Type—5:
ত্বরণ (acceleration)

Case I: (Graph)
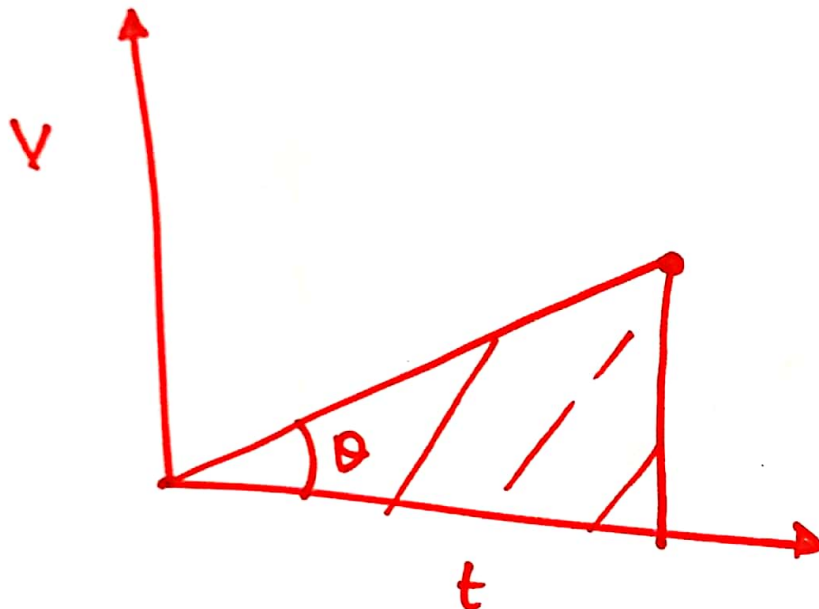
$$(V \text{ vs } t)$$

∴ এখানে, slope, $\tan\theta = \dfrac{V}{t} = a$

$$\text{Area} = Vt = S$$

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Ex: v-t তে কোন বিন্দুর স্থানাঙ্ক (3,4)

2তে এর ① ত্বরণ (acceleration) কত?

② সরণ (displacement)

⇒

$(3,4)$

Y

4

θ

3

t

$\therefore a = \tan\theta = \dfrac{4}{3} = 1.33 \, ms^{-2}$

$S^0 = \text{Area} = \dfrac{1}{2} \times 4 \times 3 = 6m$

\#

$$S_{AB} = ?$$

$$\therefore S = \sqrt{r^2 + r^2} = \sqrt{2r^2} = r\sqrt{2}$$

Case II :

EX: কোন বস্তুর (বেগ (velocity) $2\,ms^{-1}$ 2(ত

2min র ব্যবধি গোয়ে $12\,ms^{-1}$ এ- ত্বরণ

2(ন র ত্বরণ বের?)

$$\Rightarrow a = \frac{\Delta v}{t} = \frac{12 - 2}{2 \times 60}$$

$$= 0.0834\,ms^{-2}$$
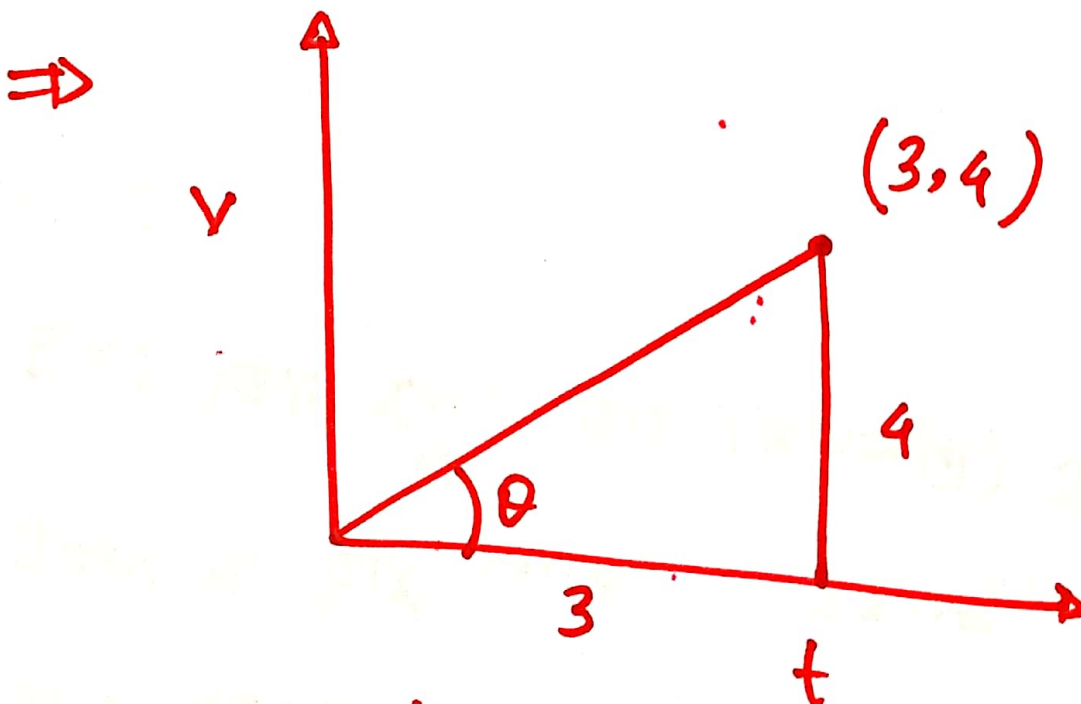
Type-6: গতির সমীকরণ: (Eqⁿ of motion)

Dynamic coordinate :(সচল স্থানাঙ্ক)

$$(s, v, a, t)$$

Case I :

1. $V = u + at$:
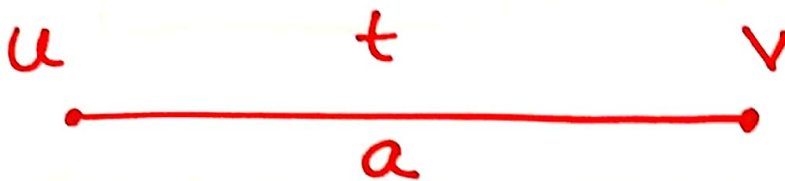
u = আদিবেগ (initial velocity)

V = শেষবেগ (final)

a = acceleration (ত্বরণ)

t = সময় (time)

এখানে, $a = \dfrac{\Delta v}{t}$

$\Rightarrow a = \dfrac{v - u}{t}$

$\Rightarrow v - u = at$

$\Rightarrow \boxed{v = u + at}$ (TTM)

স্থির অবস্থা হতে চলতে থাকলে; $u = 0$

$$v = at$$

সুষম ত্বরণঃ $a = \text{fixed} = \text{constant}$

$\therefore \boxed{v \, \alpha \, t}$

Case II: $S = \left(\dfrac{v+u}{2}\right) t$

$S = স্থান$
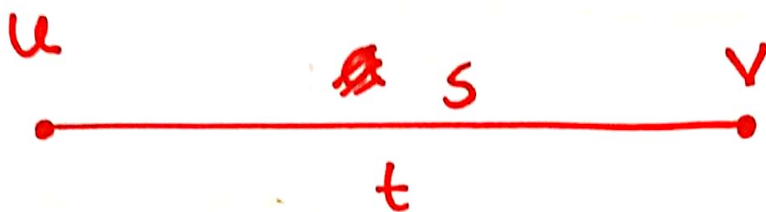
$= \text{displacement}$

here,   গড়বেগ, $\bar{V} = \dfrac{v+u}{2}$

$\therefore \ \bar{V} = \dfrac{S}{t}$

$\Rightarrow \ S = \bar{V} t$

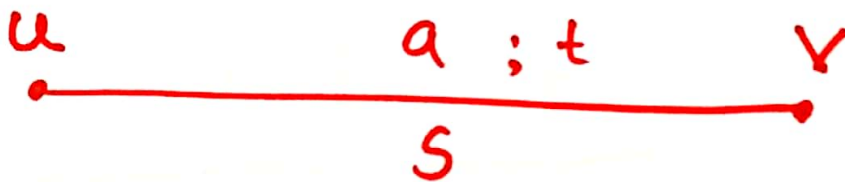$$\Rightarrow \boxed{S = \left(\dfrac{v+u}{2}\right) t}$$

Case III: $S = ut + \frac{1}{2}at^2$

$$\overset{u}{\bullet}\underset{S}{\xrightarrow{\hspace{2cm} a\ ;\ t \hspace{2cm}}}\overset{v}{\bullet}$$

$\therefore \quad \bar{v} = \dfrac{v+u}{2}$

Now, $\quad \bar{v} = \dfrac{S}{t}$

$\Rightarrow \quad S = \bar{v}t$

$\Rightarrow \quad S = \left(\dfrac{v+u}{2}\right)t \qquad [v = u+at]$

$\Rightarrow \quad S = \left(\dfrac{u+at+u}{2}\right)t$

$\Rightarrow \quad S = \left(\dfrac{2u+at}{2}\right)t$

$$\Rightarrow S = \left(\frac{2u}{2} + \frac{at}{2}\right)t$$

$$\Rightarrow S = \left(u + \frac{1}{2}at\right)t$$

$$\Rightarrow \boxed{S = ut + \frac{1}{2}at^2} \quad (TTM)$$

স্থির অবস্থায়: $u = 0$
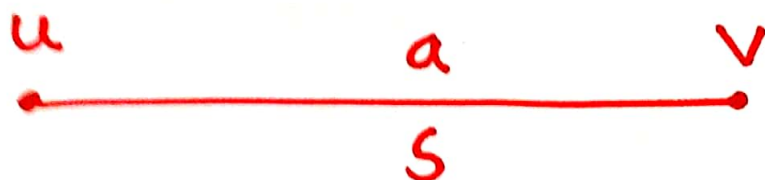
$$\therefore S = \frac{1}{2}at^2$$

$a = $ সুষমত্বরণ; $\boxed{S \propto t^2}$ ✓

Case IV: $V^2 = U^2 + 2aS$

$$\therefore \bar{V} = \frac{V + u}{2}$$

$$\therefore \bar{V} = \frac{S}{t}$$

$$\Rightarrow S = \bar{V} t$$

$$\Rightarrow S = \left(\frac{V + u}{2}\right) t \quad —①$$

$$\therefore a = \frac{V - u}{t}$$

$$\Rightarrow t = \frac{V - u}{a}$$

① s ও t এর মান বসিয়ে;

$$S = \left(\frac{v+u}{2}\right) \cdot \left(\frac{v-u}{a}\right).$$

$$\Rightarrow S = \frac{(v+u)(v-u)}{2a}$$

$$\Rightarrow S = \frac{v^2 - u^2}{2a}$$

$$\Rightarrow v^2 - u^2 = 2as$$

$$\Rightarrow \boxed{v^2 = u^2 + 2as} \quad \checkmark$$

স্থির অবস্থায়; $u = 0$ $\therefore$ $v^2 = 2as$

সুষমত্বরণ, $a = $ fixed ; $v^2 \propto s$

$\therefore v \propto \sqrt{s}$

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