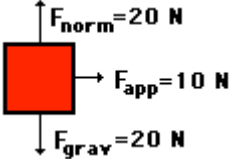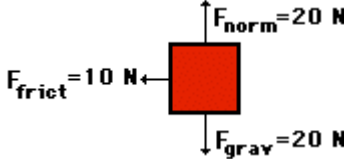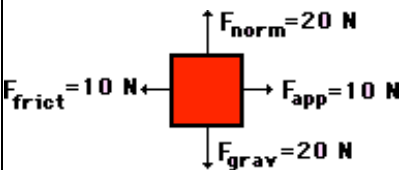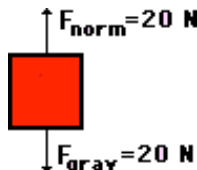# Who Wants To Do Work?

Directions: Draw a diagram for each situation below. Label all forces and the displacement.

1. Consider a tug of war in which two teams pulling on a rope are evenly matched so that no motion takes place. Assume that the rope does not stretch. Is work done on the rope? On the pullers? On the ground? Is work done at all?

2. A tugboat exerts a constant force of 5000 N on a ship moving at constant speed through a harbor. How much work does the tugboat do on the ship in a distance of 3000m?

3. A 100 N force is applied at an angle of 30° above the horizontal to move a 15 kg box at a constant speed for a horizontal distance of 5m. What is the work done on the box?

4. A block is pushed 2.2 meters along a frictionless horizontal table by a hand pushing with a constant force of 16 N. a. What is the work done by the hand?

   b. What is the work done by gravity if the weight of the block is 25N? (Hint: Are the directions of the gravitational force and displacement parallel?)

5. Ben Travlun carries a 200N suitcase up three flights of stairs (a height of 10.0 m).
   a. How much work does he do on the suitcase?

   b. Ben then pushes it with a horizontal force of 50.0 N at a constant speed of 0.5 m/s for a horizontal distance of 35.0 meters. How much work does Ben do on his suitcase?

   b. What is the total amount of work that Ben does on the suitcase?

Free-Body Diagram	Forces Doing Work on the Object	Amount of Work Done by Each Force	Net Work Done on the Object
6. A 10N forces is applied to push a block across a friction free surface for a displacement of 5.0 m to the right. $F_{norm}=20$ N $F_{app}=10$ N $F_{grav}=20$ N			
7. A 10N frictional force slows a moving block to a stop after a displacement of 5.0 m to the right. $F_{norm}=20$ N $F_{frict}=10$ N $F_{grav}=20$ N			
8. A 10N force is applied to push a block across a frictional surface at constant speed for a displacement of 5.0 m to the right. $F_{norm}=20$ N $F_{frict}=10$ N $F_{app}=10$ N $F_{grav}=20$ N			
9. A 2kg object is sliding at constant speed across a friction free surface for a displacement of 5 m to the right. $F_{norm}=20$ N $F_{grav}=20$ N			
10. A 2kg object is pulled upward at constant speed by a 20-N force for a vertical displacement of 5 m. $F_{tens}=20$ N $F_{grav}=20$ N			