Practice Problems

Problems based on Newton's first law of motion

▶ Basic level

1. A boy sitting on the topmost berth in the compartment of a train which is just going to stop on a railway station, drops an apple aiming at the open hand of his brother sitting vertically below his hands at a distance of about 2 meter. The apple will fall **[CPMT 1986]**

(a) Precisely on the hand of his brother

(b) Slightly away from the hand of his brother in the direction of motion of the train

(c) Slightly away from the hand of his brother in the direction opposite to the direction of motion of the train

(d) None of the above

2. A body of mass 10 *kg* is sliding on a frictionless surface with a velocity of $2 ms^{-1}$. The force required to keep it moving with a same velocity is

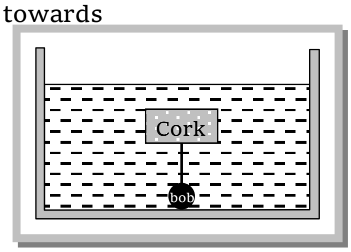
(a) 10 *N* (b) 5 *N* (c) 2.5 *N* (d) Zero

▶▶ Advance level

3. A closed compartment containing gas is moving with some acceleration in horizontal direction. Neglect the effect of gravity. Then the pressure in the compartment is

(a) Same everywhere (b) Lower in front side (c) Lower in rear side (d) Lower in upper side

4. A cork and a metal bob are connected by a string as shown in the figure. If the beaker is given an acceleration towards left then the cork will be thrown towards



(a) Right (b) Left (c) Upwards (d) Downwards

Problems based on Newton's second law of motion

▶ Basic level

5. A body of mass 2 *kg* is moving with a velocity 8 *m*/*s* on a smooth surface. If it is to be brought to rest in 4 *seconds*, then the force to be applied is

(a) 8 *N* (b) 4 *N* (c) 2 *N* (d) 1 *N*

6. A 30 *gm* bullet initially travelling at 120 *m*/*s* penetrates 12 *cm* into a wooden block. The average resistance exerted by the wooden block is

(a) 2850*N* (b) 2200 *N* (c) 2000*N* (d) 1800 *N*

7. A force of 100 dynes acts on mass of 5 *gm* for 10 *sec*. The velocity produced is **[MNR 1987]**

(a) 2 *cm/sec* (b) 20 *cm/sec* (c) 200 *cm/sec* (d) 2000 *cm/sec*

8. A force of 5 *N* acts on a body of weight 9.8 *N*. What is the acceleration produced in $m/\sec^2$

(a) 49.00 (b) 5.00 (c) 1.46 (d) 0.51

9. At a place where the acceleration due to gravity is $10\,m\,\sec^{-2}$ a force of 5 *kg-wt* acts on a body of mass 10 *kg* initially at rest. The velocity of the body after 4 *second* is

(a) $5\,m\,\sec^{-1}$ (b) $10\,m\,\sec^{-1}$ (c) $20\,m\,\sec^{-1}$ (d) $50\,m\,\sec^{-1}$

10. A player caught a cricket ball of mass 150 *gm* moving at a rate of 20 *m/s*. If the catching process be completed in 0.1*s*, then the force of the blow exerted by the ball on the hands of the player is

(a) 0.3 *N* (b) 30 *N* (c) 300 *N* (d) 3000 *N*

11. Gravels are dropped on a conveyor belt at the rate of 0.5 *kg/sec*. The extra force required in *newtons* to keep the belt moving at 2 *m/sec* is

(a) 1 (b) 2 (c) 4 (d) 0.5

Problems based on Newton's third law of motion

▶ *Basic level*

12. Swimming is possible on account of **[AFMC 1998]**

(a) First law of motion (b) Second law of motion (c) Third law of motion (d) Newton’s law of gravitation

13. On stationary sail-boat, air is blown at the sails from a fan attached to the boat. The boat will

(a) Remain stationary (b) Spin around

(c) Move in a direction opposite to that in which air is blown (d) Move in the direction in which the air is blown

14. A book is lying on an inclined plane having inclination to the horizontal θ^o. What is the angle between the weight of the book and the reaction of the plane on the book

(a) 0° (b) θ^o (c) $180^o - \theta^o$ (d) 180°

15. A cannon after firing recoils due to

(a) Conservation of energy (b) Backward thrust of gases produced

(c) Newton’s third law of motion (d) Newton’s first law of motion

16. Newton’s third law of motion leads to the law of conservation of

(a) Angular momentum (b) Energy (c) Mass (d) Momentum

17. When a horse pulls a wagon, the force that causes the horse to move forward is the force

(a) He exerts on the wagon (b) The wagon exerts on him

(c) He exerts on the ground (d) The ground exerts on him

18. The action and reaction forces referred to in Newton’s third law of motion

(a) Must act on the same body

(b) Must act on different bodies

(c) Need not be equal in magnitude but must have the same line of action

(d) Must be equal in magnitude but need not have the same line of action

▶▶ *Advance level*

19. A machine gun is mounted on a 2 quintal vehicle on a horizontal smooth road. (Friction negligible). The gun fires 10 bullets per second with a velocity of $500\ ms^{-1}$. If the mass of each bullet be 10 *g*, what is the acceleration produced in the vehicle

(a) $25\ cm\ s^{-2}$ (b) $25\ ms^{-2}$ (c) $50\ cm\ s^{-2}$ (d) $50\ m\ s^{-2}$

20. In a tug-of-war contest, two men pull on a horizontal rope from opposite sides. The winner will be the man who

(a) Exerts greater force on the rope

(b) Exerts greater force on the ground

(c) Exerts a force on the rope which is greater than the tension in the rope

(d) Makes a smaller angle with the vertical

Problems based on conservation of momentum

▶ Basic level

21. A body, whose momentum is constant, must have constant

(a) Force (b) Velocity (c) Acceleration (d) All of these

22. A man fires a bullet of mass 200 *g* at a speed of 5 *m/s*. The gun is of one *kg* mass, by how much velocity the gun rebounds backwards

[CBSE 1996]

(a) 0.1 *m/s* (b) 10 *m/s* (c) 1 *m/s* (d) 0.01 *m/s*

23. A gun of mass 1 *kg* fires a bullet of mass 1 *g* with a velocity of $1 ms^{-1}$. The recoil velocity of the gun is

(a) $1\ ms^{-1}$ (b) $0.1\ ms^{-1}$ (c) $0.01\ ms^{-1}$ (d) $0.001\ ms^{-1}$

24. A proton is moving with velocity $7\times10^6\ m/s$ towards right and neutron (mass nearly equal to that of proton) is moving with velocity $4\times10^6\ m/s$ towards left. They collide and a deuteron is formed. The deuteron will move with a velocity

(a) $1.5\times10^6\ m/s$ towards left (b) $1.5\times10^6\ m/s$ towards right

(c) $3\times10^6\ m/s$ towards right (d) $3\times10^6\ m/s$ towards left

25. A lead ball and a rubber ball both having the same mass, strike normally on a smooth vertical wall with the same velocity. The lead ball falls down after striking but the rubber ball bounces back. Check the correct statement

(a) The momentum of the lead ball is more than that of the rubber ball

(b) The momentum of the rubber ball is more than that of the lead ball

(c) The rubber ball suffers a greater change in momentum as compared to the lead ball

(d) Both the balls suffer an equal change of momentum

26. A bomb at rest explodes into a large number of tiny fragments. The total momentum of all the fragments

(a) Is zero (b) Depends on the total mass of all the fragments

(c) Depends on the speeds of various fragments (d) Is infinity

27. Nucleus of ${}_{92}U^{238}$ at rest emits an α-particle with velocity of $1.4\times10^7\ m/sec$. The velocity of the remaining nucleus is **[CPMT 1994]**

(a) $2.4\times10^5\ m/sec$ (b) $-2.4\times10^5\ m/sec$ (c) $6.2\times10^4\ m/sec$ (d) $-6.2\times10^5\ m/sec$

▶▶ Advance level

28. A man weighing 80 *kg* is standing in a trolley weighing 320 *kg*. The trolley is resting on frictionless horizontal rails. If the man starts walking on the trolley with a speed of 1 *m/s*, then after 4 *sec* his displacement relative to the ground will be **[CPMT 1988, 89]**

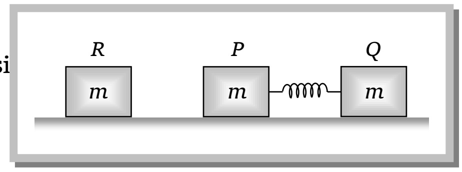
(a) 5 *m* (b) 4.8 *m* (c) 3.2 *m* (d) 3.0 *m*

29. A body of mass 1 *kg* initially at rest, explodes and breaks into three fragments of masses in the ratio 1 : 1 : 3. The two pieces of equal mass fly off perpendicular to each other, with a speed of 30 *m/s* each. What is the velocity of the heavier fragment

[IIT-JEE 1981; CBSE 1991]

(a) 10 *m/s* (b) 20 *m/s* (c) $10\sqrt{2}\ m/s$ (d) $30\sqrt{2}\ m/s$

30. Two elastic blocks *P* and *Q* of equal mass *m* are connected by a massless spring rest on a smooth horizontal surface. A third block *R* of the same mass *m* strikes the block *P* after this collision *P* and *Q* will



(a) Always move in opposite direction

(b) Sometimes move in the same direction and sometimes move in opposi

(c) Always move in the same direction

(d) Be at rest with respect to each other

31. A shell is fired from a cannon with a velocity *v* at an angle θ with the horizontal direction. At the highest point in its path it explodes into two pieces of equal mass. One of the pieces retraces its path to the cannon and the speed of the other piece immediately after the explosion is

(a) $3v\cos\theta$ (b) $2v\cos\theta$ (c) $\frac{3}{2}v\cos\theta$ (d) $\frac{\sqrt{3}}{2}v\cos\theta$

32. A body of mass 5 *kg* explodes at rest into three fragments with masses in the ration 1 : 1 : 3. The fragment with equal masses fly in mutually perpendicular directions with speeds of 21 *metres per sec*. The velocity of the heaviest fragments will be **[CBSE 1991]**

(a) 11.5 *metres per sec* (b) 14.0 *metres per sec* (c) 7.0 *metres per sec* (d) 9.87 *metres per sec*

Problems based on rocket

▶ *Basic level*

33. A rocket is ejecting 50 *g* of gases per sec at a speed of $500\ m/s$. The accelerating force on the rocket will be **[Pb PMT 2**

(a) 125 *N* (b) 25 *N* (c) 5 *N* (d) Zero

34. Rocket works on the principle of conservation of

(a) Mass (b) Energy (c) Momentum (d) None of the above

▶▶ *Advance level*

35. A 5000 *kg* rocket is set for vertical firing. The exhaust speed is $800\ ms^{-2}$. To give an initial upward acceleration of $20\ ms^{-2}$, the amount of gas ejected per second to supply the needed thrust will be $(g = 10\ ms^{-2})$

(a) $127.5\ kg\ s^{-1}$ (b) $187.5\ kg\ s^{-1}$ (c) $185.5\ kg\ s^{-1}$ (d) $137.5\ kg\ s^{-1}$

Problems based on lift

▶ *Basic level*

36. Mass of a person sitting in a lift is 50 *kg*. If lift is coming down with a constant acceleration of 10 m/sec^2. Then the reading of spring balance will be $(g = 10 m/sec^2)$

(a) 0 (b) 1000*N* (c) 100 *N* (d) 10 *N*

37. A boy whose mass is 50 *kg* stands on a spring balance inside a lift. The lift starts to ascend with an acceleration of $2ms^{-2}$. The reading of the machine or balance $(g = 10\ ms^{-2})$ is

(a) $50\,kg$ (b) Zero (c) $49\,kg$ (d) $60\,kg$

38. If rope of lift breaks suddenly, the tension exerted by the surface of lift (a = acceleration of lift)

(a) mg (b) $m(g+a)$ (c) $m(g-a)$ (d) 0

39. The apparent weight of the body, when it is travelling upwards with an acceleration of $2m/s^2$ and mass is 10 *kg*, will be

[Pb PMT 2001]

(a) 198 *N* (b) 164 *N* (c) 140 *N* (d) 118 *N*

40. If the tension in the cable of 1000 *kg* elevator is 1000 *kg* weight, the elevator **[NCERT 1971]**

(a) Is accelerating upwards (b) Is accelerating downwards

(c) May be at rest or accelerating (d) May be at rest or in uniform motion

41. A body of mass 4 *kg* weighs 4.8 *kg* when suspended in a moving lift. The acceleration of the lift is

(a) $9.80\ ms^{-2}$ downwards (b) $9.80\ ms^{-2}$ upwards (c) $1.96\ ms^{-2}$ downwards (d) $1.96\ ms^{-2}$ upwards

42. A boy having a mass equal to 40 *kilograms* is standing in an elevator. The force felt by the feet of the boy will be greatest when the elevator $(g = 9.8\ metres/\sec^2)$

(a) Stand still

(b) Moves downward at a constant velocity of $4\ metres/\sec$

(c) Accelerates downward with an acceleration equal to $4\ metres/\sec^2$

(d) Accelerates upward with an acceleration equal to $4\ metres/\sec^2$

43. If a body of mass *m* is carried by a lift moving with an upward acceleration *a*, then the forces acting on the body are (i) the reaction *R* on the floor of the lift upwards (ii) the weight *mg* of the body acting vertically downwards. The equation of motion will be given by

[MNR 1998]

(a) $R = mg - ma$ (b) $R = mg + ma$ (c) $R = ma - mg$ (d) $R = mg \times ma$

44. An 80 *kg* man stands on a spring balance in an elevator. When it starts to move, the scale reads 700 *N*. What is the acceleration of the elevator $(g = 10\ m/s^2)$

(a) $1.25\ m/s^2$ downwards (b) $2.0\ m/s^2$ upwards (c) $2.0\ m/s^2$ downwards(d)

▶▶ *Advance level*

45. If in a stationary lift, a man is standing with a bucket full of water, having a hole at its bottom. The rate of flow of water through this hole is R_0. If the lift starts to move up and down with same acceleration and then that rates of flow of water are R_u and R_d, then

[UPSEAT 2003]

(a) $R_0 > R_u > R_d$ (b) $R_u > R_0 > R_d$ (c) $R_d > R_0 > R_u$ (d) $R_u > R_d > R_0$

46. A lift accelerated downward with acceleration '*a*'. A man in the lift throws a ball upward with acceleration $a_0 (a_0 < a)$. Then acceleration of ball observed by observer, which is on earth, is

(a) $(a + a_0)$ upward (b) $(a - a_0)$ upward (c) $(a + a_0)$ downward (d) $(a - a_0)$ downward

47. A 60 *kg* man stands on a spring scale in the lift. At some instant he finds, scale reading has changed from 60 *kg* to 50 *kg* for a while and then comes back to the original mark. What should we conclude

(a) The lift was in constant motion upwards

(b) The lift was in constant motion downwards

(c) The lift while in constant motion upwards, is stopped suddenly

(d) The lift while in constant motion downwards, is suddenly stopped

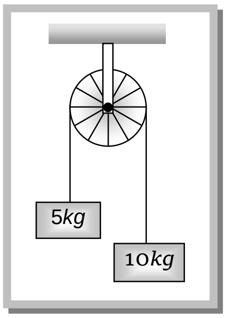
48. The mass of a body measured by a physical balance in a lift at rest is found to be m. If the lift is going up with an acceleration a, its mass will be measured as

(a) $m\left(1-\frac{a}{g}\right)$ (b) $m\left(1+\frac{a}{g}\right)$ (c) m (d) Zero

Problems based on pulley

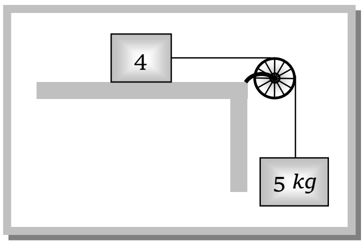
Basic level

49. Two masses of 5 *kg* and 10 *kg* are connected to a pulley as shown. What will be the acceleration of the system (g = acceleration due to gravity)



(a) g (b) $\frac{g}{2}$ (c) $\frac{g}{3}$ (d) $\frac{g}{4}$

50. Two masses of 4 *kg* and 5 *kg* are connected by a string passing through a frictionless pulley and are kept on a frictionless table as shown in the figure. The acceleration of 5 *kg* mass is

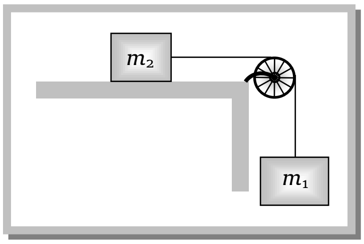


(a) $49\ m/s^2$ (b) $5.44\ m/s^2$ (c) $19.5\ m/s^2$ (d) $2.72\ m/s^2$

51. As shown in figure a monkey of 20 *g* mass is holding a light rope that passes over a frictionless pulley. A bunch of bananas of the same mass is tied to the other end of rope. In order to get access to the branch the monkey starts climbing the rope. The distance between the monkey and the bananas is

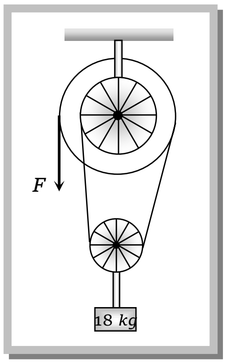
(a) Decreasing (b) Increasing (c) Unchanged (d) Nothing can be stated

52. A mass m_1 hanging at the end string, draws a mass m_2 along the surface of a smooth table if the mass on the table be doubled the tension in string becomes, 1.5 times then m_1/m_2 is



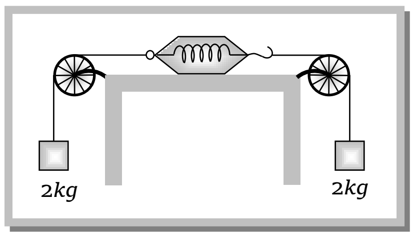
(a) 2 : 1 (b) 1 : 2 (c) 3 : 1 (d) 1 : 3

53. In the figure at the free end a force F is applied to keep the suspended mass of 18 *kg* at rest



(a) 180 N (b) 90 N (c) 60 N (d) 30 N

54. As shown in the figure, two equal masses each of 2 *kg* are suspended from a spring balance. The reading of the spring balance will be



(a) Zero (b) 2 *kg* (c) 4 *kg* (d) Between zero and 2 *kg*

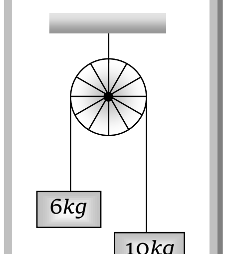
55. Two masses 2 *kg* and 3 *kg* are attached to the end of the string passed over a pulley fixed at the top. The tension and acceleration are

(a) $\frac{7g}{8};\frac{g}{8}$ (b) $\frac{21g}{8};\frac{g}{8}$ (c) $\frac{21g}{8};\frac{g}{5}$ (d) $\frac{12g}{5};\frac{g}{5}$

56. A 2 *kg* block is lying on a smooth table which is connected to a body of mass 1 *kg* by a string which passes through a pulley. The 1 *kg* mass is hanging vertically. The acceleration of block and tension in the string will be

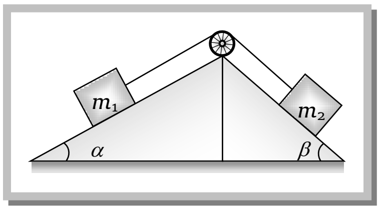
(a) $3.27\ m/s^2, 6.54\ N$ (b) $4.38\ m/s^2, 6.54\ N$ (c) $3.27\ m/s^2, 9.86\ N$ (d) $4.38\ m/s^2, 9.86\ N$

57. A light string passes over a frictionless pulley. To one of its ends a mass of 6 *kg* is attached. To its other end a mass of 10 *kg* is attached (see figure). The tension in the thread will be



(a) 24.5 N (b) 2.45 N (c) 79 N (d) 73.5 N

58. Two masses M_1 and M_2 are attached to the ends of string which passes over the pulley attached to the top of a double inclined plane. The angles of inclination of the inclined planes are α and β. See fig answer the following questions. Take $g = 10\ ms^2$



If $M_1 = M_2$ and $\alpha = \beta$, what is the acceleration of the system

(a) Zero (b) $2.5\ ms^{-2}$ (c) $5\ ms^{-2}$ (d) $10\ ms^{-2}$

59. In the above problem (58), if $M_1 = M_2 = 5\ kg$ and $\alpha = \beta = 30°$, what is the tension in the string

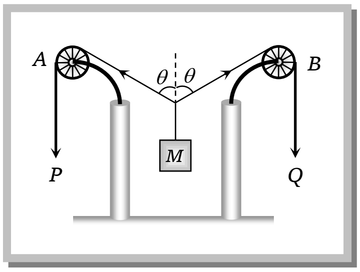
(a) 100 N (b) 50 N (c) 25 N (d) 12.5 N

▶▶ *Advance level*

60. A pulley fixed to the ceilling carries a string with blocks of mass m and 3 m attached to its ends. The masses of string and pulley are negligible. When the system is released, its centre of mass moves with what acceleration

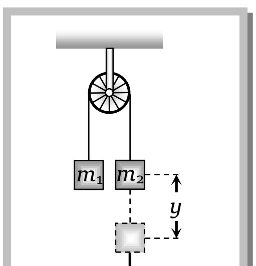
(a) 0 (b) $g/4$ (c) $g/2$ (d) $-g/2$

61. In the arrangement shown to figure the ends P and Q of an unstretchable string move down wards with uniform speed U. Pulleys A and B are fixed. Mass M moves upwards with a speed



(a) $2U\cos\theta$ (b) $U\cos\theta$ (c) $\frac{2U}{\cos\theta}$ (d) $\frac{U}{\cos\theta}$

62. Two bodies of mass m_1 and m_2 $(m_1 < m_2)$ are connected by a light string. The string passes over a frictionless pulley. The speed of the heavier body, when it has covered a distance y, will be

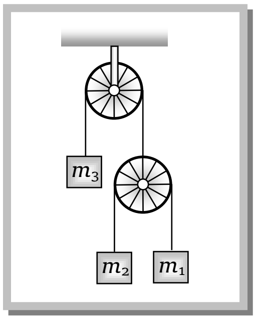


(a) $\sqrt{\frac{m_2 - m_1}{m_1 + m_2} gy}$ (b) $\sqrt{\frac{m_1 m_2}{m_1 + m_2} gy}$ (c) $\sqrt{\frac{2(m_2 - m_1)}{m_2 + m_1} gy}$ (d) None of them

63. Two masses m_1 and m_2 are connected by a light string passing over a smooth pulley. When set free, m_1 moves downwards by 1.4 m in 2s. The ratio m_1 / m_2 is $(g = 9.8\ m/s^2)$

(a) $\frac{9}{7}$ (b) $\frac{11}{9}$ (c) $\frac{13}{11}$ (d) $\frac{15}{13}$

64. Three masses m_1, m_2 and m_3 are attached to a string pulley system as shown. All three masses are held at rest and then released. To keep m_3 at rest, the condition is

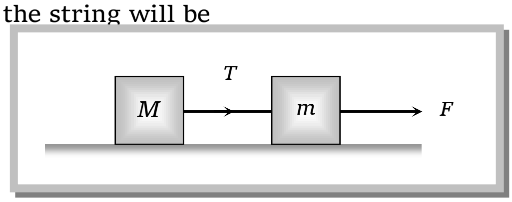


(a) $\frac{1}{m_3} = \frac{1}{m_1} + \frac{1}{m_3}$ (b) $m_1 + m_2 = m_3$ (c) $\frac{4}{m_3} = \frac{1}{m_1} + \frac{1}{m_2}$ (d) $\frac{1}{m_1} + \frac{2}{m_2} = \frac{3}{m_3}$

Problems based on connected motion by string

▶ *Basic level*

65. Two masses M and m are connected by a weight less string. They are pulled by a force F on a frictionless horizontal surface. The tension in the string will be

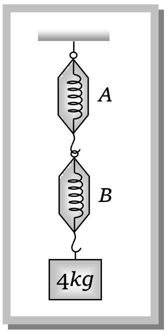


(a) $\frac{FM}{m+M}$ (b) $\frac{F}{M+m}$ (c) $\frac{FM}{m}$ (d) $\frac{Fm}{M+m}$

66. In the above problem (65), the acceleration of mass m is

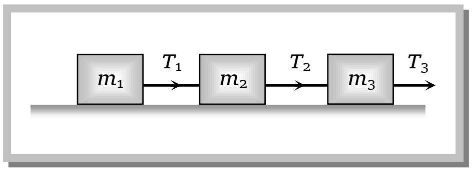
(a) $\frac{F}{m}$ (b) $\frac{F-T}{m}$ (c) $\frac{F+T}{m}$ (d) $\frac{F}{M}$

67. A block of mass 4 *kg* is suspended through two light spring balances *A* and *B*. Then *A* and *B* will read respectively **[AIIMS 1995]**



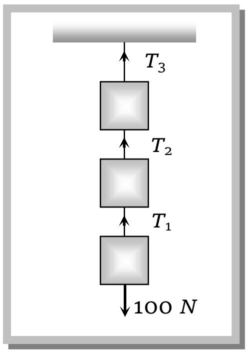
(a) 4 *kg* and zero *kg* (b) Zero *kg* and 4 *kg* (c) 4 *kg* and 4 *kg* (d) 2 *kg* and 2 *kg*

68. Three blocks of masses m_1, m_2 and m_3 are connected by massless strings as shown in the figure on a frictionless table. They are pulled with a force $T_3 = 40\ N$ If $m_1 = 10\ kg.\ m_2 = 6\ kg$ and $m_3 = 4\ kg$. The tension T_2 will be



(a) 20 *N* (b) 40 *N* (c) 10 *N* (d) 32 *N*

69. Three blocks of equal masses (each 3 *kg*) are suspended by weightless strings as shown. If applied force is 100 *N*, then T_1 is equal to $(g = 10\ ms^2)$



(a) 130 *N* (b) 190 *N* (c) 100 *N* (d) 160 *N*

70. In the above problem, T_2 is equal to

(a) 190 *N* (b) 160 *N* (c) 130 *N* (d) 100 *N*

71. A fireman wants to slide down a rope. The breaking load for the rope is $\frac{3}{4}th$ of the weight of the fireman. With what minimum acceleration should he slide down

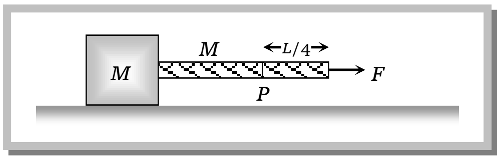
(a) g (b) $\frac{3g}{4}$ (c) $\frac{g}{4}$ (d) $\frac{g}{8}$

▶▶ *Advance level*

72. Two balls of mass 1 *kg* and 2 *kg* respectively are connected to the two ends of the spring. The two balls are pressed together and placed on a smooth table. When released, the lighter ball moves with an acceleration of $2\ ms^{-2}$. The acceleration of the heavier ball will be

(a) $4\ ms^{-2}$ (b) $2\ ms^{-2}$ (c) $1\ ms^{-2}$ (d) $0.5\ ms^{-2}$

73. A block of mass M is pulled by a uniform chain of mass M tied to it by applying a force F at the other end of the chain. The tension at a point distant quarter of the length of the chain from free end will be



(a) $\frac{7F}{8}$ (b) $\frac{4F}{5}$ (c) $\frac{3F}{4}$ (d) $\frac{6F}{7}$

Problems based on force and equilibrium

▶ *Basic level*

74. Which of the following sets of concurrent forces may be in equilibrium

(a) $F_1 = 3N,\ F_2 = 5N,\ F_3 = 9N$ (b) $F_1 = 3N,\ F_2 = 5N,\ F_3 = 1N$

(c) $F_1 = 3N, F_2 = 5N, F_3 = 15N$ (d) $F_1 = 3N,\ F_2 = 5N,\ F_3 = 6N$

75. 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

(a) F_1 / m (b) F_2F_3 / mF_1 (c) $(F_2 - F_3)/m$ (d) F_2 / m

76. An object will continue accelerating until **[CPMT 1975]**

(a) The resultant force acting on it begins to decrease

(b) The resultant force on it is zero

(c) The resultant force is at right angle to its rotation

(d) The resultant force on it is increased continuously

77. A body is in equilibrium under the action of three forces $\vec{F_1}$, $\vec{F_2}$ and $\vec{F_3}$. Which of the following statements is wrong

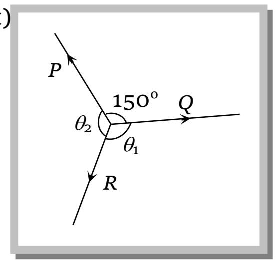
(a) $\vec{F_1} + \vec{F_2} + \vec{F_3} = 0$

(b) $\vec{F_1}, \vec{F_2}, \vec{F_3}$ can be represented by the three sides of a triangle taken in order

(c) $F_1 + F_2 + F_3 = 0$

(d) None of the above

78. P, Q and R are three coplanar forces acting at a point and are in equilibrium. Given P = 1.9318 kg wt, $\sin\theta_1 = 0.9659$, the value of R in (in kg wt)



(a) 0.9659 (b) 2 (c) 1 (d) $\frac{1}{2}$

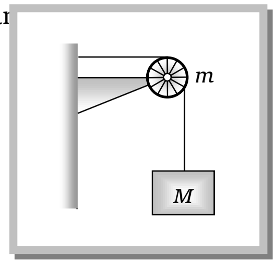
79. Three concurrent forces of the same magnitude are in equilibrium. What is the angle between the forces. Also name the triangle formed by the forces as sides

(a) 60° equilateral triangle (b) 120° equilateral triangle

(c) 120°, 30°, 30° an isosceles triangle (d) 120° an obtuse angled triangle

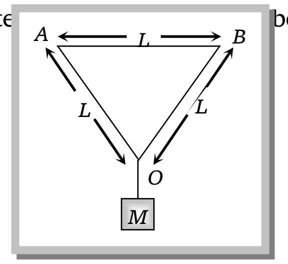
▶▶ *Advance level*

80. A string of negligible mass going over a clamped pulley of mass m supports a block of mass M as shown in the figure. The force on the pulley by the clar



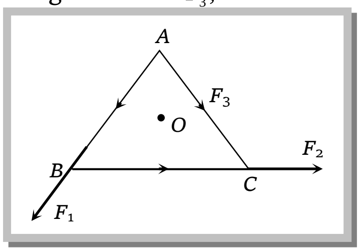
(a) $\sqrt{2}Mg$ (b) $\sqrt{2}mg$ (c) $\sqrt{(M+m)^2+m^2}\,g$ (d) $\sqrt{(M+m)^2+M^2}\,g$

81. In the following figure, the length of the rod AB is L. A weight of 1000 *Kg*. is suspended from its two ends with the help of two strings of length L. The te be



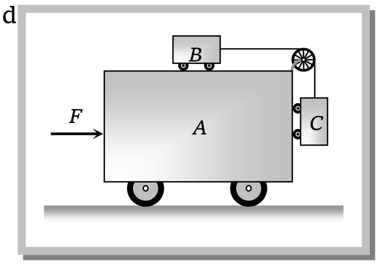
(a) $\dfrac{5\times10^3}{\sqrt{3}}N$ (b) $5\times10^3 N$ (c) $5\times10^3\times\sqrt{3}\,N$ (d) Zero

82. O is the centre of an equilateral triangle ABC. F_1, F_2 and F_3 are three forces acting along the sides AB, BC and AC as shown here. What should be the magnitude of F_3, so that the total torque about O is zero



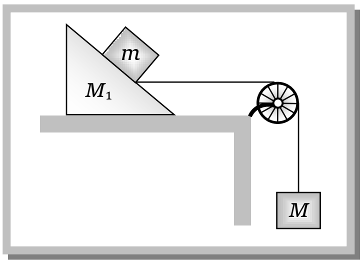
(a) $(F_1+F_2)/2$ (b) $2(F_1+F_2)$ (c) (F_1+F_2) (d) (F_1-F_2)

83. A frictionless cart A of mass 100 *kg* carries other two frictionless carts B and C having masses 8 *kg* and 4 *kg* respectively connected by a string passing over a pulley as shown in the figure. What horizontal force F must be applied on the cart so that smaller cart d



(a) 150 N (b) 340 N (c) 560 N (d) 630 N

84. Find the mass M of the hanging block shown in figure. Which will prevent the smaller block from slipping over the triangular block. All the surfaces are friction less and the strings and the pulleys are light



(a) $\frac{m+M_1}{(\sin\theta-1)}$ (b) $\frac{m+M_1}{(\cos\theta-1)}$ (c) $\frac{m+M_1}{(\tan\theta-1)}$ (d) $\frac{m+M_1}{(\cot\theta-1)}$

Miscellaneous problems

85. A bird is resting on the floor of an air tight box suspended from a spring balance. If the bird starts flying, how will the reading of spring balance change

(a) It cannot be predicted (b) It will remain unchanged (c) It will be less then earlier (d) It will be more than earlier

86. A ship of mass 3×10^7 kg initially at rest is pulled by a force of 5×10^4 N through a distance of 3m. Assume that the resistance due to water is negligible, the speed of the ship is

(a) 1.5 m/s (b) 60 m/s (c) 0.1 m/s (d) 5 m/s

87. A body kept on a smooth inclined plane having inclination 1 in x will remain stationary relative to the inclined plane if the plane is given a horizontal acceleration equal to

(a) $\sqrt{x^2-1g}$ (b) $\frac{\sqrt{x^2-1}}{x}g$ (c) $\frac{gx}{\sqrt{x^2-1}}$ (d) $\frac{g}{\sqrt{x^2-1}}$

88. A satellite in force-free space sweeps stationary interplanetary dust at a rate $\frac{dM}{dt}=\alpha v$, where M is the mass and v is the velocity of the satellite and α is a constant. The deceleration of the satellite is

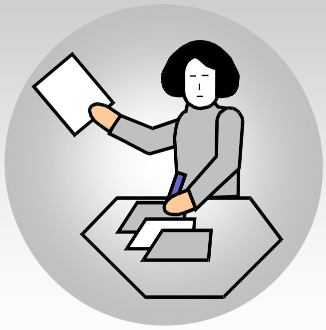
(a) $-\frac{2\alpha v^2}{M}$ (b) $-\frac{\alpha v^2}{M}$ (c) $-\frac{\alpha v^2}{2M}$ (d) $-\alpha v^2$

89. A force of $(\hat{i}+\hat{j})N$ acts on a particle of mass 0.1 kg. If it starts from rest, its position at t = 1s will be

(a) $(5\hat{i}+6\hat{j})m$ (b) $(\hat{i}+5\hat{j})m$ (c) $(5\hat{i}+5\hat{j})$ (d) $(\hat{i}+\hat{j})m$

90. A block slides down an inclined plane of slope angle θ with constant velocity, it is then projected up on the same plane with an initial velocity V_0. How far up the incline will it move before coming to rest

(a) $\frac{4g\sin\theta}{V_0^2}$ (b) $\frac{4V_0^2}{g\sin\theta}$ (c) $\frac{V_0^2}{4g\sin\theta}$ (d) $\frac{V_0^2 g}{4\sin\theta}$



Answer Sheet (Practice problems)

1.	**2.**	**3.**	**4.**	**5.**	**6.**	**7.**	**8.**	**9.**	**10.**
b	d	b	b	b	d	c	b	c	b
11.	**12.**	**13.**	**14.**	**15.**	**16.**	**17.**	**18.**	**19.**	**20.**
a	c	a	c	c	d	d	b	a	b
21.	**22.**	**23.**	**24.**	**25.**	**26.**	**27.**	**28.**	**29.**	**30.**
b	c	d	b	c	a	b	c	c	c
31.	**32.**	**33.**	**34.**	**35.**	**36.**	**37.**	**38.**	**39.**	**40.**
a	d	b	c	b	a	d	d	d	d
41.	**42.**	**43.**	**44.**	**45.**	**46.**	**47.**	**48.**	**49.**	**50.**
d	d	b	a	b	d	c	c	c	b
51.	**52.**	**53.**	**54.**	**55.**	**56.**	**57.**	**58.**	**59.**	**60.**
b	a	b	b	d	a	d	a	c	b
61.	**62.**	**63.**	**64.**	**65.**	**66.**	**67.**	**68.**	**69.**	**70.**
d	c	d	c	a	b	c	d	a	b
71.	**72.**	**73.**	**74.**	**75.**	**76.**	**77.**	**78.**	**79.**	**80.**
c	c	a	d	a	b	c	c	b	d
81.	**82.**	**83.**	**84.**	**85.**	**86.**	**87.**	**88.**	**89.**	**90.**
a	c	c	d	b	c	d	b	c	c