

## Test #1

**Circle your answers, and include the appropriate units with any numerical answer.**

**These first four problems are multiple choice and worth one point each, so just circle the correct choice:**

1. A monkey is hanging in a tree, and a hunter aims a blow gun directly at the monkey. At the instant the hunter shoots the dart, the monkey drops from the tree. Does the dart
  - (a) pass above the monkey,
  - (b) or hit the monkey,
  - (c) or pass below the monkey.
2. A Mack truck hits a Volkswagen beetle in a collision. Compare the magnitudes of the forces between the truck and the beetle. Note that the truck has a substantially larger mass than the beetle. Either the
  - (a) force on the beetle is bigger,
  - (b) or the forces have the same magnitude,
  - (c) or the force on the truck is bigger,
  - (d) or the answer depends on the initial speeds of the truck and the beetle.
3. The quantity  $50 \text{ kg m/s}^2$  describes something about an object. Which of the following could this quantity refer to?
  - (a) force,
  - (b) acceleration,
  - (c) or speed?
4. Complete the following sentence: A bowling ball and a ping pong ball fall with the same acceleration in a vacuum on the surface of the earth
  - (a) even though the force of gravity is different on the two objects.
  - (b) because the force of gravity is the same on the two objects.
  - (c) only in a dark room.
  - (d) only on the North or South poles.

Circle your answers, and include the appropriate units with any numerical answer.

These problems are rather simple and worth 1 or 2 points each.

1. (1pt) Your mass is 60 kg, and you are standing on the surface of the Earth. What is the magnitude of the force of gravity acting upon you?
  
  
  
  
  
  
  
  
  
  
2. (2 pts) At the front of the classroom is a large water-filled jar, on a turntable, with a blue ball tied to a string that keeps it from sinking to the bottom, and an orange ball that is tied to a string that keeps it from floating to the top. When the turntable is spun ... (circle the correct choice)
  - (a) Does the blue ball move **in** or **out**?
  - (b) Does the orange ball move **in** or **out**?
  
  
  
  
  
  
  
  
  
  
3. (2 pts) A 5 kg block is at rest on a table top. What is the magnitude of the sum of all of the forces acting on the block? This is also called the “net force.”
  
  
  
  
  
  
  
  
  
  
4. (2 pts) Two children slide down a frictionless slide at a playground. One child has a mass of 30 kg and slides down the slide in 3 s. The other child has a mass of 60 kg. How much time will it take the second child to slide down the slide?
  
  
  
  
  
  
  
  
  
  
5. (2 pts) An object of mass 20 kg is acted upon by three forces. One force is 3 N to the North, the second is 5 N to the South. The object moves with a constant speed of 4 m/s to the East.
  - (a) What is the **magnitude** of the third force?
  - (b) What is the **direction** of the third force?

The remainder of the problems are similar to homework problems and each is worth a total of 4 points.

Include the appropriate units on any numerical answers.

1. (4pts) A sports car can accelerate at  $5 \text{ m/s}^2$ .
  - (a) How many seconds does it take to go from 0 to  $30 \text{ m/s}$  (about  $70 \text{ mi/h}$ )?
  
  
  
  
  
  
  
  - (b) How far does it travel in this time?
  
2. (4 pts) You are standing at the edge of a cliff  $45 \text{ m}$  high, and you kick a soccer ball horizontally off the cliff with an initial speed of  $10 \text{ m/s}$ .
  - (a) How much time does it take for the ball to hit the ground?
  
  
  
  
  
  
  
  - (b) How far from the base of the cliff does the ball land?
  
3. (4 pts) You tie a rope around a tree trunk, and then you pull with a force of  $200 \text{ N}$  on the rope.
  - (a) What is the tension in the rope?
  
  
  
  
  
  
  
  - (b) What is the magnitude of the force that the tree exerts on the rope?

4. (4 pts) The diagram below shows two masses,  $M_1 = 1\text{ kg}$  and  $M_3 = 3\text{ kg}$ , and three strings with tensions  $T_1 = 5\text{ N}$ ,  $T_3 = 3\text{ N}$  and  $T_2$  (the tension of the string in the middle) is unknown.
- (a) What is the direction of the acceleration of the masses? *Left* or *Right*.
- (b) What is the magnitude of the acceleration of  $M_1$ ?
- (c) What is the magnitude of the acceleration of  $M_2$ ?
- (d) What is the tension  $T_2$ ?
5. (4 pts) First you walk south 3 meters, then you walk east 4 meters.
- (a) What is the distance from where you started to where you stopped?

6. (4 pts) Bob has a mass of 50 kg and he starts, initially at rest, at the top of a frictionless slide that is 6 m high and 10 m long as shown in the diagram. Give the units of all of your numerical answers.

When Bob starts sliding down the frictionless slide:

- (a) What is the magnitude of the net force on Bob? (Recall that this is the vector sum of all of the forces acting on Bob.)
  
  
  
  
  
  
  
  
  
  
- (b) What is the magnitude of Bob's acceleration down the slide?
  
  
  
  
  
  
  
  
  
  
- (c) How long did it take Bob to go down the slide?
  
  
  
  
  
  
  
  
  
  
- (d) What is Bob's speed at the bottom of the slide?

