

KINEMATICS

Distance $\Rightarrow l = r\theta$

radians



Displacement $\Rightarrow 2r \sin(\frac{\theta}{2})$

② Avg. Velocity & Avg. Speed :

Avg. Velocity = $\frac{\text{Total displacement}}{\text{Total time}}$

Avg. Speed = $\frac{\text{Total distance}}{\text{Total time}}$

Notes: Displacement $\leq$ distance

Avg. Velocity $\leq$ Avg. Speed.

* Important Case :-

1) If body covers 'n' equal distances with velocities $v_1, v_2, v_3, \dots, v_n$; then avg. speed:

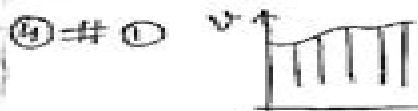
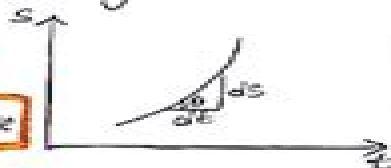
$$V_{\text{avg.}} = \frac{n}{\frac{1}{v_1} + \frac{1}{v_2} + \dots + \frac{1}{v_n}}$$

2) If $n=2$, Avg. speed will be -

$$V_{\text{avg.}} = \frac{2v_1v_2}{v_1 + v_2}$$

③ Instantaneous Velocity :

$v = \frac{ds}{dt} = \tan \theta$
= slope of s-t curve



$v = \frac{ds}{dt}$
 $ds = v dt$

$\int_{s_1}^{s_2} ds = \int_{t_1}^{t_2} v dt$
 $[s]_{s_1}^{s_2} = \int_{t_1}^{t_2} v dt$

displacement $\leftarrow [s_2 - s_1] = \int_{t_1}^{t_2} v dt = \text{Area Under Curve}$

②



$a = \frac{dv}{dt}$

$\int_{v_1}^{v_2} dv = \int_{t_1}^{t_2} a dt \Rightarrow [v]_{v_1}^{v_2} = \int_{t_1}^{t_2} a dt$

$dv = a dt$

change in velocity $\leftarrow [v_2 - v_1] = \int_{t_1}^{t_2} a dt = \text{Area under Curve}$

⑤ Equations of Motion Always valid :

① $v = \frac{ds}{dt}$

③ $s_2 - s_1 = \int_{t_1}^{t_2} v dt$

② $a = \frac{dv}{dt}$

④ $v_2 - v_1 = \int_{t_1}^{t_2} a dt$

⑤ $a = v \frac{dv}{ds}$

⑥ Equation of Motion for Uniform Acceleration

For constant acceleration,

① $v = u + at$

$u \rightarrow$ initial velocity
 $v \rightarrow$ final velocity

② $s = ut + \frac{1}{2}at^2$

$a \rightarrow$ acceleration [constant]

③ $v^2 - u^2 = 2as$

$t \rightarrow$ time period of acceleration.
 $s \rightarrow$ displacement.

⑦ Important Results for Uniform Acceleration:

$a = \text{constant}$.

1) A particle moving with uniform acceleration from A to B along a straight line has velocities v_1 and v_2 at A and B, respectively. If C is the mid point b/w A and B, then -

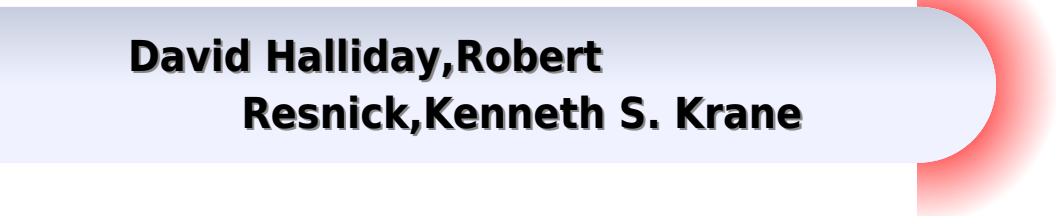
$$v = \sqrt{\frac{v_1^2 + v_2^2}{2}}$$



Dist $\rightarrow$ straight line
Ind. $\rightarrow$ not straight line

Answer Sheet For Physics Volume Halliday

**David Halliday, Robert
Resnick, Kenneth S. Krane**



Answer Sheet For Physics Volume Halliday:

Fundamentals of Physics, Volume 1 David Halliday, Robert Resnick, Jearl Walker, 2017-12-11 The first volume of a two volume text that helps students understand physics concepts and scientific problem solving Volume 1 of the Fundamentals of Physics 11th Edition helps students embark on an understanding of physics This loose leaf text covers a full range of topics including measurement vectors motion and force It also discusses energy rotation equilibrium gravitation and oscillations as well temperature and heat The First and Second Law of Thermodynamics are presented as is the Kinetic Theory of Gases The text problems questions and provided solutions guide students in improving their problem solving skills

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