Answer on Question #40806 - Physics - Mechanics

A 20 kg block on an inclined plane is pulled up the plane with a rope tied to the block. The rope is at angle of 37 degrees above the surface of the plane. The tension in the rope is 250 N and the frictional force on the block is 8.0 N.What is the acceleration of the block?

Solution



We have, according the second Newton's law that the

$$m = 20kg$$

$$\alpha = 37^{\circ}$$

$$F = 250N$$

$$F_f = 8.0N$$

 $m\vec{a} = \vec{F}_f + \vec{P} + m\vec{g} + \vec{F}$

Where \vec{F}_f is frictional force, \vec{P} is reaction force of floor, $m\vec{g}$ is gravitational force, \vec{F} is force applied at an angle of 37 degrees above the horizontal pulls

In terms of projections on directions, which are parallel and perpendicular to plane, have

$$\begin{cases} ma = F - F_f - mg \sin \alpha \\ mg \cos \alpha - P = 0 \end{cases} \Rightarrow$$
$$a = \frac{F - F_f - mg \sin \alpha}{m} = 6.2 \frac{m}{s^2}$$

Answer: $a = 6.2 \frac{m}{s^2}$