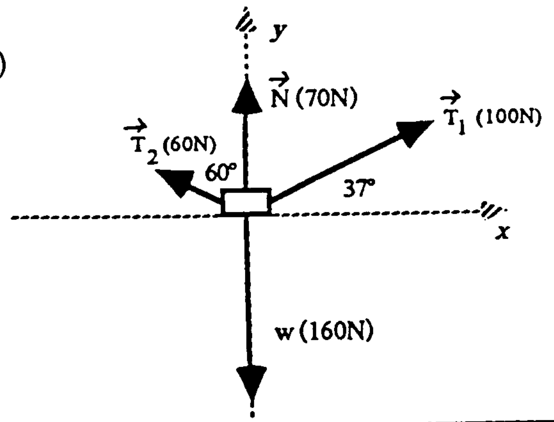
Changing Representations 1

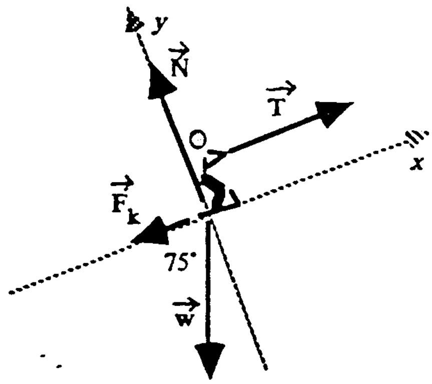
For each free-body diagram shown below, apply Newton's second law in component form. Use $w = mg$ to find the unknown masses and assume that $g = 10\ m/s^2$.

(a)



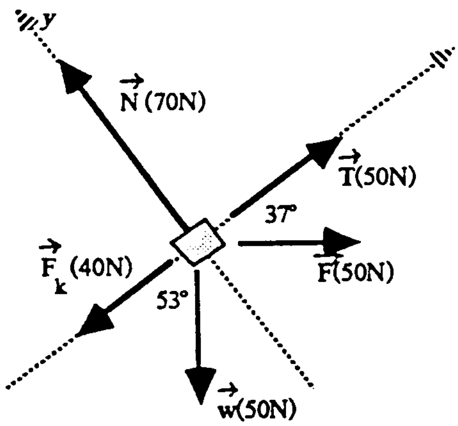
Apply Newton's second law in component form to the above free-body diagram.

(b)



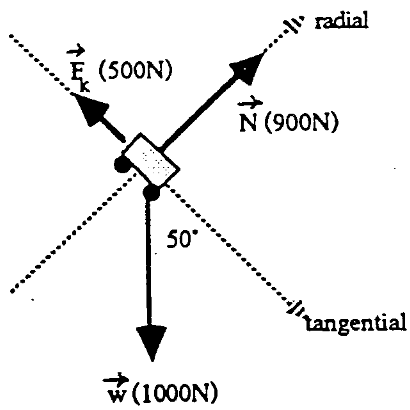
Apply Newton's second law in component and symbolic form to the above free-body diagram.

(c)



Apply Newton's second law in component form to the above free-body diagram.

(d)



Apply Newton's second law in component form to the above free-body diagram.

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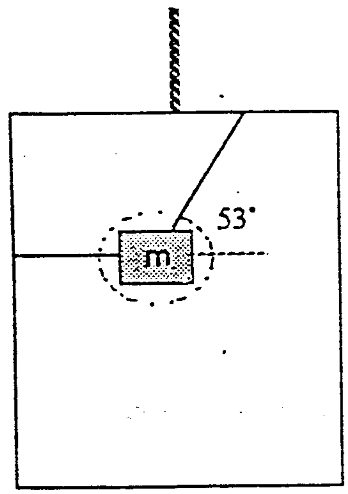
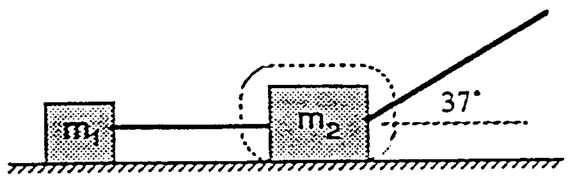
A FIPSE Project

Changing Representations 2

For each of the two situations shown below, construct a free-body diagram for the circled object and then apply Newton's second law in component form for that free-body diagram. Place symbols in the sketches below to identify quantities involved in the free-body diagram.



The elevator is accelerating up.



The blocks are accelerating right.

Construct a free-body diagram for mass m.

Construct a free-body diagram for mass m_2.

Apply Newton's second law in component form to the free-body diagram shown above.

Apply Newton's second law in component form to the free-body diagram shown above.

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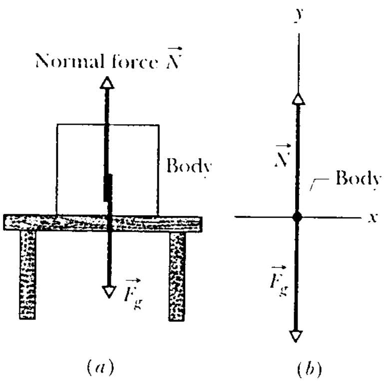
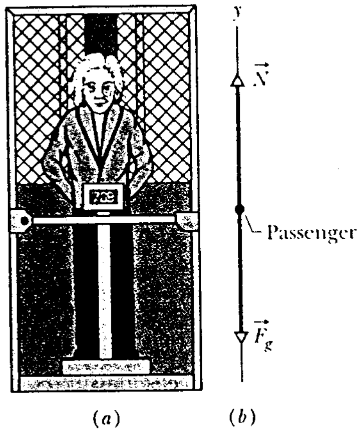


Fig. 5-8 (*a*) A body resting on a tabletop experiences a normal force $\vec{N}$ perpendicular to the tabletop. (*b*) The corresponding free-body diagram for the body.

Fig. 5-19 Sample Problem 5-8. (*a*) A passenger stands on a platform scale that indicates his weight or apparent weight. (*b*) The free-body diagram for the passenger, showing the normal force $\vec{N}$ on him from the scale and the gravitational force $\vec{F}_g$.



4. In Fig. 5-23, two forces $\vec{F}_1$ and $\vec{F}_2$ act on a "Rocky and Bullwinkle" lunch box as the lunch box slides at constant velocity over a frictionless lunchroom floor. We are to decrease the angle θ of $\vec{F}_1$ without changing the magnitude of $\vec{F}_1$. To keep the lunch box sliding at constant velocity, should we increase, decrease, or maintain the magnitude of $\vec{F}_2$?

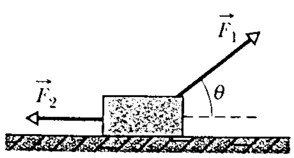


Fig. 5-23 Question 4.

36P. In Fig. 5-37, three blocks are connected and pulled to the right on a horizontal frictionless table by a force with a magnitude of $T_3 = 65.0$ N. If $m_1 = 12.0$ kg, $m_2 = 24.0$ kg, and $m_3 = 31.0$ kg, calculate (a) the acceleration of the system and the tensions (b) T_1 and (c) T_2 in the interconnecting cords.

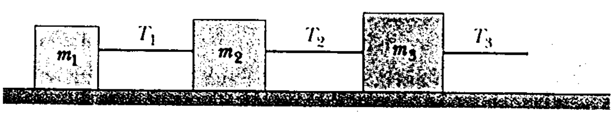


Fig. 5-37 Problem 36.

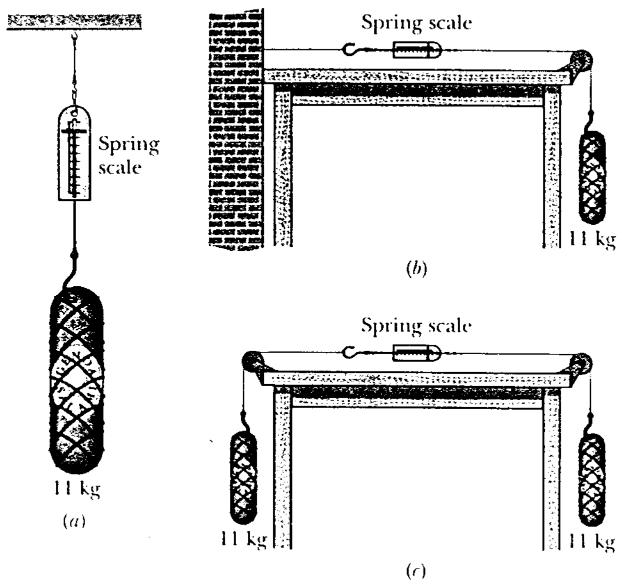
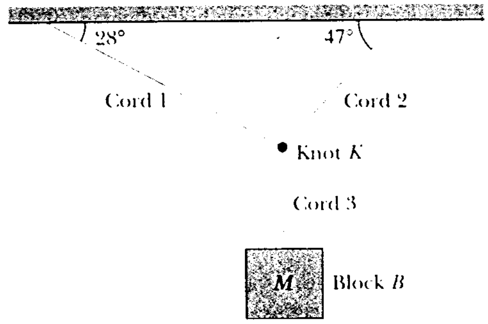


Fig. 5-33 Exercise 9.

Sample Problem 5-6

In Fig. 5-17a, a block B of mass M = 15.0 kg hangs by a cord from a knot K of mass m_K, which hangs from a ceiling by means of two other cords. The cords have negligible mass, and the magnitude of the gravitational force on the knot is negligible compared to the gravitational force on the block. What are the tensions in the three cords?

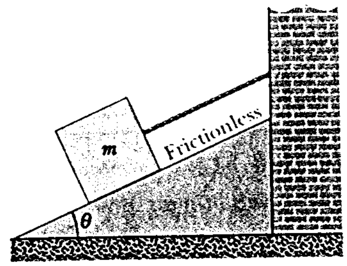


(a)

Sample Problem 5-7

In Fig. 5-18a, a cord holds stationary a block of mass m = 15 kg, on a frictionless plane that is inclined at angle θ = 27°.

(a) What are the magnitudes of the force $\vec{T}$ on the block from the cord and the normal force $\vec{N}$ on the block from the plane?



(a)

44P. In Fig. 5-42, a 1.0 kg pencil box on a 30° frictionless incline is connected to a 3.0 kg pen box on a horizontal frictionless surface. The pulley is frictionless and massless. (a) If the magnitude of $\vec{F}$ is 2.3 N, what is the tension in the connecting cord? (b) What is the largest value that the magnitude of $\vec{F}$ may have without the connecting cord becoming slack?

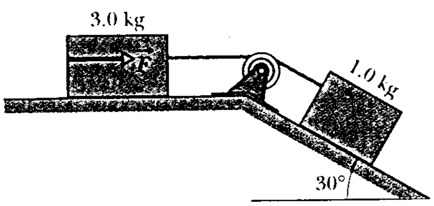


Fig. 5-42 Problem 44.

52P. In Fig. 5-48, a 100 kg crate is pushed at constant speed up the frictionless 30.0° ramp by a horizontal force $\vec{F}$. What are the magnitudes of (a) $\vec{F}$ and (b) the force on the crate from the ramp?

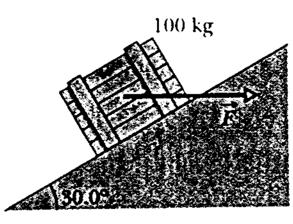


Fig. 5-48 Problem 52.

43P. A block of mass m_1 = 3.70 kg on a frictionless inclined plane of angle 30.0° is connected by a cord over a massless, frictionless pulley to a second block of mass m_2 = 2.30 kg hanging vertically (Fig. 5-41). What are (a) the magnitude of the acceleration of each block and (b) the direction of the acceleration of the hanging block? (c) What is the tension in the cord? ssm ilw www

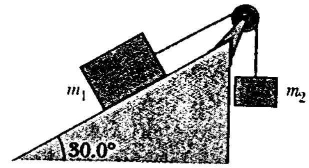


Fig. 5-41 Problem 43.