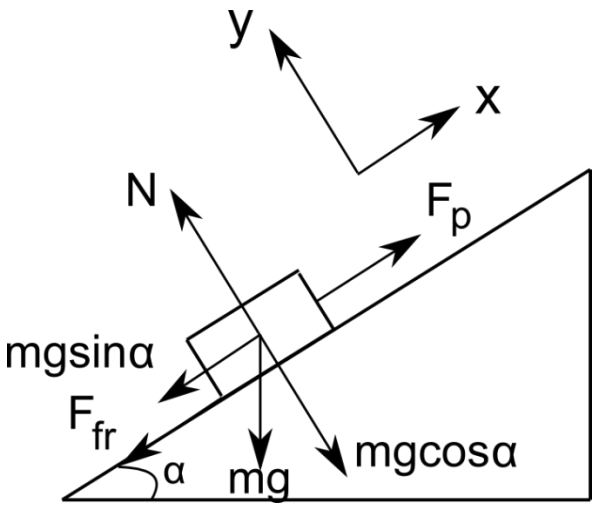
Answer on Question 76950, Physics, Other

Question:

A patient of mass 75 kg sits in a wheelchair of mass 30 kg. What is the force needed to push her (and the chair) up a 30° slope?

Solution:

There are four forces acting on the wheelchair during it moves up the slope: pushing force, the friction force, combined weight of a patient and a wheelchair (this one has two components: perpendicular and parallel to the plane) and the normal force as depicted in the picture.



Let's write the Newton's Second Law of Motion in projections on axis x. Since, the wheelchair moves up the slope with constant velocity, we can wright:

$$\sum F_x = ma_x = 0,$$

$$F_p - mgsin\alpha - F_{fr} = 0,$$

$$F_p = mgsin\alpha + F_{fr}.$$

Since, we need to know what force needed just to push the wheelchair up the slope, we can assume that the friction force is equal to zero. Then, we get:

$$F_p = mgsin\alpha = (75\ kg + 30\ kg) \cdot 9.8\ \frac{m}{s^2} \cdot sin30^\circ = 514.5\ N.$$

Answer:

$F_p = 514.5\ N.$