# How to Solve the Force Problems

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1) *First Draw Nice diagram of Situation and show all the forces acting the system with vector*

2) *Draw the Free body diagram for each body in the system and show all the forces acting on it with nice arrows and vector*

3) *Choose an suitable XY Coordinate system and resolve all the force on the X and Y direction . And apply F=ma equation separately to x and y components*

4) *Check the list of known and unknown values and solve the equations formed by Newton's law to reach at the value of unknown. Keep in mind, we need as many equation as many unknown values.*

5) *Units could be very helpful in some cases. The equation should have same unit on both sides.*

Question : Consider a three body system shown in figure below
1) Find the acceleration of the each object
2) Find the contact force between all the objects
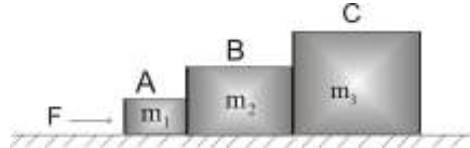
Solution

- Let a be the acceleration of the system

- Let f1 be the contact force between A and B

- Let f2 be the contact force between B and C

- Let's draw free body diagram for each object
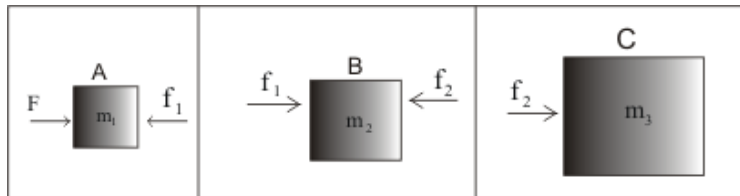
Solution continued

For object A

F- f1 = m1a   ---(1)

For object B

f1 – f2 =m2 a ---(2)

For object C

 f2 =m3 a ---(3)

Adding 1 ,2 and 3 we get

$$a= \frac{F}{m_1 + m_2 + m_3}$$

Substituting the value in 1 and 3 ,we get

$$f_1 = \frac{(m_2 + m_3)F}{m_1 + m_2 + m_3}$$

$$f_2 = \frac{m_3 F}{m_1 + m_2 + m_3}$$

Question : A Body of mass m moves along X axis such that at time t, its position is given by

$$x(t) = at^4 - bt^3 + ct$$

Where a, b, c are constant.
Find the acceleration of the body and force acting on it

Solution: Velocity and acceleration could be find out using the first and second differential

$$\frac{dx}{dt} = 3at^3 - 3bt^2 + c$$

$$\frac{d^2x}{dt^2} = 9at^2 - 6bt$$

According to Newton's Law, Force is given by

F=ma

So

$$F = m(9at^2 - 6bt) = 3mt(3t - 2b)$$