

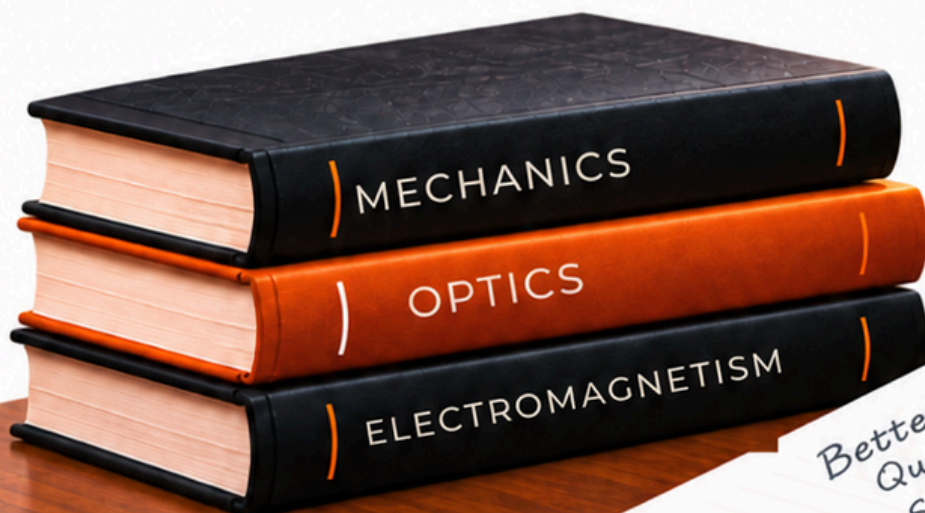
JEE Main Physics

Equilibrium of concurrent forces PYQ

$$F = ma$$



$$v = u + at$$



PRACTICE
TODAY
A BRIGHTER
TOMORROW

Subject: Physics

Years: 2026-2002

Total Questions: 18

About this PYQ collection

What is inside

A complete topic-wise set of **18 previous year questions** on **Equilibrium of concurrent forces** from **JEE Main (2026-2019)** and its predecessor **AIEEE (2006-2002)**, across **11 exam years**. **15 questions** are from 2019 onwards, so most of the set reflects the recent NTA pattern.

Questions are arranged to reduce unused page space, with newest-first priority and continuous numbering from 1. Each carries an exam date and shift tag to trace the original paper.

Topic-wise questions

TOPIC	QS	%
Equilibrium of concurrent forces	18	100%

Question types

TYPE	QS	%
Single-correct MCQ	15	83%
Numerical value	3	17%

Numerical-value questions have no options; all 3 are from 2022 onwards.

How these questions help you

- **Know where the marks are:** equilibrium of concurrent forces make up **18 of 18 questions (about 100%)**.
- **Build speed and accuracy:** practice the concepts and question styles used in previous papers.
- **Learn the patterns:** the same question styles return year after year.
- **Strengthen other chapters:** these concepts support further study in Physics.

Questions – Equilibrium of concurrent forces

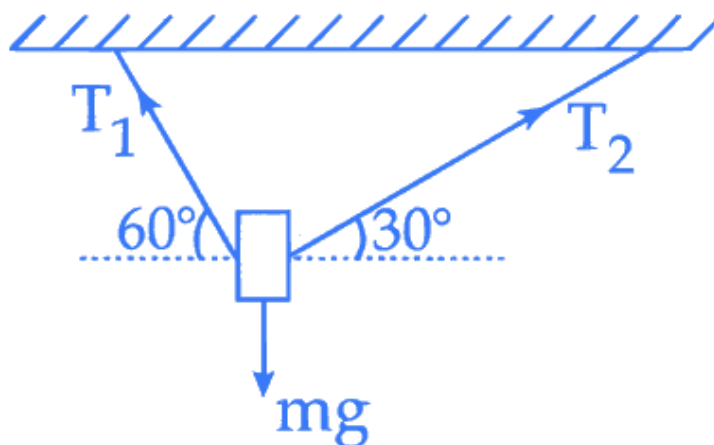
1. A flexible chain of mass m hangs between two fixed points at the same level. The inclination of the chain with the horizontal at the two points of support is 30° . Considering the equilibrium of each half of the chain, the tension of the chain at the lowest point is ____ . (24 Jan 2026 | Shift 2)

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

2. A body of mass m is suspended by two strings making angles θ_1 and θ_2 with the horizontal ceiling with tensions T_1 and T_2 simultaneously. T_1 and T_2 are related by $T_1 = \sqrt{3}T_2$, the angles θ_1 and θ_2 are (4 Apr 2025 | Shift 1)

- (A) $\theta_1 = 30^\circ, \theta_2 = 60^\circ$ with $T_2 = \frac{3mg}{4}$ (B) $\theta_1 = 45^\circ, \theta_2 = 45^\circ$ with $T_2 = \frac{3mg}{4}$
 (C) $\theta_1 = 30^\circ, \theta_2 = 60^\circ$ with $T_2 = \frac{4mg}{5}$ (D) $\theta_1 = 60^\circ, \theta_2 = 30^\circ$ with $T_2 = \frac{mg}{2}$

3.



A body of mass 1 kg is suspended with the help of two strings making angles as shown in figure. Magnitudes of tensions T_1 and T_2 , respectively, are (in N) :

(Take acceleration due to gravity 10 m/s^2)

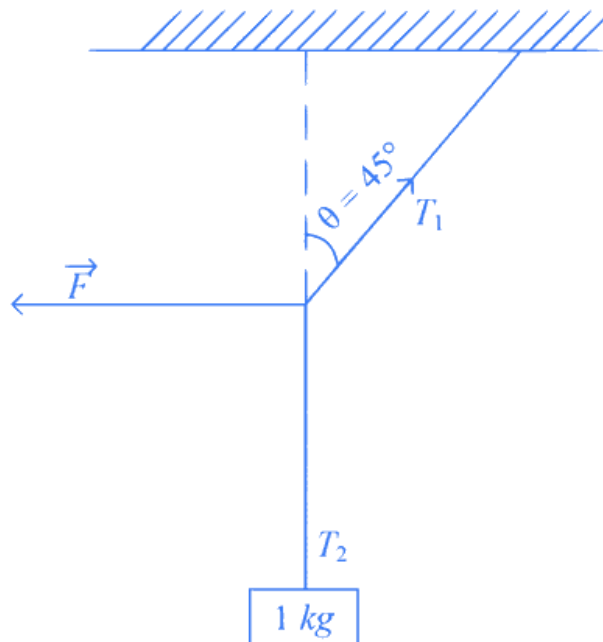
(2 Apr 2025 | Shift 2)

- (A) $5\sqrt{3}, 5$ (B) $5\sqrt{3}, 5\sqrt{3}$
 (C) $5, 5$ (D) $5, 5\sqrt{3}$

4. A body of weight 200 N is suspended from a tree branch through a chain of mass 10 kg. The branch pulls the chain by a force equal to (if $g = 10 \text{ m/s}^2$) : (6 Apr 2024 | Shift 2)

- (A) 300 N (B) 100 N
 (C) 150 N (D) 200 N

5. A 1 kg mass is suspended from the ceiling by a rope of length 4 m. A horizontal force ' F ' is applied at the mid point of the rope so that the rope makes an angle of 45° with respect to the vertical axis as shown in figure. The magnitude of F is :
(Assume that the system is in equilibrium and $g = 10 \text{ m/s}^2$)



(9 Apr 2024 | Shift 2)

- (A) 1 N
(B) 10 N
(C) $\frac{10}{\sqrt{2}} \text{ N}$
(D) $\frac{1}{10 \times \sqrt{2}} \text{ N}$

6. Three forces $F_1 = 10 \text{ N}$, $F_2 = 8 \text{ N}$, $F_3 = 6 \text{ N}$ are acting on a particle of mass 5 kg. The forces F_2 and F_3 are applied perpendicularly so that particle remains at rest. If the force F_1 is removed, then the acceleration of the particle is:

(12 Apr 2023 | Shift 1)

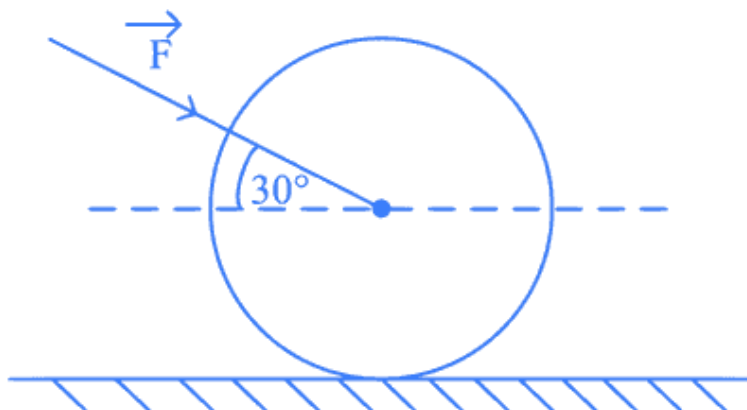
- (A) 4.8 ms^{-2}
(B) 7 ms^{-2}
(C) 2 ms^{-2}
(D) 0.5 ms^{-2}

7. A mass of 10 kg is suspended vertically by a rope of length 5 m from the roof. A force of 30 N is applied at the middle point of rope in horizontal direction. The angle made by upper half of the rope with vertical is $\theta = \tan^{-1} (x \times 10^{-1})$. The value of x is _____.

(Given, $g = 10 \text{ m/s}^2$)

(27 Jun 2022 | Shift 2)

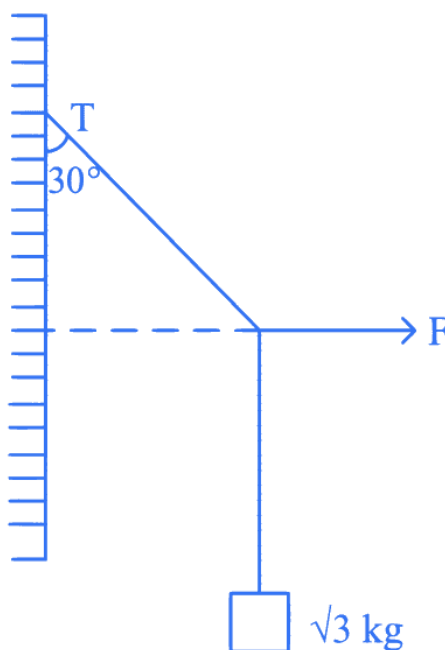
8. As shown in figure, a 70 kg garden roller is pushed with a force of $\vec{F} = 200 \text{ N}$ at an angle of 30° with horizontal. The normal reaction on the roller is
(Given $g = 10 \text{ m s}^{-2}$)



(31 Jan 2023 | Shift 1)

- (A) 800 N
(B) 600 N
(C) $200\sqrt{3} \text{ N}$
(D) $800\sqrt{2} \text{ N}$

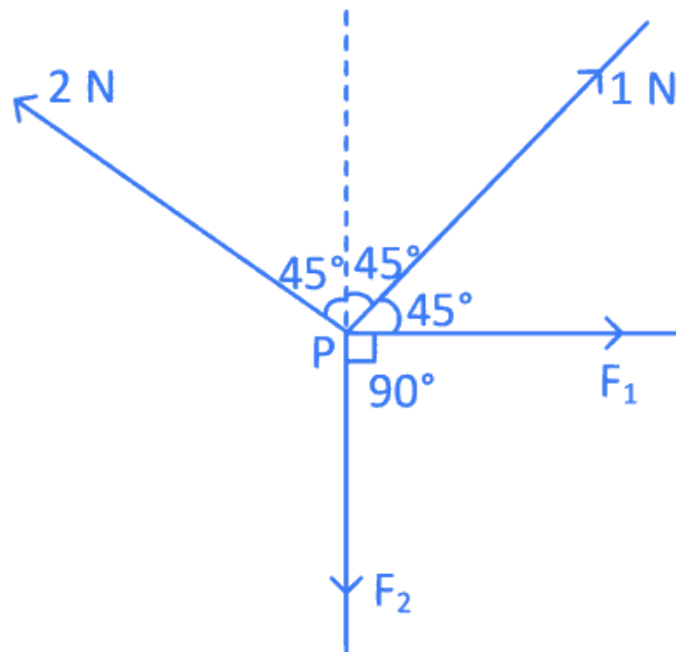
9. A block of $\sqrt{3} \text{ kg}$ is attached to a string whose other end is attached to the wall. An unknown force F is applied so that the string makes an angle of 30° with the wall. The tension T is: (Given $g = 10 \text{ ms}^{-2}$)



(30 Jan 2023 | Shift 2)

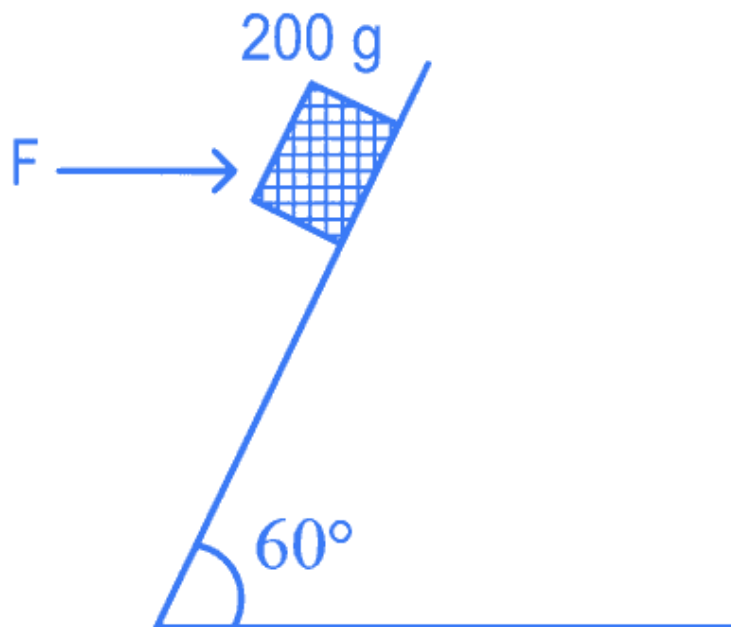
- (A) 15 N
(B) 10 N
(C) 25 N
(D) 20 N

10. Four forces are acting at a point P in equilibrium as shown in figure. The ratio of force F_1 to F_2 is $1 : x$ where $x = \underline{\hspace{2cm}}$.



(25 Jul 2022 | Shift 1)

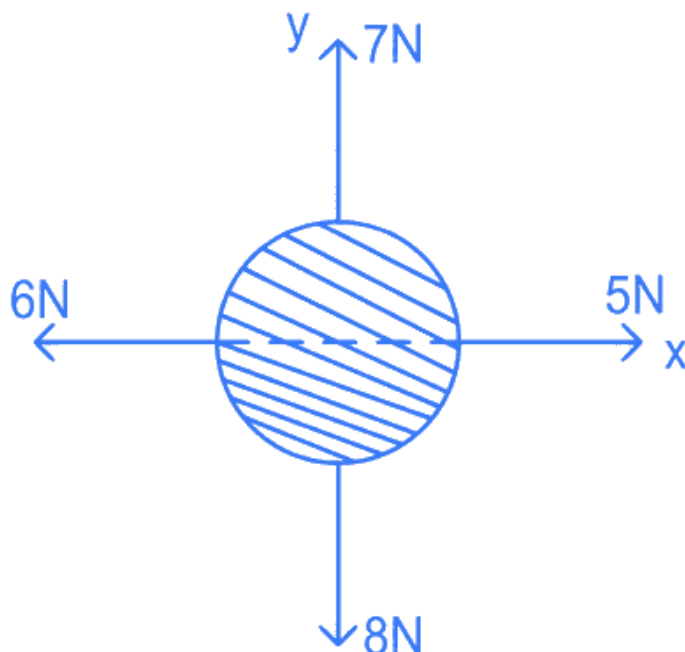
11. A block of mass 200 g is kept stationary on a smooth inclined plane by applying a minimum horizontal force $F = \sqrt{x}\text{N}$ as shown in figure.



The value of $x = \underline{\hspace{2cm}}$.

(25 Jun 2022 | Shift 2)

12. For a free body diagram shown in the figure, the four forces are applied in the 'x' and 'y' directions. What additional force must be applied and at what angle with positive x-axis so that the net acceleration of body is zero?



(25 Jul 2022 | Shift 2)

- (A) $\sqrt{2}N, 45^\circ$ (B) $\sqrt{2}N, 135^\circ$
 (C) $\frac{2}{\sqrt{3}}N, 30^\circ$ (D) $2N, 45^\circ$

13. Statement : 1

If three forces $\vec{F}_1$, $\vec{F}_2$ and $\vec{F}_3$ are represented by three sides of a triangle and $\vec{F}_1 + \vec{F}_2 = -\vec{F}_3$, then these three forces are concurrent forces and satisfy the condition for equilibrium.

Statement : 2

A triangle made up of three forces $\vec{F}_1$, $\vec{F}_2$ and $\vec{F}_3$ as its sides taken in the same order, satisfy the condition for translatory equilibrium.

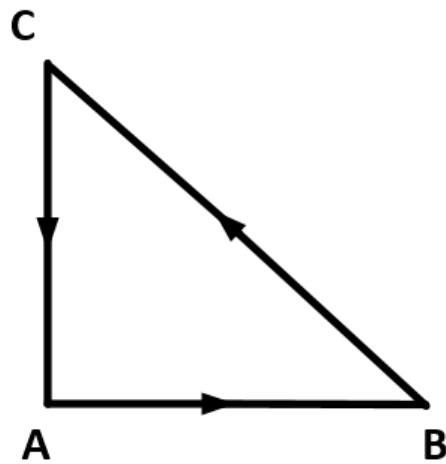
In the light of the above statements, choose the most appropriate answer from the options given below :

(31 Aug 2021 | Shift 2)

- (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 false (D) Both Statement-I and Statement-II are true

14. A mass of 10 kg is suspended by a rope of length 4 m, from the ceiling. A force F is applied horizontally at the mid point of the rope such that the top half of the rope makes an angle of 45° with the vertical. Then F equal : (Take $g = 10 \text{ ms}^{-2}$ and the rope to be massless) (7 Jan 2020 | Shift 2)
- (A) 100 N (B) 75 N
(C) 90 N (D) 70 N
-
15. A mass of 10 kg is suspended vertically by a rope from the roof. When a horizontal force is applied on the rope at some point. the rope deviated at an angle of 45° at the roof point. If the suspended mass is at equilibrium, the magnitude of the force applied is ($g = 10 \text{ ms}^{-2}$) (9 Jan 2019 | Shift 2)
- (A) 200 N (B) 140 N
(C) 70 N (D) 100 N
-
16. A mass of $M \text{ kg}$ is suspended by a weightless string. The horizontal force that is required to displace it until the string makes an angle of 45° with the initial vertical direction is (30 Apr 2006 | Single sitting)
- (A) $Mg(\sqrt{2} + 1)$ (B) $Mg\sqrt{2}$
(C) $\frac{Mg}{\sqrt{2}}$ (D) $Mg(\sqrt{2} - 1)$
-
17. When forces F_1, F_2, F_3 are acting on a particle of mass m such that F_2 and F_3 are mutually perpendicular, then the particle remains stationary. If the force F_1 is now removed then the acceleration of the particle is (19 May 2002 | Single sitting)
- (A) F_1/m (B) F_2F_3/mF_1
(C) $(F_2 - F_3)/m$ (D) F_2/m

18. Three forces start acting simultaneously on a particle moving with velocity, $\vec{v}$. These forces are represented in magnitude and direction by the three sides of a triangle ABC . The particle will now move with velocity



(26 Apr 2003 | Single sitting)

- (A) less than $\vec{v}$ (B) greater than $\vec{v}$
(C) $|\vec{v}|$ in the direction of the largest force BC (D) $\vec{v}$, remaining unchanged