in/questions/mpjIn-0iDt)

Q30 JEE Main 2024 · 30 Jan · Shift 2

Escape velocity of a body from earth is 11.2 km/s . If the radius of a planet be one-third the radius of earth and mass be one-sixth that of earth, the escape velocity from the planet is :

- | | |
|------------------------|-------------------------|
| (A) 7.9 km/s | (B) 8.4 km/s |
| (C) 4.2 km/s | (D) 11.2 km/s |

[Step-by-step solution ► prepwiser.in/questions/c14sfAgrvZ](https://www.prepwiser.in/questions/c14sfAgrvZ)

Q31 JEE Main 2023 · 13 Apr · Shift 2

Given below are two statements:

Statement I : For a planet, if the ratio of mass of the planet to its radius increases, the escape velocity from the planet also increases.

Statement II : Escape velocity is independent of the radius of the planet.

In the light of above statements, choose the most appropriate answer form the options given below

- (A) Both Statement I and Statement II are correct
- (B) Statement I is correct but statement II is incorrect
- (C) Both Statement I and Statement II are incorrect
- (D) Statement I is incorrect but statement II is correct

[Step-by-step solution ► prepwisser.in/questions/1R72B2Iy9P](https://www.prepwisser.in/questions/1R72B2Iy9P)

Q32 JEE Main 2023 · 13 Apr · Shift 1

A planet having mass $9M_e$ and radius $4R_e$, where M_e and R_e are mass and radius of earth respectively, has escape velocity in km/s given by:

(Given escape velocity on earth $V_e = 11.2 \times 10^3 \text{ m/s}$)

- (A) 33.6
- (B) 11.2
- (C) 16.8
- (D) 67.2

[Step-by-step solution ► prepwisser.in/questions/IEd07x2as1](https://www.prepwisser.in/questions/IEd07x2as1)

Q33 JEE Main 2023 · 12 Apr · Shift 1

The ratio of escape velocity of a planet to the escape velocity of earth will be:-

Given: Mass of the planet is 16 times mass of earth and radius of the planet is 4 times the radius of earth.

- (A) 1 : 4
- (B) 1 : $\sqrt{2}$
- (C) 4 : 1
- (D) 2 : 1

[Step-by-step solution ► prepwisser.in/questions/nok9EX2R0r](https://www.prepwisser.in/questions/nok9EX2R0r)

Q34 JEE Main 2023 · 11 Apr · Shift 2

A space ship of mass $2 \times 10^4 \text{ kg}$ is launched into a circular orbit close to the earth surface. The additional velocity to be imparted to the space ship in the orbit to overcome the gravitational pull will be (if $g = 10 \text{ m/s}^2$ and radius of earth = 6400km):

- (A) $7.9(\sqrt{2} - 1) \text{ km/s}$
- (B) $11.2(\sqrt{2} - 1) \text{ km/s}$
- (C) $7.4(\sqrt{2} - 1) \text{ km/s}$
- (D) $8(\sqrt{2} - 1) \text{ km/s}$

[Step-by-step solution ► prepwisser.in/questions/kV5Ja3ckoT](https://www.prepwisser.in/questions/kV5Ja3ckoT)

Q35 JEE Main 2023 · 6 Apr · Shift 1

Given below are two statements : one is labelled as Assertion **A** and the other is labelled as Reason **R**.

Assertion **A** : Earth has atmosphere whereas moon doesn't have any atmosphere.

Reason **R** : The escape velocity on moon is very small as compared to that on earth.

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

- (A) **A** is false but **R** is true
- (B) Both **A** and **R** are correct but **R** is NOT the correct explanation of **A**
- (C) Both **A** and **R** are correct and **R** is the correct explanation of **A**
- (D) **A** is true but **R** is false

[Step-by-step solution ► prepwisser.in/questions/24jNiv2fom](https://www.prepwisser.in/questions/24jNiv2fom)

Q36 JEE Main 2023 · 1 Feb · Shift 1

If earth has a mass nine times and radius twice to that of a planet P. Then $\frac{v_e}{3}\sqrt{x}\text{ms}^{-1}$ will be the minimum velocity required by a rocket to pull out of gravitational force of P, where v_e is escape velocity on earth.

The value of x is

- (A) 1
- (B) 3
- (C) 2
- (D) 18

[Step-by-step solution ► prepwisser.in/questions/pjw5aohgGF](https://www.prepwisser.in/questions/pjw5aohgGF)

Q37 JEE Main 2023 · 1 Feb · Shift 2

The escape velocities of two planets A and B are in the ratio 1 : 2. If the ratio of their radii respectively is 1 : 3, then the ratio of acceleration due to gravity of planet A to the acceleration of gravity of planet B will be :

- (A) $\frac{4}{3}$
- (B) $\frac{2}{3}$
- (C) $\frac{3}{4}$
- (D) $\frac{3}{2}$

[Step-by-step solution ► prepwisser.in/questions/ggO3Xipumj](https://www.prepwisser.in/questions/ggO3Xipumj)

Q38 JEE Main 2022 · 27 Jul · Shift 2

A body of mass m is projected with velocity λv_e in vertically upward direction from the surface of the earth into space. It is given that v_e is escape velocity and $\lambda < 1$. If air resistance is considered to be negligible, then the maximum height from the centre of earth, to which the body can go, will be :

(R : radius of earth)

- (A) $\frac{R}{1+\lambda^2}$
- (B) $\frac{R}{1-\lambda^2}$
- (C) $\frac{R}{1-\lambda}$
- (D) $\frac{\lambda^2 R}{1-\lambda^2}$

[Step-by-step solution ► prepwisser.in/questions/dayfpj3wSk](https://www.prepwisser.in/questions/dayfpj3wSk)

Q39 JEE Main 2022 · 26 Jul · Shift 2

A body is projected vertically upwards from the surface of earth with a velocity equal to one third of escape velocity. The maximum height attained by the body will be :

(Take radius of earth = 6400km and $g = 10\text{ms}^{-2}$)

- (A) 800 km (B) 1600 km
(C) 2133 km (D) 4800 km

[Step-by-step solution ► prepwiser.in/questions/QO1N8yYT2a](https://www.prepwiser.in/questions/QO1N8yYT2a)

Q40 JEE Main 2022 · 29 Jun · Shift 1

The escape velocity of a body on a planet 'A' is 12 kms^{-1} . The escape velocity of the body on another planet 'B', whose density is four times and radius is half of the planet 'A', is :

- (A) 12 kms^{-1}
(B) 24 kms^{-1}
(C) 36 kms^{-1}
(D) 6 kms^{-1}

[Step-by-step solution ► prepwiser.in/questions/nVuWQrALD7](https://www.prepwiser.in/questions/nVuWQrALD7)

Q41 JEE Main 2021 · 22 Jul · Shift 2

A body is projected vertically upwards from the surface of earth with a velocity sufficient enough to carry it to infinity. The time taken by it to reach height h is _____ s.

(A) $\sqrt{\frac{2R_e}{g}} \left[\left(1 + \frac{h}{R_e} \right)^{\frac{3}{2}} - 1 \right]$

(B) $\frac{1}{3} \sqrt{\frac{R_e}{2g}} \left[\left(1 + \frac{h}{R_e} \right)^{\frac{3}{2}} - 1 \right]$

(C) $\sqrt{\frac{R_e}{2g}} \left[\left(1 + \frac{h}{R_e} \right)^{\frac{3}{2}} - 1 \right]$

(D) $\frac{1}{3} \sqrt{\frac{2R_e}{g}} \left[\left(1 + \frac{h}{R_e} \right)^{\frac{3}{2}} - 1 \right]$

[Step-by-step solution ► prepwiser.in/questions/NU_qv0uu7K](https://www.prepwiser.in/questions/NU_qv0uu7K)

Q42 JEE Main 2021 · 17 Mar · Shift 1

The radius in kilometer to which the present radius of earth ($R = 6400\text{ km}$) to be compressed so that the escape velocity is increased 10 times is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/9UJ8JLISK7](https://www.prepwiser.in/questions/9UJ8JLISK7)

Q43 JEE Main 2021 · 25 Feb · Shift 2

The initial velocity v_i required to project a body vertically upward from the surface of the earth to reach a height of $10R$, where R is the radius of the earth, may be described in terms of escape velocity v_e such that $v_i = \sqrt{\frac{x}{y}} \times v_e$. The value of x will be _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/ntbKJydhLN](https://www.prepwiser.in/questions/ntbKJydhLN)

Q44 JEE Main 2021 · 25 Feb · Shift 1

Given below are two statements : one is labelled as Assertion A and the other is labelled as Reason R.

Assertion A : The escape velocities of planet A and B are same. But A and B are of unequal mass.

Reason R : The product of their mass and radius must be same. $M_1 R_1 = M_2 R_2$

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

- (A) Both A and R are correct and R is the correct explanation of A
- (B) Both A and R are correct but R is NOT the correct explanation of A
- (C) A is correct but R is not correct
- (D) A is not correct but R is correct

[Step-by-step solution ► prepwiser.in/questions/l2oELyujvQ](https://www.prepwiser.in/questions/l2oELyujvQ)

Q45 JEE Main 2020 · 9 Jan · Shift 2

Planet A has mass M and radius R . Planet B has half the mass and half the radius of Planet A. If the escape velocities from the Planets A and B are v_A and v_B , respectively, then $\frac{v_A}{v_B} = \frac{n}{4}$. The value of n is :

- (A) 1
- (B) 2
- (C) 4
- (D) 3

[Step-by-step solution ► prepwiser.in/questions/OiOJ3xLDME](https://www.prepwiser.in/questions/OiOJ3xLDME)

Satellites and Orbital Motion · 19 PYQs

Q46 JEE Main 2025 · 24 Jan · Shift 1

A satellite is launched into a circular orbit of radius ' R ' around the earth. A second satellite is launched into an orbit of radius $1.03 R$. The time period of revolution of the second satellite is larger than the first one approximately by

- (A) 3%
- (B) 2.5%
- (C) 4.5%
- (D) 9%

[Step-by-step solution ► prepwiser.in/questions/AXmLjNgbCs](https://www.prepwiser.in/questions/AXmLjNgbCs)

Q47 JEE Main 2024 · 9 Apr · Shift 1

An astronaut takes a ball of mass m from earth to space. He throws the ball into a circular orbit about earth at an altitude of 318.5km. From earth's surface to the orbit, the change in total mechanical energy of the ball is $x \frac{GM_em}{21R_e}$. The value of x is (take $R_e = 6370\text{km}$) :

- (A) 12 (B) 11
(C) 9 (D) 10

[Step-by-step solution ► prepwisar.in/questions/6C14YPmoIa](https://www.prepwisar.in/questions/6C14YPmoIa)

Q48 JEE Main 2024 · 9 Apr · Shift 2

A satellite of 10^3kg mass is revolving in circular orbit of radius $2R$. If $\frac{10^4 R}{6}\text{J}$ energy is supplied to the satellite, it would revolve in a new circular orbit of radius
(use $g = 10\text{m/s}^2$, $R = \text{radius of earth}$)

- (A) 4 R (B) 6 R
(C) 2.5 R (D) 3 R

[Step-by-step solution ► prepwisar.in/questions/_E-q-g_U92](https://www.prepwisar.in/questions/_E-q-g_U92)

Q49 JEE Main 2024 · 8 Apr · Shift 1

Two planets A and B having masses m_1 and m_2 move around the sun in circular orbits of r_1 and r_2 radii respectively. If angular momentum of A is L and that of B is $3L$, the ratio of time period $\left(\frac{T_A}{T_B}\right)$ is:

- (A) $\left(\frac{r_2}{r_1}\right)^{\frac{3}{2}}$
(B) $27\left(\frac{m_1}{m_2}\right)^3$
(C) $\left(\frac{r_1}{r_2}\right)^3$
(D) $\frac{1}{27}\left(\frac{m_2}{m_1}\right)^3$

[Step-by-step solution ► prepwisar.in/questions/z0klqnvHEY](https://www.prepwisar.in/questions/z0klqnvHEY)

Q50 JEE Main 2024 · 5 Apr · Shift 2

A satellite revolving around a planet in stationary orbit has time period 6 hours. The mass of planet is one-fourth the mass of earth. The radius orbit of planet is :
(Given = Radius of geo-stationary orbit for earth is $4.2 \times 10^4\text{km}$)

- (A) $1.68 \times 10^5\text{km}$ (B) $1.4 \times 10^4\text{km}$
(C) $8.4 \times 10^4\text{km}$ (D) $1.05 \times 10^4\text{km}$

[Step-by-step solution ► prepwisar.in/questions/fWXROuhwC-](https://www.prepwisar.in/questions/fWXROuhwC-)

Q51 JEE Main 2024 · 4 Apr · Shift 2

Correct formula for height of a satellite from earths surface is :

- (A) $\left(\frac{T^2 R^2 g}{4\pi^2}\right)^{1/3} - R$
(B) $\left(\frac{T^2 R^2 g}{4\pi}\right)^{1/2} - R$
(C) $\left(\frac{T^2 R^2 g}{4\pi^2}\right)^{-1/3} + R$
(D) $\left(\frac{T^2 R^2}{4\pi^2 g}\right)^{1/3} - R$

[Step-by-step solution ► prepwisar.in/questions/keYHXprRzf](https://www.prepwisar.in/questions/keYHXprRzf)

Q52 JEE Main 2024 · 27 Jan · Shift 2

Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R).
Assertion (A) : The angular speed of the moon in its orbit about the earth is more than the angular speed of the earth in its orbit about the sun.

Reason (R) : The moon takes less time to move around the earth than the time taken by the earth to move around the sun.

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

- (A) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
- (B) (A) is correct but (R) is not correct
- (C) Both (A) and (R) are correct and (R) is the correct explanation of (A)
- (D) (A) is not correct but (R) is correct

[Step-by-step solution ► prepwiser.in/questions/ANX6v1nzhv](https://www.prepwiser.in/questions/ANX6v1nzhv)

Q53 JEE Main 2023 · 12 Apr · Shift 1

Two satellites A and B move round the earth in the same orbit. The mass of A is twice the mass of B. The quantity which is same for the two satellites will be

- (A) Potential energy
- (B) Kinetic energy
- (C) Total energy
- (D) Speed

[Step-by-step solution ► prepwiser.in/questions/UXeMfqYBLS](https://www.prepwiser.in/questions/UXeMfqYBLS)

Q54 JEE Main 2023 · 10 Apr · Shift 2

The time period of a satellite, revolving above earth's surface at a height equal to R will be

(Given $g = \pi^2 \text{m/s}^2$, R = radius of earth)

- (A) $\sqrt{32R}$
- (B) $\sqrt{4R}$
- (C) $\sqrt{8R}$
- (D) $\sqrt{2R}$

[Step-by-step solution ► prepwiser.in/questions/N-Tnag2jGa](https://www.prepwiser.in/questions/N-Tnag2jGa)

Q55 JEE Main 2023 · 8 Apr · Shift 2

The orbital angular momentum of a satellite is L , when it is revolving in a circular orbit at height h from earth surface. If the distance of satellite from the earth centre is increased by eight times to its initial value, then the new angular momentum will be -

- (A) $9L$
- (B) $8L$
- (C) $4L$
- (D) $3L$

[Step-by-step solution ► prepwiser.in/questions/3EjdI0VInR](https://www.prepwiser.in/questions/3EjdI0VInR)

Q56 JEE Main 2023 · 29 Jan · Shift 2

The time period of a satellite of earth is 24 hours. If the separation between the earth and the satellite is decreased to one fourth of the previous value, then its new time period will become.

- (A) 12 hours
- (B) 3 hours
- (C) 6 hours
- (D) 4 hours

[Step-by-step solution ► prepwiser.in/questions/acqgTPNgC8](https://www.prepwiser.in/questions/acqgTPNgC8)

Q57 JEE Main 2022 · 27 Jul · Shift 1

Two satellites A and B, having masses in the ratio 4 : 3, are revolving in circular orbits of radii $3r$ and $4r$ respectively around the earth. The ratio of total mechanical energy of A to B is :

- (A) 9 : 16 (B) 16 : 9
(C) 1 : 1 (D) 4 : 3

[Step-by-step solution ► prepwiser.in/questions/HbKvPudaQj](https://www.prepwiser.in/questions/HbKvPudaQj)

Q58 JEE Main 2022 · 29 Jun · Shift 2

The time period of a satellite revolving around earth in a given orbit is 7 hours. If the radius of orbit is increased to three times its previous value, then approximate new time period of the satellite will be

- (A) 40 hours (B) 36 hours
(C) 30 hours (D) 25 hours

[Step-by-step solution ► prepwiser.in/questions/kepRILE6dD](https://www.prepwiser.in/questions/kepRILE6dD)

Q59 JEE Main 2022 · 25 Jun · Shift 2

Two satellites S_1 and S_2 are revolving in circular orbits around a planet with radius $R_1 = 3200$ km and $R_2 = 800$ km respectively. The ratio of speed of satellite S_1 to be speed of satellite S_2 in their respective orbits would be $\frac{1}{x}$ where $x = \underline{\hspace{2cm}}$.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/JaMQ-z2g1Z](https://www.prepwiser.in/questions/JaMQ-z2g1Z)

Q60 JEE Main 2021 · 27 Jul · Shift 2

The planet Mars has two moons, if one of them has a period 7 hours, 30 minutes and an orbital radius of 9.0×10^3 km. Find the mass of Mars.

$$\left\{ \text{Given } \frac{4\pi^2}{G} = 6 \times 10^{11} N^{-1} m^{-2} kg^2 \right\}$$

- (A) 5.96×10^{19} kg
(B) 3.25×10^{21} kg
(C) 7.02×10^{25} kg
(D) 6.00×10^{23} kg

[Step-by-step solution ► prepwiser.in/questions/nGAwJAN7C_](https://www.prepwiser.in/questions/nGAwJAN7C_)

Q61 JEE Main 2021 · 20 Jul · Shift 2

A satellite is launched into a circular orbit of radius R around earth, while a second satellite is launched into a circular orbit of radius $1.02 R$. The percentage difference in the time periods of the two satellites is :

- (A) 1.5 (B) 2.0
(C) 0.7 (D) 3.0

[Step-by-step solution ► prepwiser.in/questions/Kjd5ZtpH1k](https://www.prepwiser.in/questions/Kjd5ZtpH1k)

Q62 JEE Main 2021 · 20 Jul · Shift 2

Consider a binary star system of star A and star B with masses m_A and m_B revolving in a circular orbit of radii r_A and r_B , respectively. If T_A and T_B are the time period of star A and star B, respectively,

Then :

(A) $\frac{T_A}{T_B} = \left(\frac{r_A}{r_B}\right)^{\frac{3}{2}}$

(B) $T_A = T_B$

(C) $T_A > T_B$ (if $m_A > m_B$)

(D) $T_A > T_B$ (if $r_A > r_B$)

Step-by-step solution ► [prepwiser.in/questions/v6O4pBPuN-](https://www.prepwiser.in/questions/v6O4pBPuN-)

Q63 JEE Main 2021 · 18 Mar · Shift 1

The time period of a satellite in a circular orbit of radius R is T . The period of another satellite in a circular orbit of radius $9R$ is :

(A) $9T$

(B) $27T$

(C) $12T$

(D) $3T$

Step-by-step solution ► [prepwiser.in/questions/NbBlnAglOH](https://www.prepwiser.in/questions/NbBlnAglOH)

Q64 JEE Main 2021 · 24 Feb · Shift 1

Consider two satellites S_1 and S_2 with periods of revolution 1 hr. and 8 hr. respectively revolving around a planet in circular orbits. The ratio of angular velocity of satellite S_1 to the angular velocity of satellite S_2 is :

(A) $1 : 4$

(B) $8 : 1$

(C) $2 : 1$

(D) $1 : 8$

Step-by-step solution ► [prepwiser.in/questions/Su8r19TwuX](https://www.prepwiser.in/questions/Su8r19TwuX)

Variation of g · 35 PYQs

Q65 JEE Main 2025 · 24 Jan · Shift 2

Acceleration due to gravity on the surface of earth is ' g '. If the diameter of earth is reduced to one third of its original value and mass remains unchanged, then the acceleration due to gravity on the surface of the earth is _____ g .

Numerical answer — enter the value.

Step-by-step solution ► [prepwiser.in/questions/K4IbDUQCnl](https://www.prepwiser.in/questions/K4IbDUQCnl)

Q66 JEE Main 2025 · 22 Jan · Shift 2

Given below are two statements. One is labelled as Assertion (A) and the other is labelled as Reason (R).
Assertion (A) : A simple pendulum is taken to a planet of mass and radius, 4 times and 2 times, respectively, than the Earth. The time period of the pendulum remains same on earth and the planet.
Reason (R) : The mass of the pendulum remains unchanged at Earth and the other planet.
In the light of the above statements, choose the correct answer from the options given below :

- (A) Both (A) and (R) are true and (R) is the correct explanation of (A)
- (B) (A) is false but (R) is true
- (C) (A) is true but (R) is false
- (D) Both (A) and (R) are true but (R) is NOT the correct explanation of (A)

[Step-by-step solution ► prepwiser.in/questions/YKGfTLTYxl](https://www.prepwiser.in/questions/YKGfTLTYxl)

Q67 JEE Main 2024 · 6 Apr · Shift 2

Assuming the earth to be a sphere of uniform mass density, a body weighed 300N on the surface of earth. How much it would weigh at $R/4$ depth under surface of earth ?

- (A) 75 N
- (B) 375 N
- (C) 300 N
- (D) 225 N

[Step-by-step solution ► prepwiser.in/questions/6xvPzwCrSL](https://www.prepwiser.in/questions/6xvPzwCrSL)

Q68 JEE Main 2024 · 5 Apr · Shift 1

A simple pendulum doing small oscillations at a place R height above earth surface has time period of $T_1 = 4s$. T_2 would be it's time period if it is brought to a point which is at a height $2R$ from earth surface. Choose the correct relation [R = radius of earth] :

- (A) $3T_1 = 2T_2$
- (B) $T_1 = T_2$
- (C) $2T_1 = 3T_2$
- (D) $2T_1 = T_2$

[Step-by-step solution ► prepwiser.in/questions/Vk2SVS0Ici](https://www.prepwiser.in/questions/Vk2SVS0Ici)

Q69 JEE Main 2024 · 30 Jan · Shift 2

A simple pendulum is placed at a place where its distance from the earth's surface is equal to the radius of the earth. If the length of the string is $4m$, then the time period of small oscillations will be _____ s. [take $g = \pi^2 ms^{-2}$]

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/tjsjWqZSN7](https://www.prepwiser.in/questions/tjsjWqZSN7)

Q70 JEE Main 2023 · 13 Apr · Shift 2

Two planets A and B of radii R and $1.5 R$ have densities ρ and $\rho/2$ respectively. The ratio of acceleration due to gravity at the surface of B to A is:

- (A) 2 : 1
- (B) 2 : 3
- (C) 4 : 3
- (D) 3 : 4

[Step-by-step solution ► prepwiser.in/questions/WvKqwICNjH](https://www.prepwiser.in/questions/WvKqwICNjH)

Q71 JEE Main 2023 · 11 Apr · Shift 1

The radii of two planets 'A' and 'B' are 'R' and '4R' and their densities are ρ and $\rho/3$ respectively. The ratio of acceleration due to gravity at their surfaces ($g_A : g_B$) will be:

- (A) 3 : 16 (B) 4 : 3
(C) 1 : 16 (D) 3 : 4

[Step-by-step solution ► prepwisser.in/questions/jgwfTseUhG](https://www.prepwisser.in/questions/jgwfTseUhG)

Q72 JEE Main 2023 · 10 Apr · Shift 1

Assuming the earth to be a sphere of uniform mass density, the weight of a body at a depth $d = \frac{R}{2}$ from the surface of earth, if its weight on the surface of earth is 200 N, will be:

(Given R = radius of earth)

- (A) 100 N (B) 400 N
(C) 300 N (D) 500 N

[Step-by-step solution ► prepwisser.in/questions/1B4o9Q8QF2](https://www.prepwisser.in/questions/1B4o9Q8QF2)

Q73 JEE Main 2023 · 10 Apr · Shift 2

Given below are two statements:

Statement I : Rotation of the earth shows effect on the value of acceleration due to gravity (g)

Statement II : The effect of rotation of the earth on the value of 'g' at the equator is minimum and that at the pole is maximum.

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

- (A) Statement I is false but statement II is true
(B) Statement I is true but statement II is false
(C) Both Statement I and Statement II are true
(D) Both Statement I and Statement II are false

[Step-by-step solution ► prepwisser.in/questions/9rbijG0HU8](https://www.prepwisser.in/questions/9rbijG0HU8)

Q74 JEE Main 2023 · 8 Apr · Shift 2

The acceleration due to gravity at height h above the earth if $h \ll R$ (Radius of earth) is given by

- (A) $g' = g \left(1 - \frac{2h}{R}\right)$
(B) $g' = g \left(1 - \frac{2h^2}{R^2}\right)$
(C) $g' = g \left(1 - \frac{h^2}{2R^2}\right)$
(D) $g' = g \left(1 - \frac{h}{2R}\right)$

[Step-by-step solution ► prepwisser.in/questions/1HAmbHDvnF](https://www.prepwisser.in/questions/1HAmbHDvnF)

Q75 JEE Main 2023 · 8 Apr · Shift 1

The weight of a body on the earth is 400N. Then weight of the body when taken to a depth half of the radius of the earth will be:

- (A) 300 N (B) 200 N
(C) 100 N (D) Zero

[Step-by-step solution ► prepwisser.in/questions/XR9PYFYfXL](https://www.prepwisser.in/questions/XR9PYFYfXL)

Q76 JEE Main 2023 · 6 Apr · Shift 1

A planet has double the mass of the earth. Its average density is equal to that of the earth. An object weighing W on earth will weigh on that planet:

- (A) $2^{2/3}W$ (B) W
(C) $2W$ (D) $2^{1/3}W$

Step-by-step solution ► [prepwisser.in/questions/clxKiKk3UY](https://www.prepwisser.in/questions/clxKiKk3UY)

Q77 JEE Main 2023 · 6 Apr · Shift 2

The weight of a body on the surface of the earth is $100N$. The gravitational force on it when taken at a height, from the surface of earth, equal to one-fourth the radius of the earth is:

- (A) 50 N (B) 64 N
(C) 25 N (D) 100 N

Step-by-step solution ► [prepwisser.in/questions/LGtakVW3cG](https://www.prepwisser.in/questions/LGtakVW3cG)

Q78 JEE Main 2023 · 1 Feb · Shift 1

Given below are two statements:

Statement I: Acceleration due to gravity is different at different places on the surface of earth.

Statement II: Acceleration due to gravity increases as we go down below the earth's surface.

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

- (A) Both Statement I and Statement II are true
(B) Both Statement I and Statement II are false
(C) Statement I is false but Statement II is true
(D) Statement I is true but Statement II is false

Step-by-step solution ► [prepwisser.in/questions/qNRm_Z49KI](https://www.prepwisser.in/questions/qNRm_Z49KI)

Q79 JEE Main 2023 · 31 Jan · Shift 1

At a certain depth " d " below surface of earth, value of acceleration due to gravity becomes four times that of its value at a height $3R$ above earth surface. Where R is Radius of earth (Take $R = 6400\text{km}$). The depth d is equal to

- (A) 5260 km (B) 2560 km
(C) 640 km (D) 4800 km

Step-by-step solution ► [prepwisser.in/questions/3g6gXeBICs](https://www.prepwisser.in/questions/3g6gXeBICs)

Q80 JEE Main 2023 · 31 Jan · Shift 2

A body weight W , is projected vertically upwards from earth's surface to reach a height above the earth which is equal to nine times the radius of earth. The weight of the body at that height will be :

- (A) $\frac{W}{91}$ (B) $\frac{W}{3}$
(C) $\frac{W}{100}$ (D) $\frac{W}{9}$

Step-by-step solution ► [prepwisser.in/questions/p5DbAqZB2D](https://www.prepwisser.in/questions/p5DbAqZB2D)

Q81 JEE Main 2023 · 25 Jan · Shift 1

T is the time period of simple pendulum on the earth's surface. Its time period becomes x T when taken to a height R (equal to earth's radius) above the earth's surface. Then, the value of x will be :

- (A) 4 (B) $\frac{1}{2}$
(C) 2 (D) $\frac{1}{4}$

[Step-by-step solution ► prepwisser.in/questions/G6Yg3c0i1u](https://www.prepwisser.in/questions/G6Yg3c0i1u)

Q82 JEE Main 2023 · 24 Jan · Shift 2

Given below are two statements:

Statement I : Acceleration due to earth's gravity decreases as you go 'up' or 'down' from earth's surface.

Statement II : Acceleration due to earth's gravity is same at a height 'h' and depth 'd' from earth's surface, if $h = d$.

In the light of above statements, choose the most appropriate answer from the options given below

- (A) Statement I is correct but statement II is incorrect
(B) Both Statement I and II are correct
(C) Statement I is incorrect but statement II is correct
(D) Both Statement I and Statement II are incorrect

[Step-by-step solution ► prepwisser.in/questions/8CUCUBhTeP](https://www.prepwisser.in/questions/8CUCUBhTeP)

Q83 JEE Main 2023 · 24 Jan · Shift 1

The weight of a body at the surface of earth is 18 N. The weight of the body at an altitude of 3200 km above the earth's surface is (given, radius of earth $R_e = 6400\text{km}$) :

- (A) 9.8 N (B) 4.9 N
(C) 19.6 N (D) 8 N

[Step-by-step solution ► prepwisser.in/questions/whw8KZgPwy](https://www.prepwisser.in/questions/whw8KZgPwy)

Q84 JEE Main 2022 · 29 Jul · Shift 1

If the acceleration due to gravity experienced by a point mass at a height h above the surface of earth is same as that of the acceleration due to gravity at a depth αh ($h \ll R_e$) from the earth surface. The value of α will be _____.

(use $R_e = 6400\text{km}$)

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/5sQp7xhswl](https://www.prepwisser.in/questions/5sQp7xhswl)

Q85 JEE Main 2022 · 28 Jul · Shift 1

If the radius of earth shrinks by 2% while its mass remains same. The acceleration due to gravity on the earth's surface will approximately :

- (A) decrease by 2% (B) decrease by 4%
(C) increase by 2% (D) increase by 4%

[Step-by-step solution ► prepwisser.in/questions/d01Q-wxXrr](https://www.prepwisser.in/questions/d01Q-wxXrr)

Q86 JEE Main 2022 · 28 Jul · Shift 2

Assume there are two identical simple pendulum clocks. Clock - 1 is placed on the earth and Clock - 2 is placed on a space station located at a height h above the earth surface. Clock - 1 and Clock - 2 operate at time periods 4 s and 6 s respectively. Then the value of h is -

(consider radius of earth $R_E = 6400\text{km}$ and g on earth 10m/s^2)

- (A) 1200 km (B) 1600 km
(C) 3200 km (D) 4800 km

[Step-by-step solution ► prepwiser.in/questions/dVtCqLw4q0](https://www.prepwiser.in/questions/dVtCqLw4q0)

Q87 JEE Main 2022 · 26 Jul · Shift 1

The percentage decrease in the weight of a rocket, when taken to a height of 32km above the surface of earth will, be :

(Radius of earth = 6400km)

- (A) 1% (B) 3%
(C) 4% (D) 0.5%

[Step-by-step solution ► prepwiser.in/questions/9_7a51bhjJ](https://www.prepwiser.in/questions/9_7a51bhjJ)

Q88 JEE Main 2022 · 25 Jul · Shift 2

An object is taken to a height above the surface of earth at a distance $\frac{5}{4}R$ from the centre of the earth. Where radius of earth, $R = 6400\text{ km}$. The percentage decrease in the weight of the object will be :

- (A) 36% (B) 50%
(C) 64% (D) 25%

[Step-by-step solution ► prepwiser.in/questions/VmNk9bH1bu](https://www.prepwiser.in/questions/VmNk9bH1bu)

Q89 JEE Main 2022 · 25 Jul · Shift 2

The length of a seconds pendulum at a height $h = 2R$ from earth surface will be:

(Given R = Radius of earth and acceleration due to gravity at the surface of earth, $g = \pi^2\text{ ms}^{-2}$)

- (A) $\frac{2}{9}\text{ m}$ (B) $\frac{4}{9}\text{ m}$
(C) $\frac{8}{9}\text{ m}$ (D) $\frac{1}{9}\text{ m}$

[Step-by-step solution ► prepwiser.in/questions/3Iiv_MNDkk](https://www.prepwiser.in/questions/3Iiv_MNDkk)

Q90 JEE Main 2022 · 30 Jun · Shift 1

The radii of two planets A and B are in the ratio 2 : 3. Their densities are 3ρ and 5ρ respectively. The ratio of their acceleration due to gravity is :

- (A) 9 : 4 (B) 9 : 8
(C) 9 : 10 (D) 2 : 5

[Step-by-step solution ► prepwiser.in/questions/iBfwgKToxI](https://www.prepwiser.in/questions/iBfwgKToxI)

Q91 JEE Main 2022 · 26 Jun · Shift 2

Given below are two statements : One is labelled as Assertion A and the other is labelled as Reason R.
Assertion A : If we move from poles to equator, the direction of acceleration due to gravity of earth always points towards the center of earth without any variation in its magnitude.

Reason R : At equator, the direction of acceleration due to the gravity is towards the center of earth.

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

- (A) Both A and R are true and R is the correct explanation of A.
- (B) Both A and R are true but R is NOT the correct explanation of A.
- (C) A is true but R is false.
- (D) A is false but R is true.

[Step-by-step solution ► prepwisser.in/questions/uBF4Rj44d4](https://www.prepwisser.in/questions/uBF4Rj44d4)

Q92 JEE Main 2022 · 25 Jun · Shift 1

The height of any point P above the surface of earth is equal to diameter of earth. The value of acceleration due to gravity at point P will be : (Given g = acceleration due to gravity at the surface of earth).

- (A) $g/2$
- (B) $g/4$
- (C) $g/3$
- (D) $g/9$

[Step-by-step solution ► prepwisser.in/questions/9iI-xu2xTA](https://www.prepwisser.in/questions/9iI-xu2xTA)

Q93 JEE Main 2022 · 24 Jun · Shift 1

The approximate height from the surface of earth at which the weight of the body becomes $\frac{1}{3}$ of its weight on the surface of earth is :

[Radius of earth $R = 6400$ km and $\sqrt{3} = 1.732$]

- (A) 3840 km
- (B) 4685 km
- (C) 2133 km
- (D) 4267 km

[Step-by-step solution ► prepwisser.in/questions/MuLcQSbN45](https://www.prepwisser.in/questions/MuLcQSbN45)

Q94 JEE Main 2021 · 31 Aug · Shift 2

If R_E be the radius of Earth, then the ratio between the acceleration due to gravity at a depth ' r ' below and a height ' r ' above the earth surface is : (Given : $r < R_E$)

- (A) $1 - \frac{r}{R_E} - \frac{r^2}{R_E^2} - \frac{r^3}{R_E^3}$
- (B) $1 + \frac{r}{R_E} + \frac{r^2}{R_E^2} + \frac{r^3}{R_E^3}$
- (C) $1 + \frac{r}{R_E} - \frac{r^2}{R_E^2} + \frac{r^3}{R_E^3}$
- (D) $1 + \frac{r}{R_E} - \frac{r^2}{R_E^2} - \frac{r^3}{R_E^3}$

[Step-by-step solution ► prepwisser.in/questions/K6sa5UINoe](https://www.prepwisser.in/questions/K6sa5UINoe)

Q95 JEE Main 2021 · 25 Jul · Shift 2

Consider a planet in some solar system which has a mass double the mass of earth and density equal to the average density of earth. If the weight of an object on earth is W , the weight of the same object on that planet will be :

- (A) $2W$ (B) W
(C) $2^{\frac{1}{3}}W$ (D) $\sqrt{2}W$

[Step-by-step solution ► prepwisar.in/questions/zACRfKnIr2](https://www.prepwisar.in/questions/zACRfKnIr2)

Q96 JEE Main 2021 · 24 Feb · Shift 2

A body weights 49N on a spring balance at the north pole. What will be its weight recorded on the same weighing machine, if it is shifted to the equator?

[Use $g = \frac{GM}{R^2} = 9.8 \text{ ms}^{-2}$ and radius of earth, $R = 6400 \text{ km}$.]

- (A) 49 N (B) 49.83 N
(C) 48.83 N (D) 49.17 N

[Step-by-step solution ► prepwisar.in/questions/GspAKADBBP](https://www.prepwisar.in/questions/GspAKADBBP)

Q97 JEE Main 2020 · 5 Sep · Shift 1

The value of the acceleration due to gravity is g_1 at a height $h = \frac{R}{2}$ (R = radius of the earth) from the surface of the earth. It is again equal to g_1 at a depth d below the surface of the earth. The ratio $\left(\frac{d}{R}\right)$ equals :

- (A) $\frac{5}{9}$ (B) $\frac{1}{9}$
(C) $\frac{7}{9}$ (D) $\frac{4}{9}$

[Step-by-step solution ► prepwisar.in/questions/yvoY1cjRDw](https://www.prepwisar.in/questions/yvoY1cjRDw)

Q98 JEE Main 2020 · 5 Sep · Shift 2

The acceleration due to gravity on the earth's surface at the poles is g and angular velocity of the earth about the axis passing through the pole is ω . An object is weighed at the equator and at a height h above the poles by using a spring balance. If the weights are found to be same, then h is ($h \ll R$, where R is the radius of the earth)

- (A) $\frac{R^2\omega^2}{2g}$ (B) $\frac{R^2\omega^2}{g}$
(C) $\frac{R^2\omega^2}{8g}$ (D) $\frac{R^2\omega^2}{4g}$

[Step-by-step solution ► prepwisar.in/questions/oL20zXbBL0](https://www.prepwisar.in/questions/oL20zXbBL0)

Q99 JEE Main 2020 · 7 Jan · Shift 2

A box weight 196 N on a spring balance at the north pole. Its weight recorded on the same balance if it is shifted to the equator is close to (Take $g = 10 \text{ ms}^{-2}$ at the north pole and the radius of the earth = 6400 km) :

- (A) 194.32 N (B) 195.66 N
(C) 195.32 N (D) 194.66 N

[Step-by-step solution ► prepwisar.in/questions/VVRCStpqnd](https://www.prepwisar.in/questions/VVRCStpqnd)

Orbital Velocity and Satellites · 6 PYQs

Q100 JEE Main 2025 · 2 Apr · Shift 2

A satellite of mass 1000 kg is launched to revolve around the earth in an orbit at a height of 270 km from the earth's surface. Kinetic energy of the satellite in this orbit is _____ $\times 10^{10}$ J.

(Mass of earth = 6×10^{24} kg, Radius of earth = 6.4×10^6 m, Gravitational constant = 6.67×10^{-11} N m² kg⁻²)

Numerical answer — enter the value.

[Step-by-step solution](https://www.prepwisar.in/questions/fAHBzH7M4O) ► [prepwisar.in/questions/fAHBzH7M4O](https://www.prepwisar.in/questions/fAHBzH7M4O)

Q101 JEE Main 2025 · 23 Jan · Shift 2

A satellite of mass $\frac{M}{2}$ is revolving around earth in a circular orbit at a height of $\frac{R}{3}$ from earth surface. The angular momentum of the satellite is $M\sqrt{\frac{GMR}{x}}$. The value of x is _____, where M and R are the mass and radius of earth, respectively. (G is the gravitational constant)

Numerical answer — enter the value.

[Step-by-step solution](https://www.prepwisar.in/questions/Uz72Py3F3E) ► [prepwisar.in/questions/Uz72Py3F3E](https://www.prepwisar.in/questions/Uz72Py3F3E)

Q102 JEE Main 2024 · 8 Apr · Shift 2

Two satellite A and B go round a planet in circular orbits having radii 4R and R respectively. If the speed of A is 3v, the speed of B will be :

- | | |
|--------|--------------------|
| (A) 6v | (B) $\frac{4}{3}v$ |
| (C) 3v | (D) 12v |

[Step-by-step solution](https://www.prepwisar.in/questions/IvOKOy6MXu) ► [prepwisar.in/questions/IvOKOy6MXu](https://www.prepwisar.in/questions/IvOKOy6MXu)

Q103 JEE Main 2023 · 10 Apr · Shift 1

Two satellites of masses m and 3m revolve around the earth in circular orbits of radii r & 3r respectively. The ratio of orbital speeds of the satellites respectively is

- | | |
|-----------|--------------------|
| (A) 3 : 1 | (B) $\sqrt{3} : 1$ |
| (C) 1 : 1 | (D) 9 : 1 |

[Step-by-step solution](https://www.prepwisar.in/questions/CsNIY1yLBT) ► [prepwisar.in/questions/CsNIY1yLBT](https://www.prepwisar.in/questions/CsNIY1yLBT)

Q104 JEE Main 2023 · 8 Apr · Shift 1

Given below are two statements:

Statement I: If E be the total energy of a satellite moving around the earth, then its potential energy will be $\frac{E}{2}$.

Statement II: The kinetic energy of a satellite revolving in an orbit is equal to the half the magnitude of total energy E.

In the light of the above statements, choose the most appropriate answer from the options given below

- (A) Both Statement I and Statement II are incorrect
(B) Statement I is incorrect but Statement II is correct
(C) Statement I is correct but Statement II is incorrect
(D) Both Statement I and Statement II are correct

[Step-by-step solution](https://www.prepwisar.in/questions/AjREe-j91W) ► [prepwisar.in/questions/AjREe-j91W](https://www.prepwisar.in/questions/AjREe-j91W)

A body is moving in a low circular orbit about a planet of mass M and radius R . The radius of the orbit can be taken to be R itself. Then the ratio of the speed of this body in the orbit to the escape velocity from the planet is:

(A) 2

(B) 1

(C) $\sqrt{2}$

(D) $\frac{1}{\sqrt{2}}$

Step-by-step solution ► prepwiser.in/questions/ulubMqeeqy

Answer key — Gravitation

Numbers match the question numbers above. For full working, open the solution link under each question.

1	C	2	D	3	C	4	D	5	C	6	D	7	C	8	D
9	D	10	B	11	8	12	C	13	D	14	D	15	A	16	A
17	C	18	A	19	A	20	B	21	B	22	A	23	A	24	3
25	C	26	16	27	C	28	C	29	D	30	A	31	B	32	C
33	D	34	D	35	C	36	C	37	C	38	B	39	A	40	A
41	D	42	64	43	10	44	C	45	C	46	C	47	B	48	B
49	D	50	D	51	A	52	C	53	D	54	A	55	D	56	B
57	B	58	B	59	2	60	D	61	D	62	B	63	B	64	B
65	9	66	D	67	D	68	A	69	8	70	D	71	D	72	A
73	B	74	A	75	B	76	D	77	B	78	D	79	D	80	C
81	C	82	A	83	D	84	2	85	D	86	C	87	A	88	A
89	D	90	D	91	D	92	D	93	B	94	D	95	C	96	C
97	A	98	A	99	C	100	3	101	3	102	A	103	B	104	A
105	D														

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