

Problem	Points	Score
1	7	
2	13	
3	15	
4	15	
Total	50	

Instructions:

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

1. Multiple Guess (7 pts) Find the answer which best fits the question and write it in the space provided.

a) How many significant figures should result in the computation: $1.03 \cdot .0602 / 4321$?

- a. 0 b. 2 c. 3 d. 4 e. 5

b) Distance is always _____

- equal to the magnitude of the corresponding displacement.
- less than or equal to the magnitude of the corresponding displacement.
- greater than or equal to the magnitude of the corresponding displacement.

c) Which of the following is bigger? _____

- a. 1 in. b. 30 mm. c. 0.02 m. d. 0.25 ft. e. 1000 mm.

d) An object is thrown vertically upward from ground level and returns to the ground. Neglecting air resistance, its

- maximum height is independent of the initial velocity;
- velocity changes nonuniformly;
- travel time upward is greater than its travel time downward;
- speed upon striking the ground is the same as its initial speed.

e) On Cartesian axes the x component of a vector is generally associated with _____

- a) cosine, b) sine, c) tangent, d) none of these.

f) An object falls to the ground with a gravitational acceleration of _____

9.8 m/s^2 . This means that the

- speed of the object decreases 9.8 m/s each second.
- speed of the object increases 9.8 m/s each second.
- object falls 9.8 m in the first second.
- object falls 9.8 m during each second.

g) A bomber releases a bomb to hit a target. The plane continues to fly horizontally as the bomb descends. Neglecting air resistance, the bomb lands at a point _____

- behind the plane.
- directly under the plane.
- in front of the plane.

2. Definitions/Principles (13 pts)

a. Define the following:

i. Average Velocity.

ii. Vector.

c. One student, using unit analysis, says that the equation

$v = \sqrt{2ax}$ is dimensionally correct. Another says that it isn't.

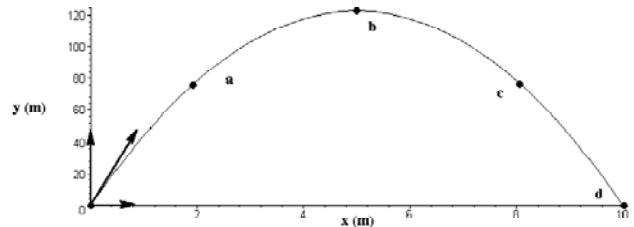
With whom do you agree? Why?

d. List the four main Kinematic Equations for 1D motion. (Need to be exactly correct for credit.)

e. On the projectile path below:

i) Draw the velocity vector at point c.

ii) Of the points a, b, c or d, indicate which have the greatest and least speeds.



Bonus: A boat can travel with a speed of 5.0 m/s relative to still water. If the boat is heading upstream in a river with a current of 3.0 m/s , what distance does the boat travel in 30s ?

3. Motion Problems (15 pts)

a. A runner accelerates at 0.640 m/s^2 due west for 3.0 s and reaches a final velocity of 20.0 km/hr due west. Find the runner's initial velocity in m/s .

b. A jetliner, traveling northward, is landing with a speed of 69 m/s . Once the jet touches down, it has 750 m of runway in which to reduce its speed to 6.1 m/s .

i. Compute the average acceleration of the plane during landing.

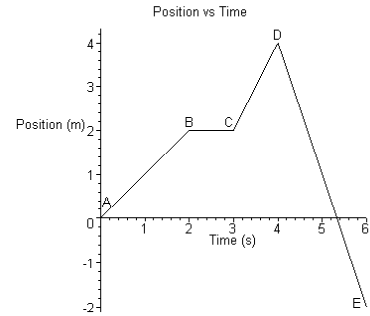
ii. How long does it take to land?

c. From her bedroom window a girl drops a water-filled balloon to the ground, 6.0 m below. If the balloon is released from rest, how long is it in the air?

d. A football is kicked with an initial velocity of 25.0 m/s at an angle of 30° . How far does the ball travel before hitting the ground?

4. Graphs and Vectors (15 pts)

a. A person moves in one dimension as shown by the graph below.



i. Find the average velocities between the following points:

1) AB

2) BC

3) BE

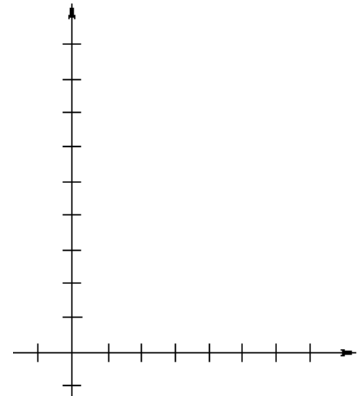
b. Consider the following two displacement vectors:

A has magnitude 6.0 m , oriented 60° to the x -axis.

B has an x -component of 3.0 m and a y -component of 1.0 m .

i. Find the x and y components of **A**.

ii. Sketch and label **A**, **B**, and **A+B**.



iii. Find the magnitude and direction of $\mathbf{C}=\mathbf{A}+\mathbf{B}$, analytically.