

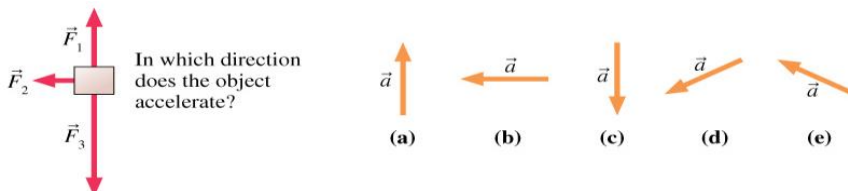
ASSIGNMENT 8
NEWTON'S LAWS

Released: Nov 2,

Due: Nov 9 5:30PM

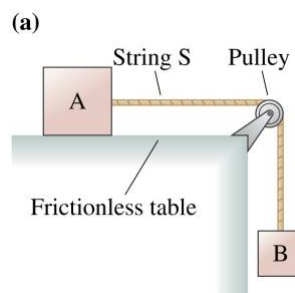
- 1 Two rubber bands stretched the standard distance cause an object to accelerate at 2 m/s^2 . Suppose another object with twice the mass is pulled by four rubber bands stretched the standard length. The acceleration of this second object is
A) 16 m/s^2 . B) 8 m/s^2 . C) 4 m/s^2 . D) 2 m/s^2 . E) 1 m/s^2 .

- 2 Three forces act on an object. In which direction does the object accelerate



ANS: D

- 3 In the figure to the right, is the tension in the string greater than, less than, or equal to the weight of block B?



- A. Equal to
B. Greater than
C. Less than
D. Impossible to answer without extra information

- 4 A small car is pushing a larger truck that has a dead battery. The mass of the truck is larger than the mass of the car. Which of the following statements is true?

- A. The truck exerts a larger force on the car than the car exerts on the truck.
B. The truck exerts a force on the car but the car doesn't exert a force on the truck.
C. The car exerts a force on the truck but the truck doesn't exert a force on the car.
D. The car exerts a larger force on the truck than the truck exerts on the car.
E. The car exerts the same amount of force on the truck as the truck exerts on the car.

- 5 A bag of cement of weight F_g hangs from three wires as shown.

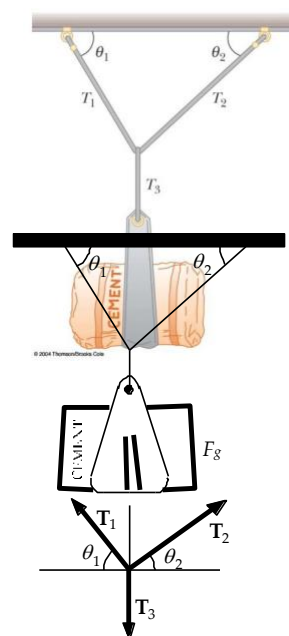
Two of the wires make angles θ_1 and θ_2 with the horizontal. If the system is in equilibrium, show that the tension in the left-hand wire is $T_1 = F_g \cos \theta_2 / \sin(\theta_1 + \theta_2)$

$$T_3 = F_g \quad (1)$$

$$T_1 \sin \theta_1 + T_2 \sin \theta_2 = F_g \quad (2)$$

$$T_1 \cos \theta_1 = T_2 \cos \theta_2 \quad (3) \text{ Eliminate } T_2 \text{ and solve for } T_1$$

$$T_1 = \frac{F_g \cos \theta_2}{(\sin \theta_1 \cos \theta_2 + \cos \theta_1 \sin \theta_2)} = \frac{F_g \cos \theta_2}{\sin(\theta_1 + \theta_2)}$$



6 The distance between two telephone poles is 50.0 m. When a 1.00-kg bird lands on the telephone wire midway between the poles, the wire sags 0.200 m. Draw a free-body diagram of the bird. How much tension does the bird produce in the wire? Ignore the weight of the wire.

$$m = 1.00 \text{ kg}$$

$$mg = 9.80 \text{ N}$$

$$\tan \alpha = \frac{0.200 \text{ m}}{25.0 \text{ m}}$$

$$\alpha = 0.458^\circ$$

Balance forces,

$$2T \sin \alpha = mg$$

$$T = \frac{9.80 \text{ N}}{2 \sin \alpha} = \boxed{613 \text{ N}}$$

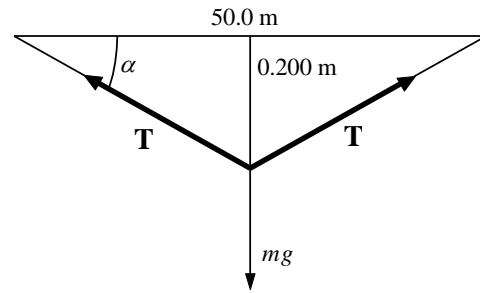
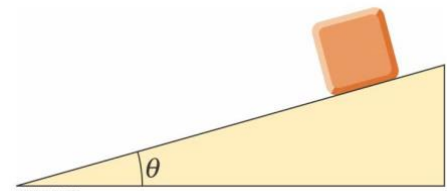


FIG. P5.17

7 A block is given an initial velocity of 5.00 m/s up a frictionless 20.0° incline. How far up the incline does the block slide before coming to rest?



P5.25 After it leaves your hand, the block's speed changes only because of one component of its weight:

$$\sum F_x = m a_x \quad -m g \sin 20.0^\circ = m a$$

$$v_f^2 = v_i^2 + 2a(x_f - x_i).$$

Taking $v_f = 0$, $v_i = 5.00 \text{ m/s}$, and $a = -g \sin(20.0^\circ)$ gives

$$0 = (5.00)^2 - 2(9.80) \sin(20.0^\circ)(x_f - 0)$$

or

$$x_f = \frac{25.0}{2(9.80) \sin(20.0^\circ)} = \boxed{3.73 \text{ m}}.$$

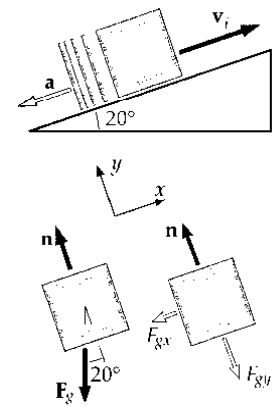


FIG. P5.25