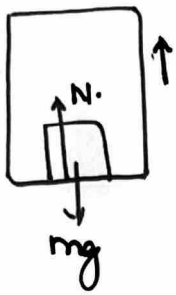
I. **Normal force**

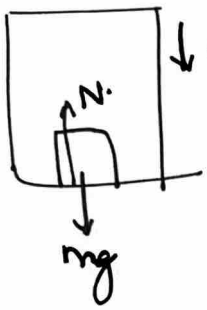
(i)



$N - mg = ma$

$N = mg + ma$

(ii)



$mg - N = ma$

$N = mg - ma$.

* Weight displayed on platform weight scale is "Normal force value"

× × ×

II. rope of length 'L' on smooth surface

$\boxed{T = \left(\frac{x}{L}\right)F}$ 'x' - measured from free end.

× × ×

III. T_{max} → Maximum tension.

If tension max. value is given use it to a_{max} or a_{min} as per situation.

× × ×

1Q. A person's weight is 500N. Find his weighing scale reading if he is inside a lift which is

(i) accelerating upwards at 5m/s²

(ii) accelerating down at 2m/s².

(iii) retarding up at 3m/s²

(iv) going down at const. vel = 5m/s.

× × ×

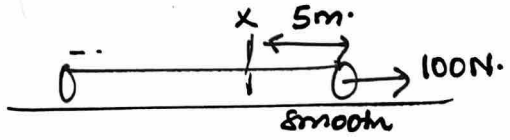
2Q. In an elevator which can accelerate & decelrate at same rate. Maximum & minimum weight's are of a man are 720N & 500N.

(i) Calculate mass of the man.

(ii) Calculate the magnitude of acceleration of man.

× × ×

3Q.



If rope is of length '20m', find tension at x.

Spring force (F_s).

* spring force = $k \cdot x$.

k - spring constant unit (N/m).

x - elongation / compression.

* spring force does not adjust to change immediately.

× × ×

* Spring / string when cut, thier force = 0.

× × ×

1. 

(i) Find tension & spring force at equilibrium stage

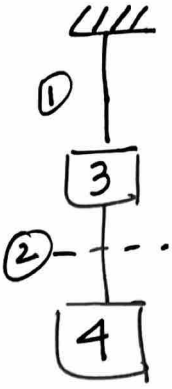
(ii) If string is cut, find acceleration of both blocks.

2. 

Find acceleration of both the block when

(i) (2) spring is cut.

(ii) (1) spring is cut.

3. 

If string (2) is cut find both accelerations.

4.

Worksheet 1

1. A person sitting in an open car moving at constant velocity throws a ball vertically up. The ball falls
   (a) outside the car
   (b) in the car ahead of the person
   (c) in the car to the side of the person
   (d) exactly in the hand which threw it up

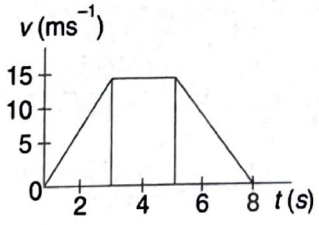
2. An object will continue accelerating until
   (a) the resultant force on it begins to decrease
   (b) its velocity changes direction
   (c) the resultant force on it is zero
   (d) the resultant force is at right angles to its direction of motion

3. In which of the following cases the net force is not zero on the "underlined" object?
   (a) A kite skillfully held stationary in the sky
   (b) A ball freely falling from a height
   (c) An aeroplane rising upwards at an angle of 45° with the horizontal at a constant speed
   (d) A cork lying on the surface of water

4. A block of mass 4kg is suspended through two light spring balances A and B. Then A and B will read respectively

   (a) 4kg and 0kg
   (b) 0 kg and 4kg
   (c) 4kg and 4kg
   (d) 2kg and 2kg

5. A particle of mass 50 g moves on a straight line. The variation of speed with time is shown in the figure. The force acting on the particle at time t = 2 s, 4 s and 6 s will be

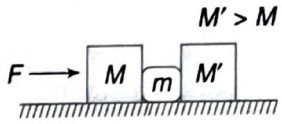


   (a) 0.25 N along the motion, 0 N and 0.25 N opposite to the motion respectively
   (b) 0.25 N opposite to the motion, 0 N and 0.25 N along the motion respectively
   (c) 0 N, 0.25 N opposite to the motion and 0.25 N along the motion respectively
   (d) None

6. An elevator weighing 400kg is pulled upward by a cable with an acceleration of 5 ms^{-2}. Taking g to be 10 ms^{-2}, tension in the cable is
   (a) 6000 N (b) 9000 N
   (c) 60000 N (d) 90000 N

7. The ratio of the weight of a man in a stationary lift and when it is moving downward with uniform acceleration 'a' is 3 : 2. Value of 'a' is
   (a) 3/2 g (b) g/3
   (c) 2/3 g (d) g

8. A small object of mass m is placed between two blocks of mass M and M' as shown in the figure. A constant force F is applied in the horizontal direction on the block of mass M as shown and the system gets accelerated. Contact force between M and m is N and between m and M' is N' then

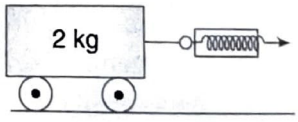


   (a) $N = N'$ (b) $N > N'$
   (c) $N' > N$ (d) cannot be determined

9. Two persons are holding a light rope tightly at its ends so that it is horizontal. A 25kg weight is attached to the rope at the mid point and the rope is no longer horizontal. The minimum tension required to completely straighten the rope is
   (a) 15kg (b) $\frac{15}{2}$kg
   (c) 5kg (d) infinitely large

10. 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 him. His hands are at a distance of about 2 m. The apple will fall
    (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 these

11. A massless spring balance is attached to a 2kg trolley and is used to pull the trolley along a flat surface as shown in the figure. The reading on the spring balance remains at 1.0 kg during the motion. The acceleration of the trolley is (Use g = 9.8 ms^{-2})



    (a) 49 ms^{-2} (b) 9.8 ms^{-2}
    (c) 4.9 ms^{-2} (d) 98 ms^{-2}

12. A person standing on the floor of an elevator drops a coin. The coin reaches the floor of the elevator in time t_1 when elevator is stationary, in time t_2