

Name (printed) _____

Name (signature as on ID) _____

Lab Section Number _____

Exam I Chaps. 1-5 in Young&Geller

The formula sheet is the last page of the exam. It can be torn off from the rest of the exam and doesn't have to be turned in.

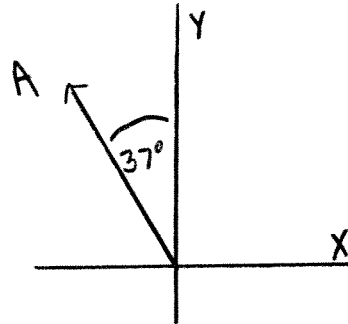
Multiple Choice questions. Circle the correct answer. No work needs to be shown.

(5 pts) 1. A small rock is thrown at an angle of 53° above the horizontal and a speed of 10 m/s from the roof of a 15 m tall building. Air resistance can be neglected. When the rock is at its maximum height, its speed is

- (a) zero
- (b) 10 m/s
- (c) 6 m/s
- (d) 8 m/s

(5 pts) 2. Consider the vector A shown in the sketch. The magnitude of A is 5 km. The x -component of A is

- (a) 3.0 km
- (b) -3.0 km
- (c) 4.0 km
- (d) -4.0 km

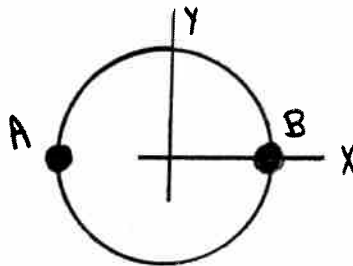


(5 pts) 3. A small car is pushing a large truck to the right on a level road. The two vehicles have an acceleration of 2.0 m/s^2 , toward the right. Which statement is correct:

- (a) The magnitude of the force that the car exerts on the truck is greater than the magnitude of the force that truck exerts on the car.
- (b) The magnitude of the force that the car exerts on the truck is less than the magnitude of the force that truck exerts on the car.
- (c) The magnitude of the force that the car exerts on the truck is the same as the magnitude of the force that truck exerts on the car.

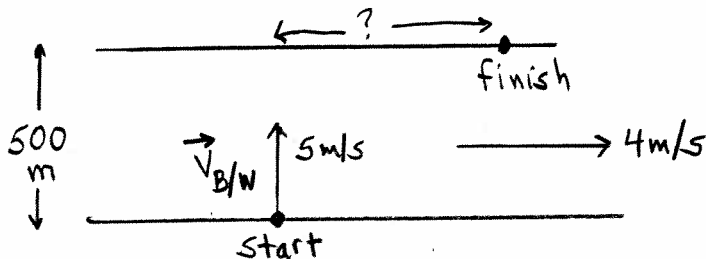
(5 pts) 4. A small object travels with constant speed of 5.0 m/s on a circular path, as shown in the figure. The object moves clockwise around the path and takes 20.0 s to travel from point A to point B. For the motion from point A to point B, the y -component of the average acceleration of the object is

- (a) zero
- (b) $+0.50 \text{ m/s}^2$
- (c) $+0.25 \text{ m/s}^2$
- (d) -0.50 m/s^2
- (e) -0.25 m/s^2
- (f) none of the above answers



On the following four problems show all your work. Partial credit will be given if earned. Write your answers in the blanks provided.

(14 pts) 5. A river flows due east with a speed of 4.0 m/s. A man steers a motorboat across the river. His velocity relative to the water is 5.0 m/s due north.



(a) How long does it take him to cross the river?

Ans. 100 s

(b) How far east of his starting point will he reach the opposite bank?

Ans. 400 m

(14 pts) 6. A subway train moving on a straight, level track starts from rest and leaves station A. It travels with a constant acceleration of 4.0 m/s^2 for 10.0 s . Then it slows down with a constant acceleration and stops 20.0 s after it started slowing down.

(a) What is the distance the train travels in the first 10.0 s ?

Ans. 200 m

(b) What total distance does it travel from station A until it stops 30.0 s later?

Ans. 600 m

(14 pts) 7. A ball is thrown straight upward with a speed of 20 m/s .

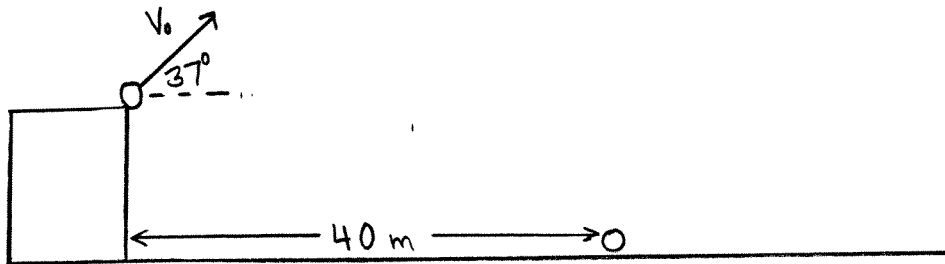
(a) How high does it rise above the point from which it was thrown?

Ans. 20.4 m

(b) How much time elapses from the instant it was thrown until it returns to the point from which it was thrown?

Ans. 4.08 s

(20 pts) 8. A small rock is thrown from the roof of a building at an angle of 37° above the horizontal and with speed v_0 . It is observed that the rock strikes the ground at a distance of 40.0 m from the base of the building at $t = 5.0$ s after it was thrown.



(a) What is the speed v_0 ?

Ans. 10 m/s

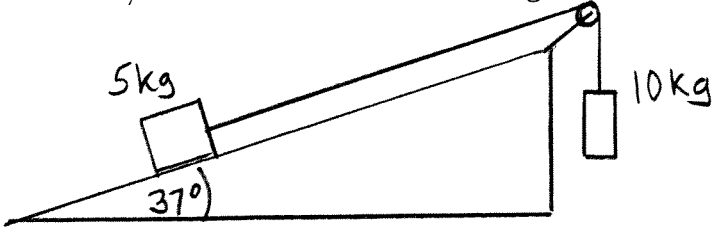
(b) What is the speed v of the rock just before it strikes the ground?

Ans. 43.7 m/s

(c) What is the height of the building?

Ans. 92.5 m

(18 pts) 9. A 5 kg block on a 37° incline is connected by a light rope to a 10 kg block that is suspended as shown. The pulley is light and frictionless. When the blocks are released from rest, it is observed that the 10 kg block has a downward acceleration of 4.0 m/s^2 .



(a) After the blocks are released, what is the tension in the rope?

Ans. 58 N

(b) What is the magnitude of the normal force that the incline exerts on the 5.0 kg block?

Ans. 39.1 N

(c) What is the coefficient of kinetic friction between the 5 kg block and the incline?

Ans. 0.218