

Instructions:

1. Do all of your work on this sheet.
2. **Show all of your steps** in problems for full credit.
3. **Be clear and neat** in your work. Any illegible work, or scribbling in the margins, will not be graded.
4. Place your **answers in a box**.
5. If you need more space, you may use the back of the page and write **On back** in the problem space.

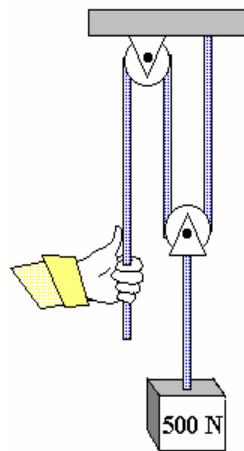
1. **Multiple Guess (3 pts)** Find the answer which best fits the question and write it in the space provided.

- a. As a general rule, friction \_\_\_\_\_
  - a) depends on the surface area.
  - b) depends on the sliding speed.
  - c) is proportional to the normal force.
  - d) is greater for smoother surfaces.
  - e) None of the above.
- b. Cars moving on a properly banked track remain on the track because of \_\_\_\_\_
  - a) friction.
  - b) Newton's Law of Inertia.
  - c) the normal force.
  - d) their mass.
- c. A measure of inertia is \_\_\_\_\_
  - a) g
  - b) apparent weight
  - c) mass
  - d) force
  - e) none of these.

2. **Definition/Principle (5 pts)**

- a. State Newton's Third Law of Motion.

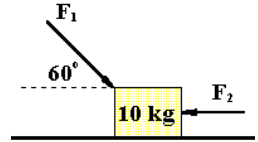
- b. Draw all of the forces on the block and the massless pulleys and label appropriately, such as tension, weight, normal force.



**Bonus:** What force is being exerted by the person to keep the block in equilibrium?

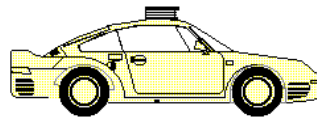
3. **Problems (12 pts)**

- a. Two forces act on a 10.0 kg block as shown below. The magnitudes of the forces are  $F_1 = 30.0\text{N}$  and  $F_2 = 20.0\text{N}$ .
  - i. What is the horizontal acceleration of the block?



- ii. What is the normal force?

- b. A 80.0 kg person stands on a scale in an elevator. What is the apparent weight when the elevator is accelerating upward at  $2.50\text{ m/s}^2$ ?
- c. A student, in a hurry to go home after, leaves her book on top of the car. She drives around a flat curve with a 70 m radius. If the coefficient of static friction between the book and the car is 0.10, what is the maximum speed the car can have without the book sliding off?



- d. A 1700 kg car is parked on a road that rises  $15^\circ$  above the horizontal.



- i. What is the magnitude of the static frictional force exerted on the tires by the road?

- ii. What is the coefficient of static friction?