# Kinematics eq'ns

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① $\vec{v}_f = \vec{a}t + \vec{v}_i$

② $\Delta d = \frac{1}{2}(\vec{v}_i + \vec{v}_f)\Delta t$

③ $\Delta d = \frac{1}{2}\vec{a}t^2 + \vec{v}_i \cdot t$

④ $v_f^2 = 2\vec{a}\Delta\vec{d} + v_i^2$

valid if

$\vec{a}$ is constant

$\vec{a}$ could be + ($\vec{v}_f$ is greater than $\vec{v}_i$)

$\vec{a}$ could be − ($\vec{v}_f$ is less than $\vec{v}_i$)

or v is increasing in the negative direction

$\vec{a}$ = zero when $\vec{v}$ is constant

$v = \frac{d}{t}$

① if $\vec{a} = 0 m/s^2$

$v_f = 0 \times t + v_i$

$\therefore v_f = v_i = v$

② $\Delta d = \frac{1}{2}(v + v)\Delta t = \frac{1}{2}(2v)\Delta t = v \cdot \Delta t$

$\Delta d = v \cdot \Delta t$ ... $v = \frac{\Delta d}{\Delta t}$

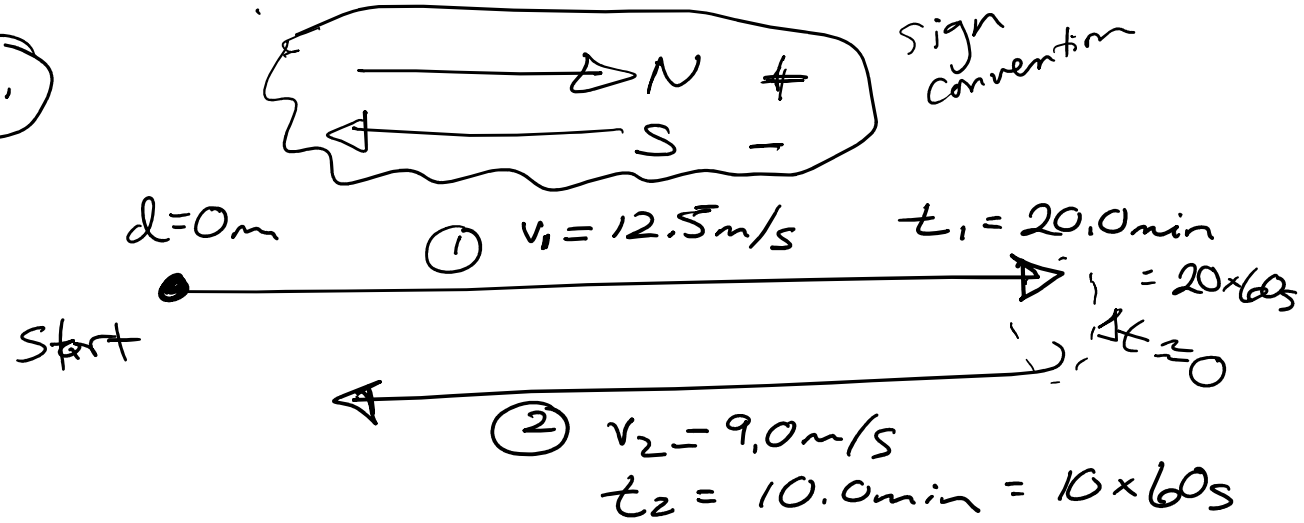
③ $\Delta d = \frac{1}{2}\cancel{0}\,t^2 + v \cdot t$

$\Delta d = v \cdot \Delta t$ $\quad v = \frac{\Delta d}{\Delta t}$

④ $v_f^2 = \cancel{2 \cdot 0 \cdot \Delta d} + v_i^2$

$\therefore v_f = v_i$

1.




(a) $dist = v_1 \times t_1 + v_2 \times t_2$

$= (12.5 m/s)(20 \times 60 s) + (9.0 m/s)(10 \times 60 s)$

$dist = d = 20400 m = \boxed{2.0 \times 10^4 m}$

(b) $\vec{d} = \vec{v}_1 \cdot t_1 + \vec{v}_2 \cdot t_2$

$= (12.5 m/s)(20 \times 60 s) + (-9.0 m/s)(10 \times 60 s)$

$\vec{d} = 9600 m = \boxed{9.6 \times 10^3 m [N]}$

(c) speed $v = \dfrac{dist}{t} = \dfrac{d_1 + d_2}{t_1 + t_2}$

$v = \dfrac{20400 m}{(20 \times 60 s) + (10 \times 60 s)} = \boxed{11.3 m/s}$

(d) $\vec{v} = \frac{\Delta \vec{d}}{t} = \frac{9600\,m}{(20 \times 60\,s) + (10 \times 60\,s)}$

$\boxed{\vec{v} = 5.3\,m/s\,[N]}$

2. $v = 45.0\,km/h$

$t = ?$

$d = 6500.0\,m$

$v = \frac{d}{t}$

$t \times v = \frac{d}{t} \times t$

$\frac{d}{v} = \frac{t \times v}{v}$

$t = \frac{d}{v}$

$\frac{x \cdot t}{x} = \frac{d}{v}$

$v = \frac{45.0\,km/h}{3.6\,\frac{km/h}{m/s}}$

$= \left(\frac{45}{3.6}\right) m/s$

$t = \frac{d}{v} = \frac{6500.0\,m}{(45.0/3.6)\,m/s}$

$\boxed{t = 5.20 \times 10^2\,s}$

$= 8.67\,min$

Physics 11 W.S. Kinematics

#1 to 9

Answer Key is posted