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STUDENT [REDACTED]  
NAME [REDACTED]

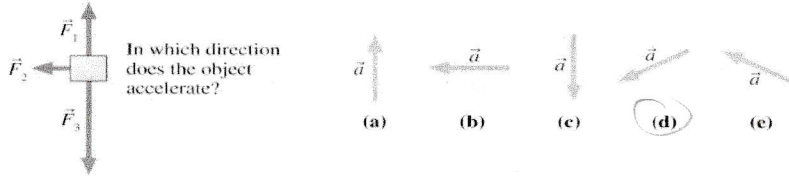
**ASSIGNMENT 7  
NEWTON'S LAWS**

Released: Nov 2, Due: Nov 9 5:30PM

1. Two rubber bands stretched the standard distance cause an object to accelerate at  $2 \text{ m/s}^2$ . 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)  $16 \text{ m/s}^2$ . B)  $8 \text{ m/s}^2$ . C)  $4 \text{ m/s}^2$ . **D)  $2 \text{ m/s}^2$** . E)  $1 \text{ m/s}^2$ .

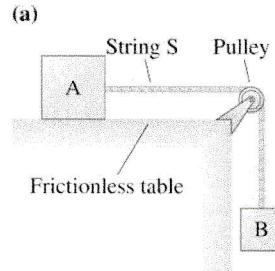
2. Three forces act on an object. In which direction does the object accelerate



ANSWER: **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?

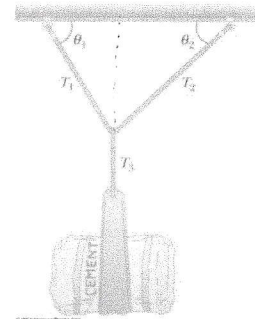
- A. Equal to  
B. Greater than  
C. Less than  
**D. Impossible to answer without extra information**



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  $\theta_1$  and  $\theta_2$  with the horizontal. The system is in equilibrium. Find the tension in the left-hand wire as function of the given angles and  $F_g$



Free Body Diagram with coordinate system such that  $F_2$  has no y component. We know  $F_3 = F_g$ .

$$\sin(\theta_1 + \theta_2) = \frac{x}{T_1} \quad \cos\theta_2 = \frac{x}{T_3}$$

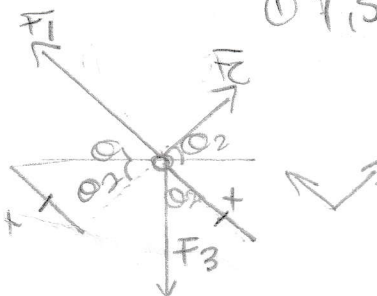
$$\textcircled{1} T_1 \sin(\theta_1 + \theta_2) = x \quad \textcircled{2} T_3 \cos\theta_2 = x$$

Sub(1) and (2)

$$T_1 \sin(\theta_1 + \theta_2) = T_3 \cos\theta_2$$

$$T_1 = \frac{T_3 \cos\theta_2}{\sin(\theta_1 + \theta_2)}$$

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



**D**

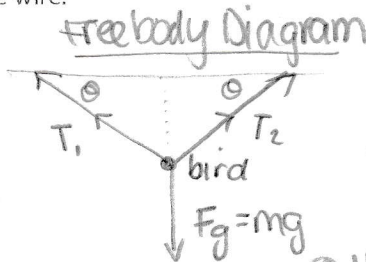
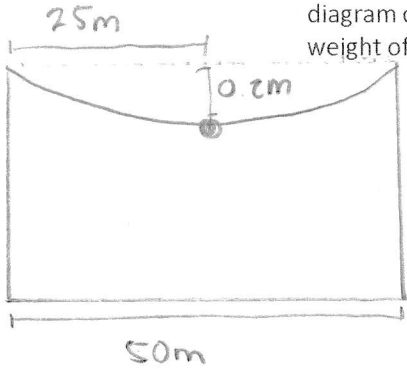
ASSIGNMENT 7 CONT.

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- 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.



① Find angle:  $\tan \theta = \frac{0.2\text{m}}{25\text{m}}$

$\theta = 0.46^\circ$

② x component:  $T_1$  and  $T_2$  will cancel out: no calcs.

③ y component:  $\sum F_y = T_{1y} + T_{2y} = F_g = mg$

$T_1 \sin \theta + T_2 \sin \theta = mg$

$T_1 = T_2$

$T \sin \theta + T \sin \theta = mg$

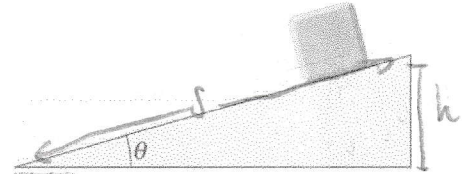
$T = \frac{mg}{2 \sin \theta}$

$= \frac{9.8\text{N}}{2 \sin(0.46^\circ)}$

$T = 610.3\text{N}$

- 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?

Let  $s$  denote the distance travelled by the block and  $h$  denote the height of the ramp.



$mgh = \frac{1}{2}mv^2$

$\sin \theta = \frac{h}{s}$

①  $h = \frac{v^2}{2g}$

②  $s \sin \theta = h$

sub ① and ②

$s \sin \theta = \frac{v^2}{2g}$

$s = \frac{v^2}{2g \sin \theta}$

$s = \frac{(5\text{m/s})^2}{2(9.8\text{m/s}^2) \sin(20.0^\circ)}$

$s = 3.73\text{m}$