Assignment 4

PHY1001

NO LATE SUBMISSION IS ACCEPTED

13 Two particles of masses m and $2m$ are placed on a smooth horizontal table. A string, which joins these two masses, hangs over the edge supporting a pulley, which suspends a particle of mass $3m$, as shown in Fig. 5-23. The pulley has negligible mass. The two parts of the string on the table are parallel and perpendicular to the edge of the table. The hanging parts of the string are vertical. Find the acceleration of the particle of mass $3m$.

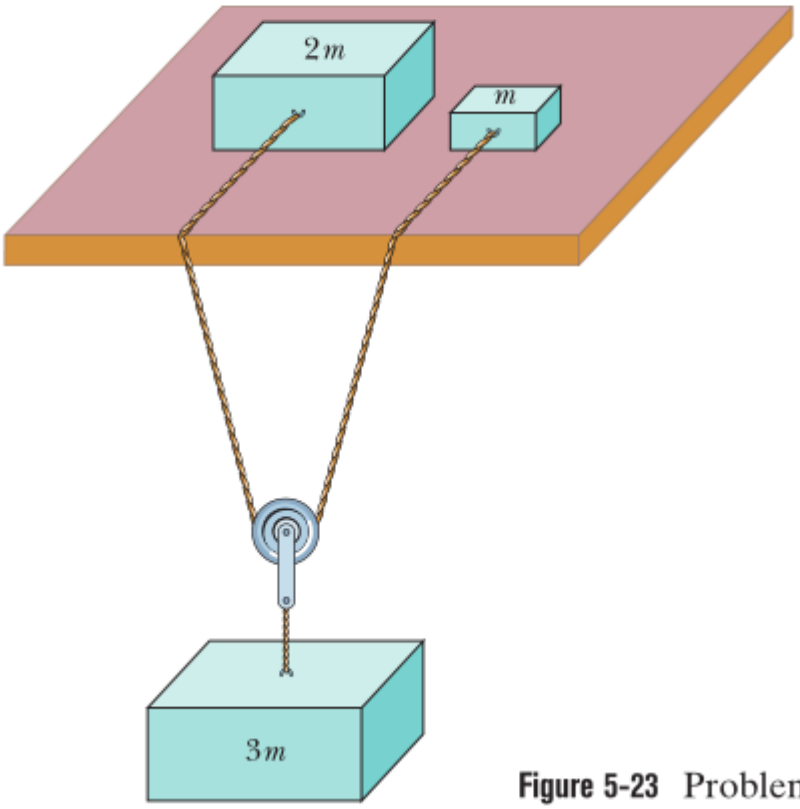

Figure 5-23 Problem 13.

24 There are two horizontal forces on the 2.0 kg box in the overhead view of Fig. 5-28 but only one (of magnitude $F_1 = 30$ N) is shown. The box moves along the x axis. For each of the following values for the acceleration a_x of the box, find the second force in unit-vector notation: (a) 10 m/s^2, (b) 20 m/s^2, (c) 0, (d) -10 m/s^2, and (e) -20 m/s^2.

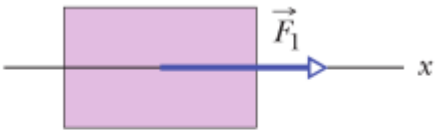

Figure 5-28 Problem 24.

42 In earlier days, horses pulled barges down canals in the manner shown in Fig. 5-32. Suppose the horse pulls on the rope with a force of 8600 N at an angle of $\theta = 18°$ to the direction of motion of the barge, which is headed straight along the positive direction of an x axis. The mass of the barge is 9500 kg, and the magnitude of its acceleration is 0.12 m/s^2. What are the (a) magnitude and (b) direction (relative to positive x) of the force on the barge from the water?

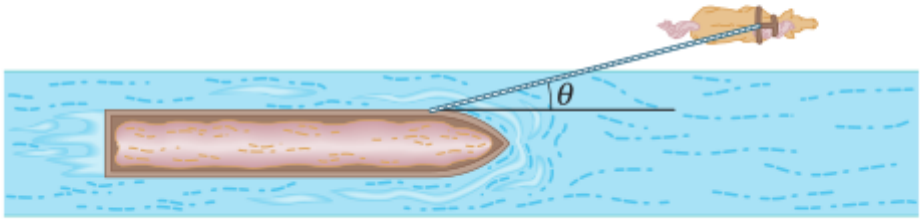

Figure 5-32 Problem 42.

46 An elevator cab is pulled upward by a cable. The cab and its single occupant have a combined mass of 2000 kg. When that occupant drops a coin, its acceleration relative to the cab is 8.30 m/s^2 downward. What is the tension in the cable?

50 In Fig. 5-36, three ballot boxes are connected by cords, one of which wraps over a pulley having negligible friction on its axle and negligible mass. The three masses are $m_A = 30.0$ kg, $m_B = 30.0$ kg, and $m_C = 10.0$ kg. When the assembly is released from rest, (a) what is the tension in the cord connecting B and C and (b) how far does A move in the first 0.250 s (assuming it does not reach the pulley)?

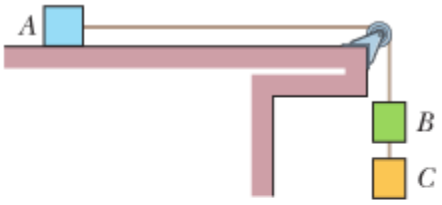

Figure 5-36 Problem 50.

54 Figure 5-39 shows four penguins that are being playfully pulled along very slippery (frictionless) ice by a curator. The masses of three penguins and the tension in two of the cords are $m_1 = 12$ kg, $m_3 = 15$ kg, $m_4 = 20$ kg, $T_2 = 111$ N, and $T_4 = 222$ N. Find the penguin mass m_2 that is not given.

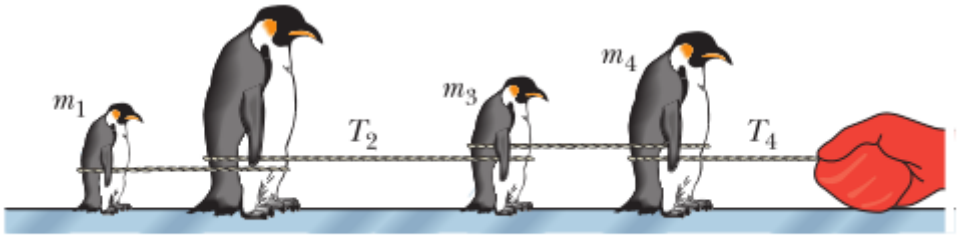

Figure 5-39 Problem 54.

57 Two blocks of masses $m_1 = 8.0$ kg and $m_2 = 4.0$ kg are connected by a string as shown in Fig. 5-42, over a frictionless pulley of negligible mass. What is the acceleration magnitude of the two-block system if $\theta = 30.0°$?

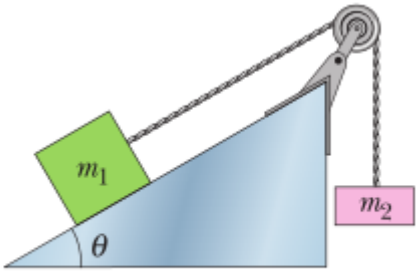

Figure 5-42 Problem 57.

64 Figure 5-46 shows a box of mass $m_2 = 1.0$ kg on a frictionless plane inclined at angle $\theta = 30°$. It is connected by a cord of negligible mass to a box of mass $m_1 = 2.5$ kg on a horizontal frictionless surface. The pulley is frictionless and massless. (a) If the magnitude of horizontal force $\vec{F}$ is 2.3 N, what is the tension in the connecting cord? (b) What is the largest value the magnitude of $\vec{F}$ may have without the cord becoming slack?

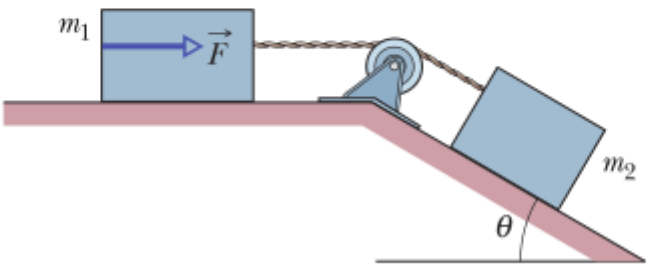

Figure 5-46 Problem 64.