

Name (printed) _____

Name (signature as on ID) _____

Lab Section Number _____

Exam I Chapt. 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. Vector \vec{A} has components $A_x = +6.0$ m and $A_y = -8.0$ m. The magnitude of the vector \vec{A} is

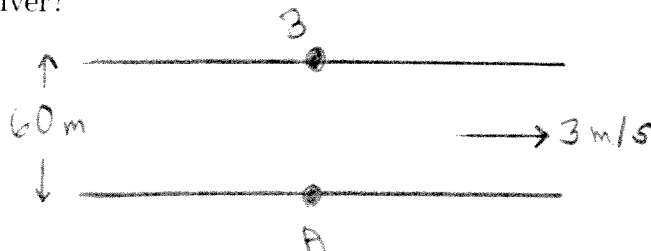
- (a) 14.0 m
- b** (b) 10.0 m
- (c) -10.0 m
- (d) 2.0 m
- (e) -2.0 m
- (f) none of the above

(5 pts) 2. A small rock is thrown straight up. At the highest point of its motion, the acceleration of the rock

- a** (a) is 9.8 m/s^2 , downward
- (b) is 9.8 m/s^2 , upward
- (c) is zero
- (d) depends on the initial speed with which it was thrown.

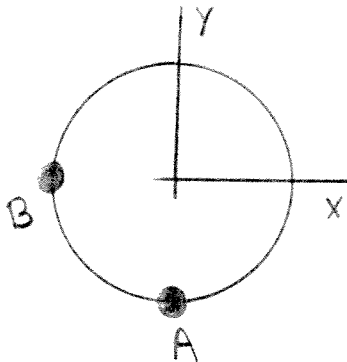
(6pts) 3. A river flows due east. The velocity of the water relative to the earth (the current) has magnitude 3.0 m/s. The river is 60.0 m wide. A boat travels due north across the river, from point A on one bank to point B on the other bank. The velocity of the boat relative to the water is constant and has magnitude 5.0 m/s. How long does it take the boat to cross the river?

- (a) 20.0 s
- b** (b) 15.0 s
- (c) 12.0 s
- (d) 10.3 s
- (e) none of the above



(5 pts) 4. A man runs at constant speed around a circular track that has radius 40 m. Take the origin of coordinates to be at the center of the circle. Point A is at $x = 0$, $y = -40$ m and point B is at $x = -40$ m, $y = 0$. It takes the man 8.0 s to run along the track from A to B . For the motion from A to B , the x -component of the average velocity of the man is

- (a) zero
- (b) 7.9 m/s
- (c) -7.9 m/s
- (d) 5.0 m/s
- (e) -5.0 m/s**
- (f) none of the above



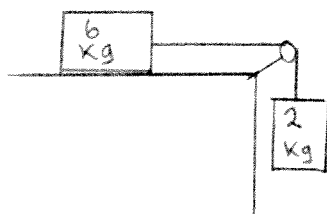
(6 pts) 5. Two boxes are in contact on a horizontal frictionless surface. Box A has mass 5.0 kg and box B has mass 15.0 kg. A horizontal force of 60 N is applied to box A . The force that box A exerts on box B is

- (a) 20 N**
- (b) 45 N
- (c) 60 N
- (d) 180 N
- (e) zero
- (f) none of the above



(6 pts) 6. A 6.0 kg block on a horizontal frictionless tabletop is connected by a light rope over a light frictionless pulley to a suspended block that has mass 2.0 kg. When the system is released from rest, the acceleration of the 2.0 kg block is

- (a) 2.45 m/s²**
- (b) 3.27 m/s²
- (c) 9.80 m/s²
- (d) zero
- (e) none of the above



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

(16 pts) 7. A 60 kg woman is standing in an elevator. Starting from rest the elevator moves downward 8.0 m in 4.0 s. If the acceleration of the elevator is constant, what is the magnitude of the normal force that the floor of the elevator exerts on the woman while the elevator is moving?

Ans. 528 N

(15 pts) 8. A small rock is thrown straight up with an initial speed v_0 from the edge of the roof of a 16.0 m tall building. The rock reaches a maximum height of 14.0 m above the roof (30.0 m above the ground). The rock misses the roof on the way down and reaches the ground. Air resistance can be neglected.

(a) What is the initial speed v_0 of the rock?

Ans. 16.6 m/s

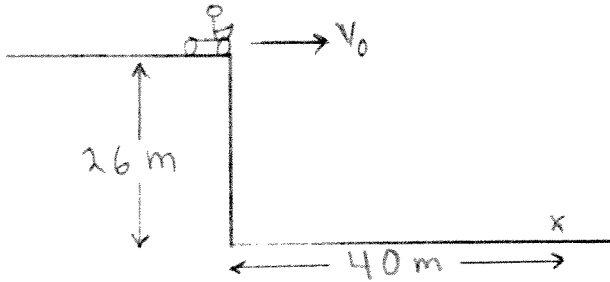
(b) What is the speed of the rock just before it strikes the ground?

Ans. 24.3 m/s

(c) How much time does it take the rock to travel from where it was thrown to the ground?

Ans. 4.17 s

(18 pts) 9. A motorcycle traveling at constant speed v_0 on the horizontal roof of a 26.0 m tall building drives off the roof and lands on the ground at a point that is a horizontal distance of 40.0 m from the edge of the roof. Air resistance can be neglected.



(a) How much time does it take the motorcycle to travel from the edge of the roof to the ground?

Ans. 2.30 s

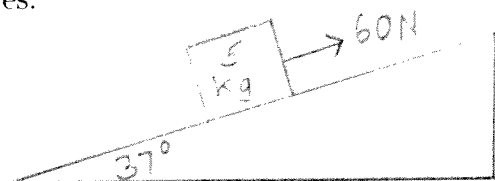
(b) What was the initial speed v_0 of the motorcycle?

Ans. 17.4 m/s

(c) What is the magnitude of the velocity of the motorcycle just before it reaches the ground?

Ans. 28.4 m/s

(18 pts) 10. A 5.0 kg box is placed on a ramp that is inclined at 37° above the horizontal. The coefficient of kinetic friction between the box and the ramp is 0.50. A force of 60 N that is parallel to the ramp and directed up the ramp is applied to the box and the box moves.



(a) What is the magnitude of the kinetic friction force that the ramp exerts on the box while the box is moving?

Ans. 19.6 N

(b) What is the magnitude of the acceleration of the box while the ⁶⁰~~80~~ N force is acting on it?

Ans. 2.18 m/s²