Unit I Kinematics

How fast am I moving?...

$$ReCOS\ 43$$

$$V = \frac{2\pi r}{24\ h}$$

1000 km/h

1560 Km/h
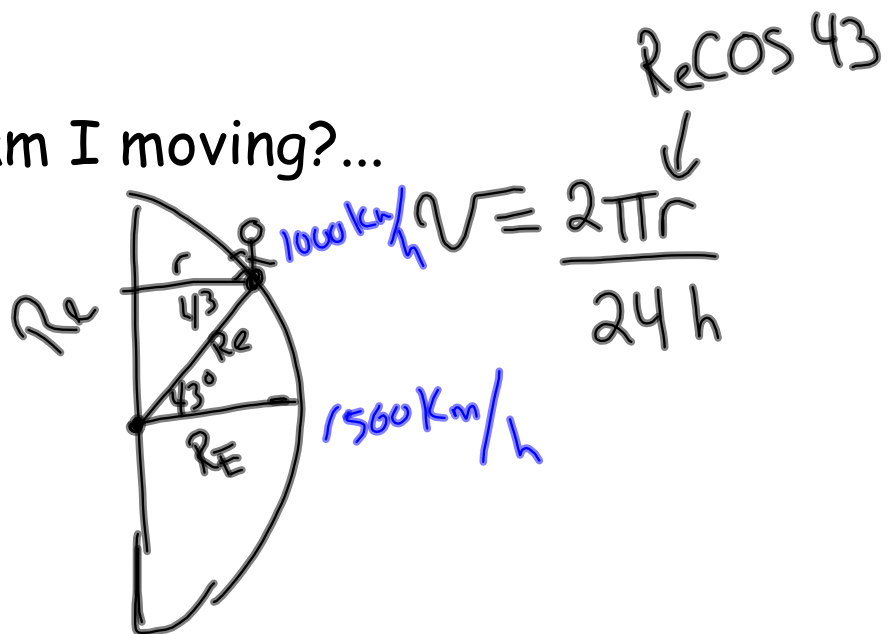
FRAME OF REFERENCE (Ch. 2.1 - pg 30):
a subset of the physical world defined by an observer in which positions or motions can be discussed or compared. This can be stationary or moving.

Ex. If you are in a stopped school bus and you walk towards the front of the bus you are moving with respect to others sitting in the bus, the floor of the bus and the ground.
   If you are sitting in a moving school bus, you are NOT moving with respect to the floor of the bus, or others around you sitting down. You ARE moving with respect to the ground and landscape outside the bus.
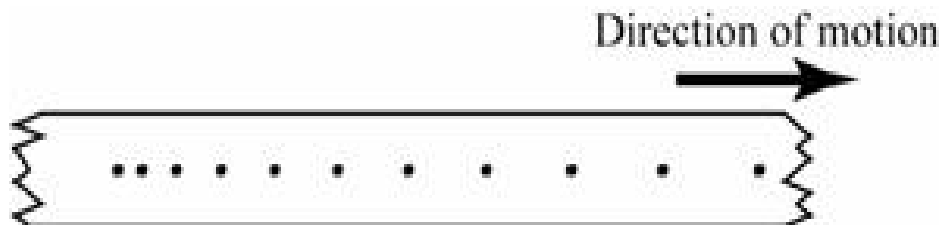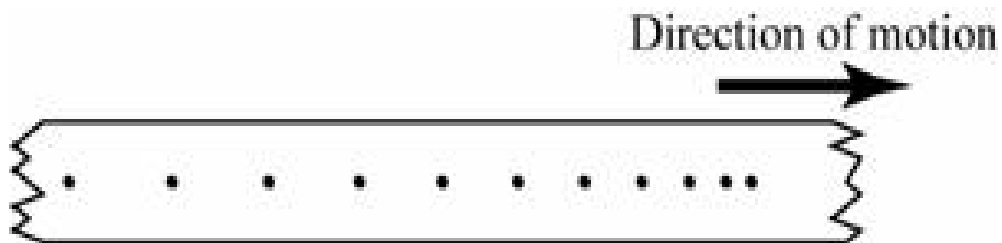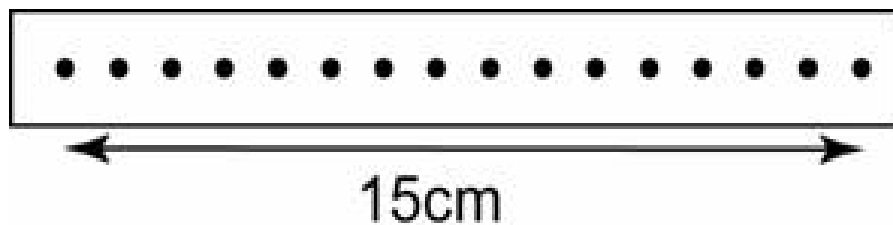
Coordinate System

Used to describe an object's position and motion mathematically.
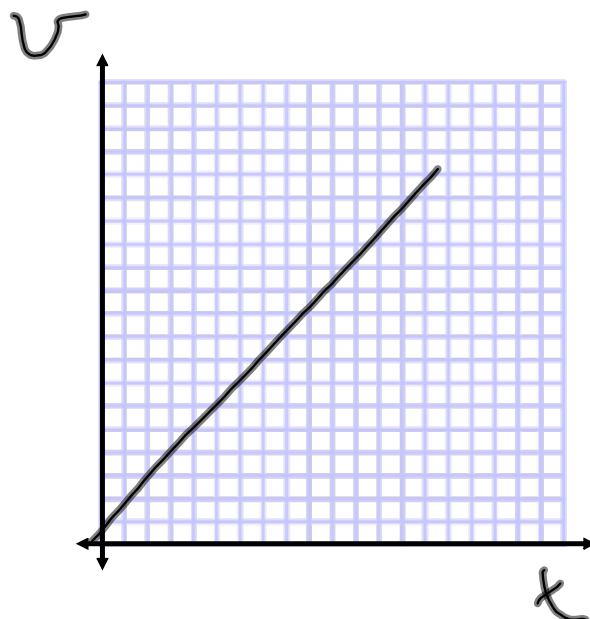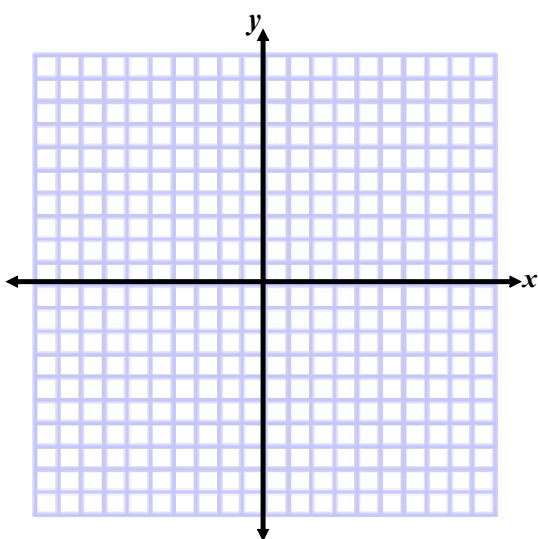
Visualizing Motion

The time interval is the same between each dot.

15cm

Direction of motion

Direction of motion

Kinematics – Describing Motion

Distance

- the separation between two points (how far an object has traveled)
- scalar quantity
- symbol: d
- units: nm, μm, cm, m, km, Mm, etc.

Position

- separation between an object and a reference point
- vector quantity
- symbol: $\vec{x}$
- units: cm, m, km, etc.

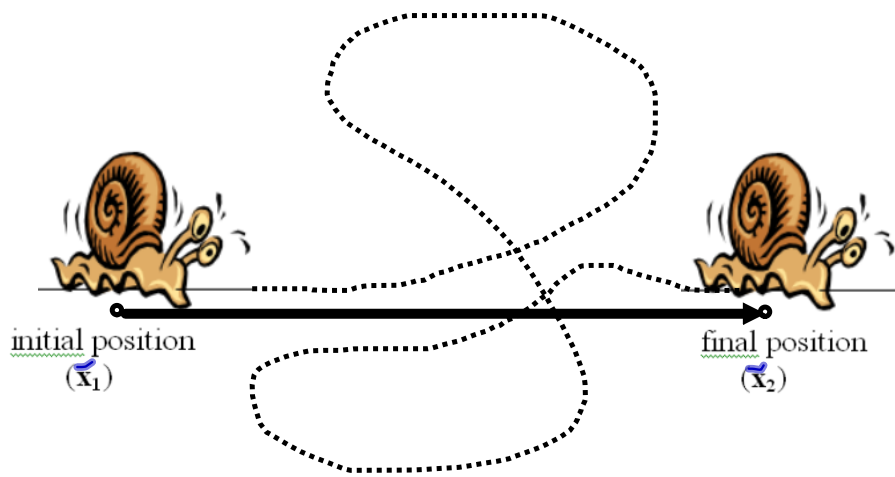   **Note**: Instantaneous position is the location of an object at an instant (at a single time, t)

Displacement

- change in position (the difference between two positions)
- vector quantity
- symbol: $\vec{\Delta x}$

$$\vec{\Delta x} = \vec{x_2} - \vec{x_1}$$

- units: cm, m, km, etc.

Snail - on his morning walk…

$$\Delta \vec{x} = \vec{x_2} - \vec{x_1}$$

initial position
$(\vec{x_1})$

final position
$(\vec{x_2})$

Time Interval

- the amount of time that passes between two instants of time
- symbol: Δt
- units: s, h
- scalar quantity

Speed

- the distance an object travels divided by the time interval during which the object was traveling (how fast an object is traveling)

$$speed = \frac{distance}{\Delta t}$$

- scalar quantity
- symbol: v
- units: cm/s, m/h, km/h, m/s

Note: *Instantaneous speed* is the speed at which an object is traveling at time, t.

(Average) Velocity

- describes how fast an object moves from one position to another *and* indicates the direction in which the object is travelling
- the rate of change of position or the displacement of an object over a time interval
- vector quantity
- symbol: $\vec{v}$
- units: cm/s, m/s, km/h, etc.

$$\vec{v} = \frac{\Delta \vec{x}}{\Delta t} = \frac{\vec{x}_2 - \vec{x}_1}{\Delta t}$$

← displacement

(Average) Acceleration

- the rate of change of velocity of an object over a time interval
- vector quantity
- symbol: $\vec{a}$
- units: m/s^2

$$\vec{a} = \frac{\Delta \vec{v}}{\Delta t} = \frac{\vec{v}_2 - \vec{v}_1}{\Delta t}$$

Homework:

1. Conceptual Problems bottom of pg 41.
2. Practice problem 2 pg 45.
3. Section Review 2.2 pg 46 #'s 1, 2, 3.
4. Read Section 2.3 pg 47 - 60.

Read Chapter 2.3
Pg. 60 #'s 1-3, 6

Read Chapter 2.4
Pg. 70 #'s 1, 5

Review
Pg. 71 #'s 1, 15 - 22, 24 - 27