UNIT #3 - MOTION

Speed and Velocity

REVIEW - DISTANCE

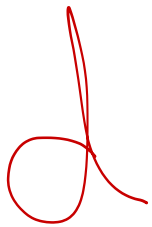
- **distance–the total path length travelled by an object**
  - (m)
  - SCALAR
- example: If you walk

  2m from your locker to your biology class

  2m from biology class to the washroom

  7m from the washroom to your physics class

  11m
- You have travelled a **distance** of 11m.



REVIEW - POSITION

- **position–the distance and direction of an object from a reference point.**
  - VECTOR
  - $\vec{d}$

- example : the brick is 5m to the right of it's starting point.

REVIEW DISPLACEMENT

- **displacement**-the change in position of an object
  - VECTOR
  - $\overrightarrow{\Delta d}$

- example 1: the brick was displaced 5m to the right

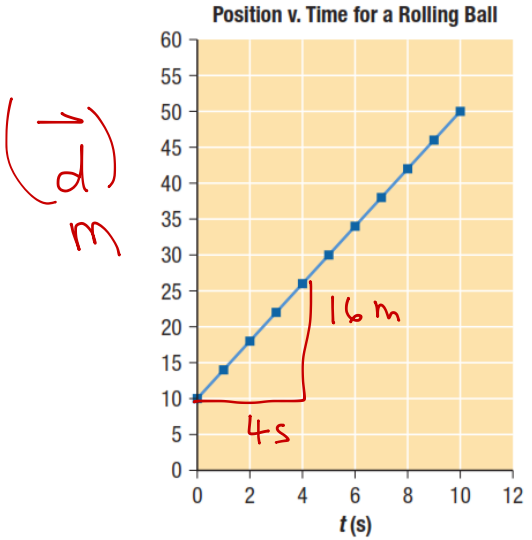
LINEAR MOTION

- Motion along a straight line
- Can be described mathematically using only 1 dimension. (in the x-direction, in the y-direction, North, East, etc.)
- Also called rectilinear motion (Rectilinear propogation of light in Gr. 10 optics)

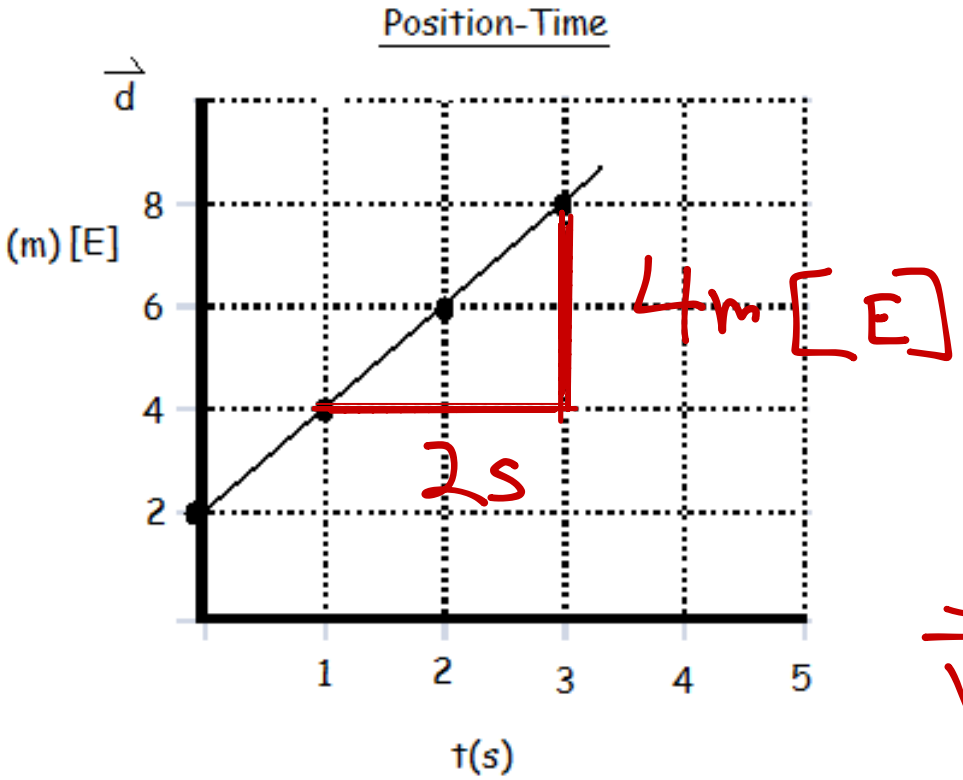
POSITION-TIME GRAPH (CONSTANT VELOCITY)

- A graph describing the motion of an object, with position on the vertical axis and time on the horizontal axis

- The slope of a position-time graph gives the velocity of the object



POSITION-TIME



Uniform Motion

$\vec{a} = 0$

$$\vec{v} = \frac{4m\,[E]}{2s}$$

$$\vec{v} = 2m/s\,[E]$$

POSITION-TIME

slope = rise/run

No Motion

$= \frac{0}{4}$

$= 0$

SPEED

- average speed = $\frac{\text{total distance}}{\text{total time}}$ (m/s)

- SCALAR quantity (has ONLY **magnitude**)

- Example: speedometer

- Average speed is the total distance travelled divided by the total time of travel

INSTANTANEOUS SPEED

- Instantaneous speed is the speed at a particular instant in time

AVERAGE VELOCITY

- The change of position divided by the time interval
- Vector quantity

- average velocity = $\frac{\text{total displacement}}{\text{total time}}$ (m/s)

- VECTOR quantity (has **magnitude** and **direction**)

- $\vec{\mathbf{v}}$

INSTANTANEOUS VELOCITY

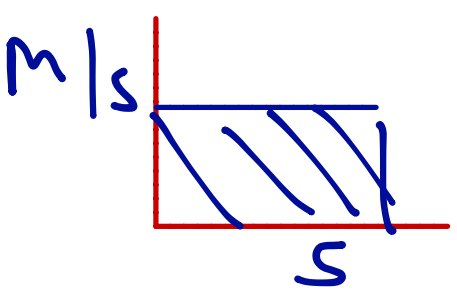
- The velocity at a particular instant
- The rate of change of position
- Vector quantity

VELOCITY-TIME GRAPH

- A graph describing the motion of an object, with velocity on the vertical axis and time on the horizontal axis

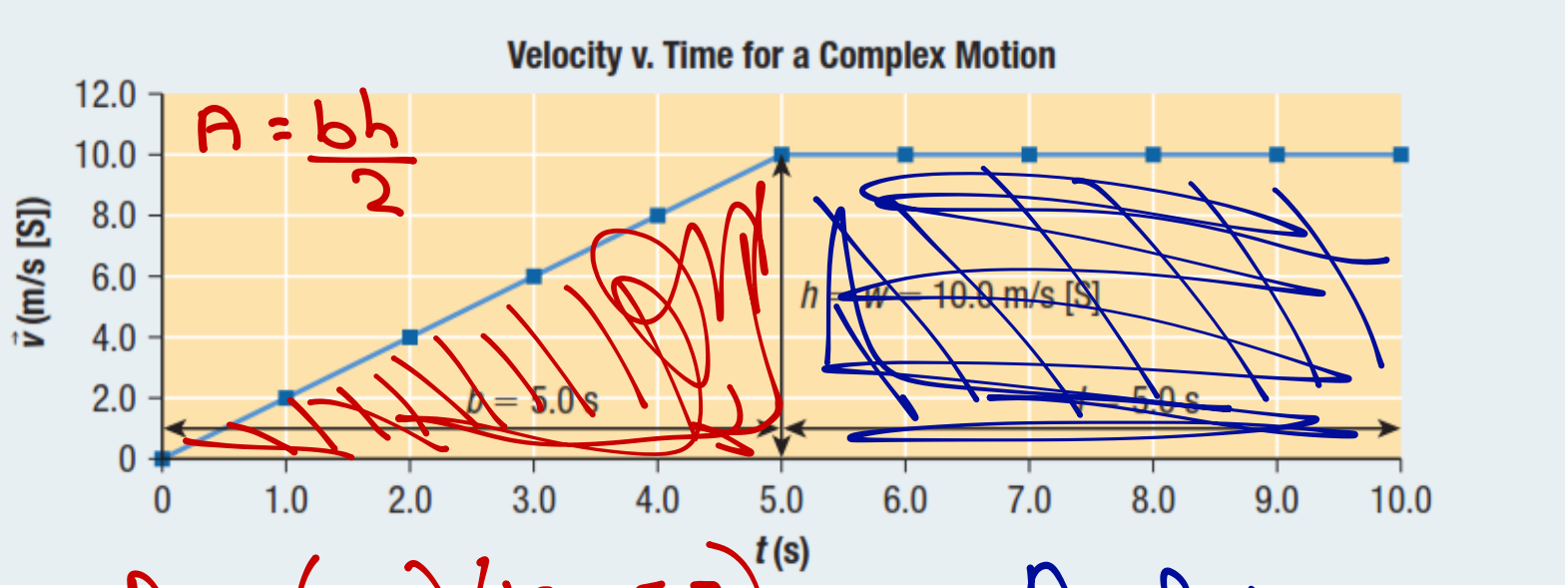
- The slope of a velocity-time graph gives the average acceleration of an object

- The area under a velocity-time graph gives the displacement of the object whose motion it describes



$\frac{m}{s} \times s$

VELOCITY-TIME GRAPH



$A = \frac{bh}{2}$

$A = \frac{(5\,s)(10\,\frac{m}{s}[S])}{2}$

$A = 25\,m[S]$

$\therefore \vec{\Delta d} = 25\,m[S]$

$A = lw$

$= (5\,s)(10\,\frac{m}{s}[S])$

$A = 50\,m[S]$

$\vec{\Delta d} = 50\,m[S]$

$\therefore \vec{\Delta d} = 75\,m[S]$

HOMEWORK

- p.13 #8-10
- p.15 #11
- p.16 #1-3,7,8