

Name _____ Date _____ Pd _____

Kinematics Problem Set 1 – Horizontal Motion

$$v_f = v_i + at \quad \Delta x = v_i t + \frac{1}{2} at^2 \quad v_f^2 = v_i^2 + 2a \Delta x \quad \Delta x = v_{avg} t = \frac{1}{2} (v_i + v_f) t$$

Problem Solving Process (GUESS)

G Write down the Givens.

U Write down the Unknown.

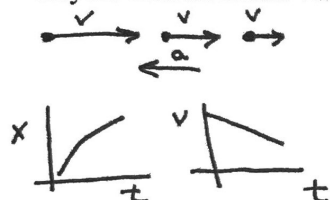
E Rearrange Equation to solve for unknown.

S Substitute the numbers (with units)

S Solve. Be sure to cancel units to make sure that your answer has the correct units.

Instructions: Draw a motion map with velocity vectors and an acceleration vector. Draw x-t and v-t graphs. Use GUESS steps when solving. Include direction if the answer is a vector quantity (displacement, velocity, acceleration).

Ex. With an average acceleration of 0.75 m/s^2 West, how much time will it take a cyclist to bring a bicycle with an initial velocity of 11.0 m/s East to a velocity of 4.0 m/s East?



G: $a = -0.75 \text{ m/s}^2$

$v_i = 11 \text{ m/s}$

$v_f = 4 \text{ m/s}$

U: $t = ?$

E: $v_f = v_i + at \quad t = \frac{v_f - v_i}{a}$

E: $t = \frac{4 \text{ m/s} - 11 \text{ m/s}}{-0.75 \text{ m/s}^2}$

S: $t = 9.3 \text{ s}$

1. It takes 6.5 hours to travel from New Orleans to Houston at an average velocity of 95 km/hr . What is the displacement for the trip? Include the direction. (Houston is west of New Orleans)

2. Find the acceleration in the following scenario: When a stoplight turns green, a driver accelerates from 0.0 m/s over 8.5 seconds to reach a velocity of 19.0 m/s West. Include the direction.

3. A jet plane accelerates uniformly from rest to a velocity of 240 km/h (67 m/s) East in 6.5 s. Find the displacement of the plane in meters. Also calculate the acceleration in m/s^2 (include direction).

4. When Maggie applies the brakes, her car slows uniformly from 15.0 m/s West to 0 m/s in 2.50 s.
- How many meters before a stop sign must she apply her brakes in order to stop at the sign?
 - What is her acceleration? Remember acceleration is a vector.

5. A jet plane lands with a speed of 100 m/s and can accelerate uniformly at a maximum rate of -5.0 m/s^2 (in the opposite direction) as it comes to rest. Can this plane land at an airport where the runway is 0.80 km long? Justify in words with your work.

6. An automobile with an initial velocity of 4.0 m/s East accelerates uniformly at the rate of 2.0 m/s^2 East. Find the final velocity and the displacement after 3.0 s (include direction).

7. An aircraft has a liftoff speed at the end of the runway of 33 m/s (it begins from rest). What minimum constant acceleration does this require if the aircraft is to be airborne after a take-off run of 240 m?

8. A ball is thrown downward from a tall building with an initial speed of 2.0 m/s down. After 3.0 seconds, the ball is traveling 28 m/s down. Find the acceleration. Why is it less than $g = -10 \text{ m/s}^2$?