One end of a massless string is connected to block A of mass 5.0 kg placed on a horizontal table. The co-efficient of kinetic friction between the table and the surface is 0.3. Block B of mass 3.0 kg hangs from the other end of the string which runs over a frictionless, massless pulley..

a) Find the acceleration on the blocks
b) Find the tension on the string.

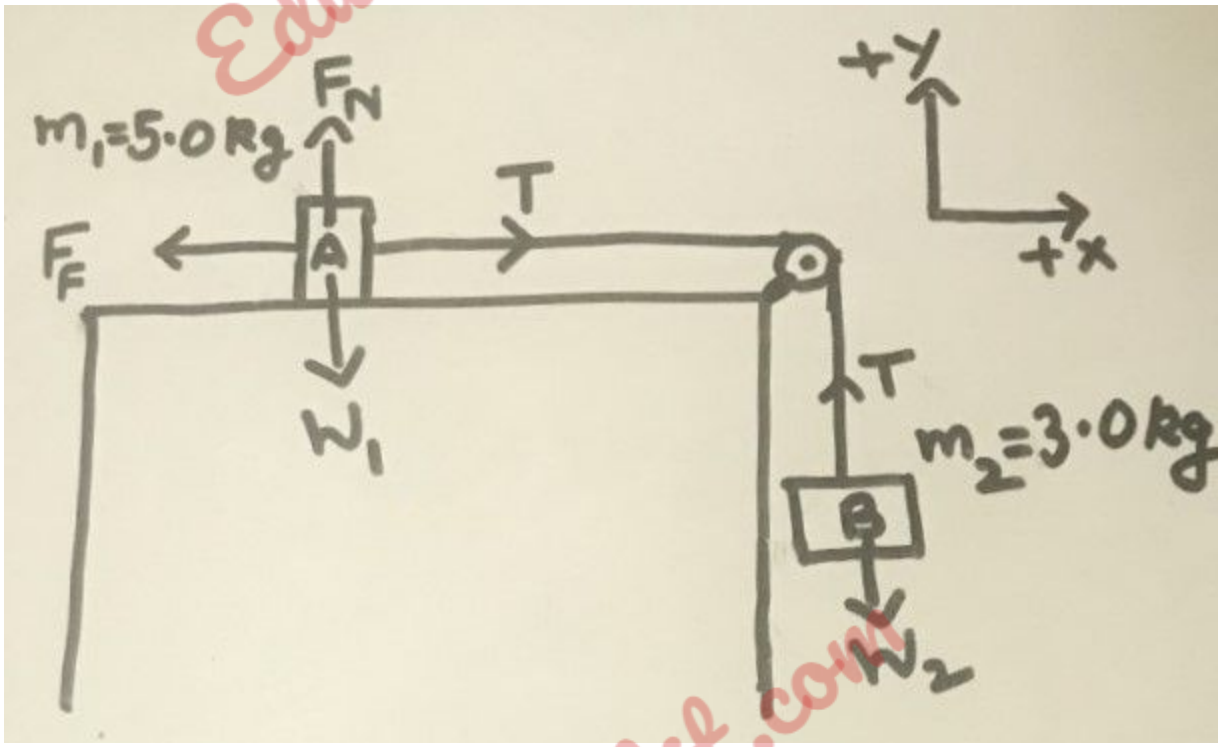

Fig (1)

a) Determine: acceleration on the blocks: a

Given:

Mass of block A: $m_1 = 5.0$ kg
Mass of block B $m_2 = 3.0$ kg
Co-efficient of kinetic friction between block A and the table surface: $\mu_k = 0.3$

Known:
Acceleration due to gravity: $g = -9.8\ m/s^2$

a) Determine: acceleration of the blocks: a

From fig (1):

Resultant force on block A in X-direction:

$$F_{ARX} = m_1 a = T - F_F \text{ ----------(1)}$$

Resultant force on block B in Y-direction:

$$F_{BRY} = m_2 a = W_2 - T = m_2 g - T \text{ ----------(2)}$$

Combining (1) and (2):

$$m_1 a + F_F = m_2 g - m_2 a \text{ ----------(3)}$$

Rearranging (3):

$$(m_1 + m_2) \times a = m_2 g - F_F \text{ ---------(4)}$$

But frictional force $F_F = \mu_k F_N = \mu_k \times m_1 g$

$F_F = 0.3 \times 5 \times | -9.8 | = 14.7$ N

Substituting for m_1, m_2, g and F_F in (4):

$$\mathbf{a = [(3 \times | -9.8 |) - 14.7] / (5 + 3) = 1.8\ m/s^2}$$

b) Determine: tension in the string: T

Using equation (1):

$$\mathbf{T = m_1 a + F_F = (5 \times 1.8) + 14.7 = 24\ N}$$

N is Newtons, the unit of force.

1 N = 1 kg m / s^2.