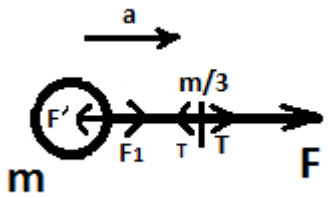
Answer to Question #69712, Physics / Mechanics | Relativity

Question:

A block of mass m is resting on smooth horizontal surface one end of a uniform rope of mass m/3 in fixed to block which is pulled in horizontal direction by applying force at other end find the tension in the middle of rope

Solution:



Taking in to account that the whole system moves with the same acceleration we can write

$$F = \left(m + \frac{m}{3}\right) a = \frac{4}{3} ma$$

$$a = \frac{3F}{4m}$$

Then the force applied by the rope to the block is equal

$$F' = F_1 = ma = \frac{3}{4} F$$

The tension in the middle of the rope is then equal

$$\boldsymbol{T} = F + F' = F + \frac{3}{4} F = \frac{\mathbf{7}}{\mathbf{8}} \boldsymbol{F}$$