

Study Guide – Unit 1: Introduction to Linear Motion

Name: _____ Date: _____ Hour: _____

Terms

1. What's the difference between a vector and a scalar quantity?
2. Classify the following as either a vector or scalar:
 - a. Distance
 - b. Displacement
 - c. Speed
 - d. Velocity
 - e. Acceleration.
3. What controls on a car will cause a change in speed?
4. What controls on a car will cause a change in velocity (or an acceleration)?

Data Tables

1. The position-time & velocity-time data sets below represent the motion of four objects. Describe the position, velocity and/or acceleration of each or write "not enough information".

Data Set A

t (s)	p (m)
0	-10
1	-7
2	-4
3	-1
4	2
5	5
6	8

Position:

Velocity:

Acceleration:

Data Set B

t (s)	v (m/s)
0	-4
1	-4
2	-4
3	-4
4	-4
5	-4
6	-4

Position:

Velocity:

Acceleration:

Data Set C

t (s)	v (m/s)
0	35
1	30
2	25
3	20
4	15
5	10
6	5

Position:

Velocity:

Acceleration:

Data Set D

t (s)	p (m)
0	21
1	20
2	18
3	15
4	11
5	6
6	0

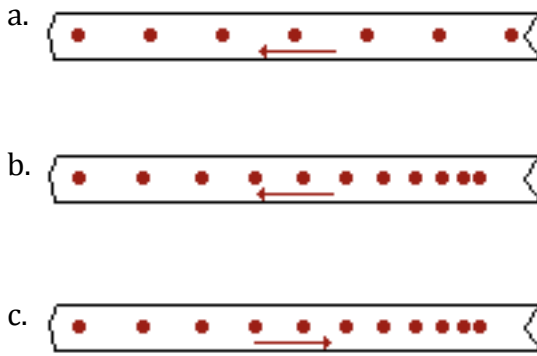
Position:

Velocity:

Acceleration:

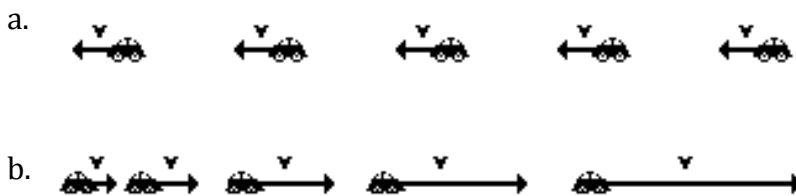
Ticker Tape Diagrams

5. What is the direction of the velocity and acceleration in each of the diagrams below:



Vector Diagrams

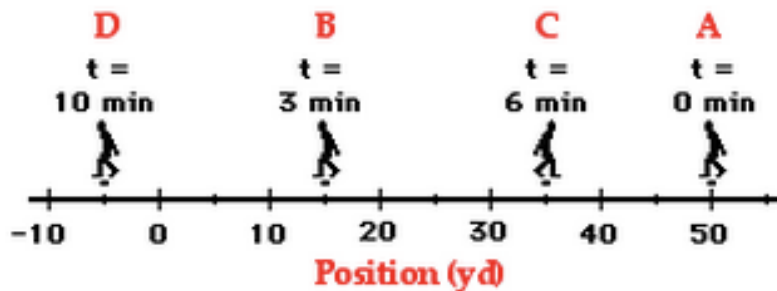
6. What is the direction of the velocity and acceleration in each of the diagrams below:



Calculations

$$v = d/t \quad d = v_i t + \frac{1}{2} a t^2 \quad v_f^2 = v_i^2 + 2 a d \quad v_f = v_i + a t \quad d = \frac{1}{2} (v_i + v_f) t$$

7. A football coach starts at the 50-yard line (A) and walks to the 15-yard line (B) in three minutes. He turns around and walks to the 35-yard line (C) in the next two minutes. He turns around again and walks back to the -5-yard line (D) in the next three minutes, thus completing his 8 minutes of pacing.



- a. What is the coach's distance? c. What is the coach's average speed?
- b. What is the coach's displacement? d. What is the coach's average velocity?

8. In the Funny Car competition at the Joliet Speedway in Joliet, Illinois in October of 2004, John Force completed the 400 m dragster race in a record time of 4.437 seconds. Determine the average speed of the dragster.
9. In the qualifying round of the 50-yd freestyle in the sectional swimming championship, Dugan got an early lead by finishing the first 25.00 yd in 10.01 seconds. Dugan finished the return leg (25.00 yd distance) in 10.22 seconds.
- Determine Dugan's average speed for the first 25.00 yd leg of the race.
 - Determine Dugan's average speed for the entire race.
 - Determine Dugan's average velocity for the entire race.
10. During a recent morning run, Ken averaged a speed of 5.8 m/s for 12.9 minutes (774 seconds). Ken then averaged a speed of 6.10 m/s for 7.1 minutes (426 seconds). Determine the total distance that Ken ran during his 20-minute jog.
11. A Formula One car is a single-seat racing car with an open cockpit and substantial wings located in the front and rear. At high speeds, the aerodynamics of the car help to create a strong downward force which allows the car to brake from 27.8 m/s (100 km/hr or 62.2 mi/hr) to 0 in as little as 1.22s. Determine the acceleration rate achieved by such a car.
12. During the annual shuffleboard competition, Renee gives her puck a push and it begins moving down the board with a velocity of 9.32 m/s. The puck slows down at a rate of -4.06 m/s/s . Determine the time it takes the puck to slow to a stop.

