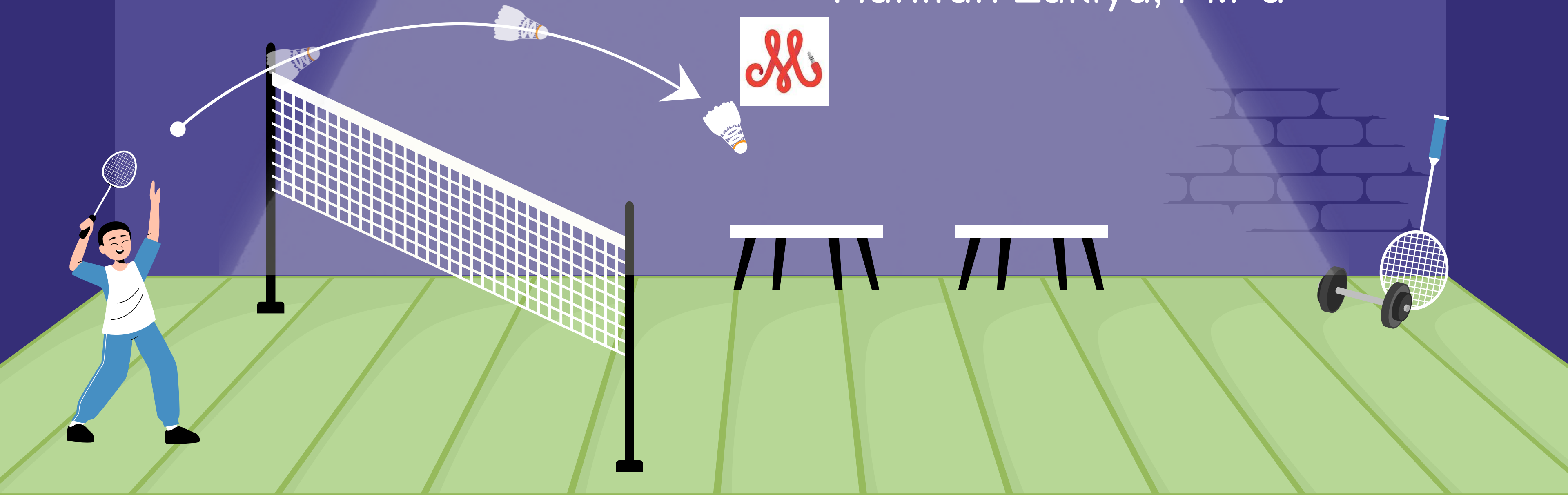


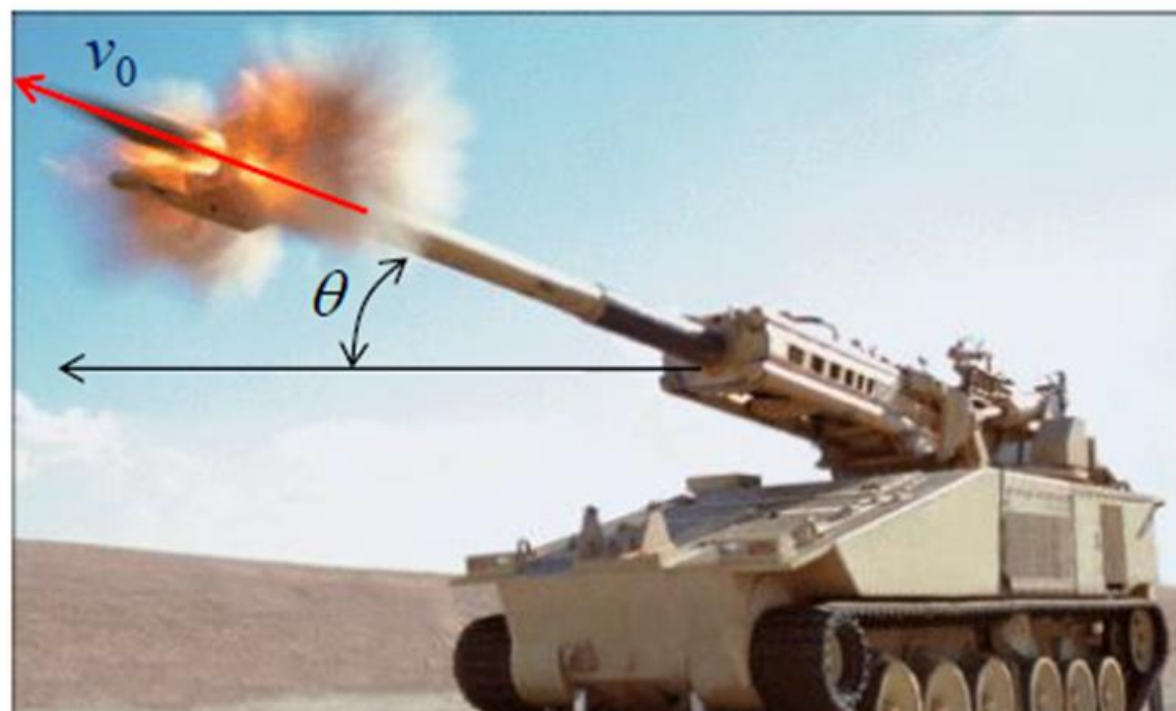
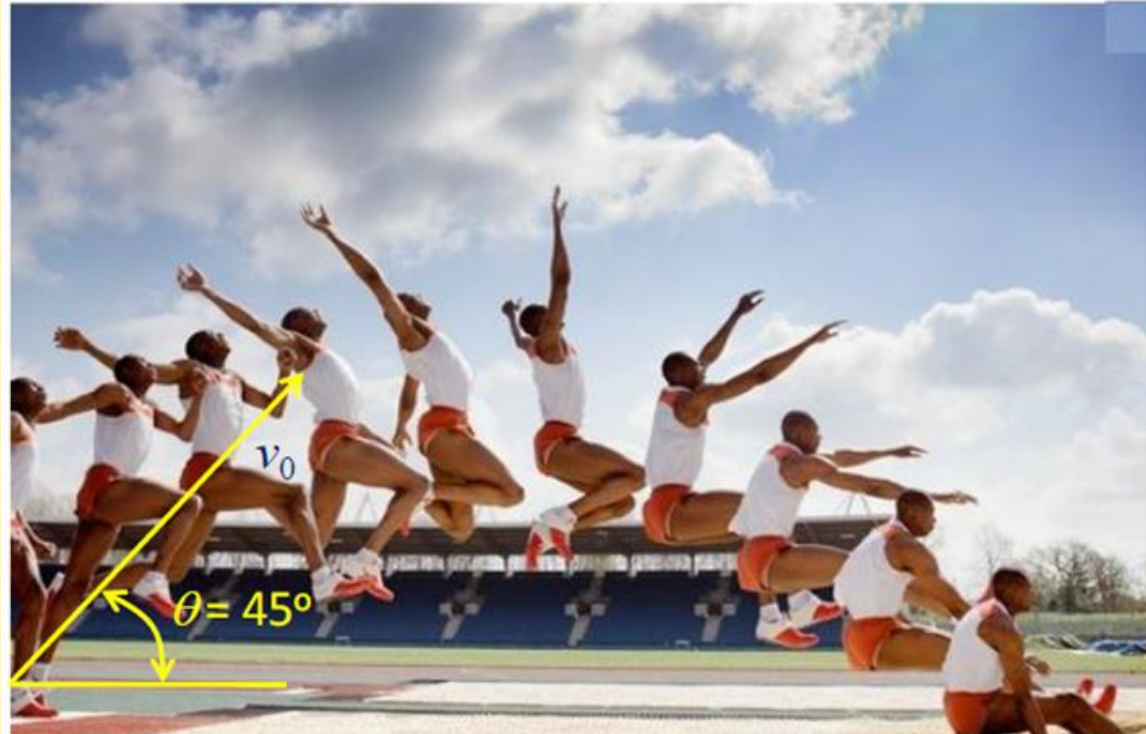
00:3
0

Gerak 2 Dimensi : Gerak Parabola

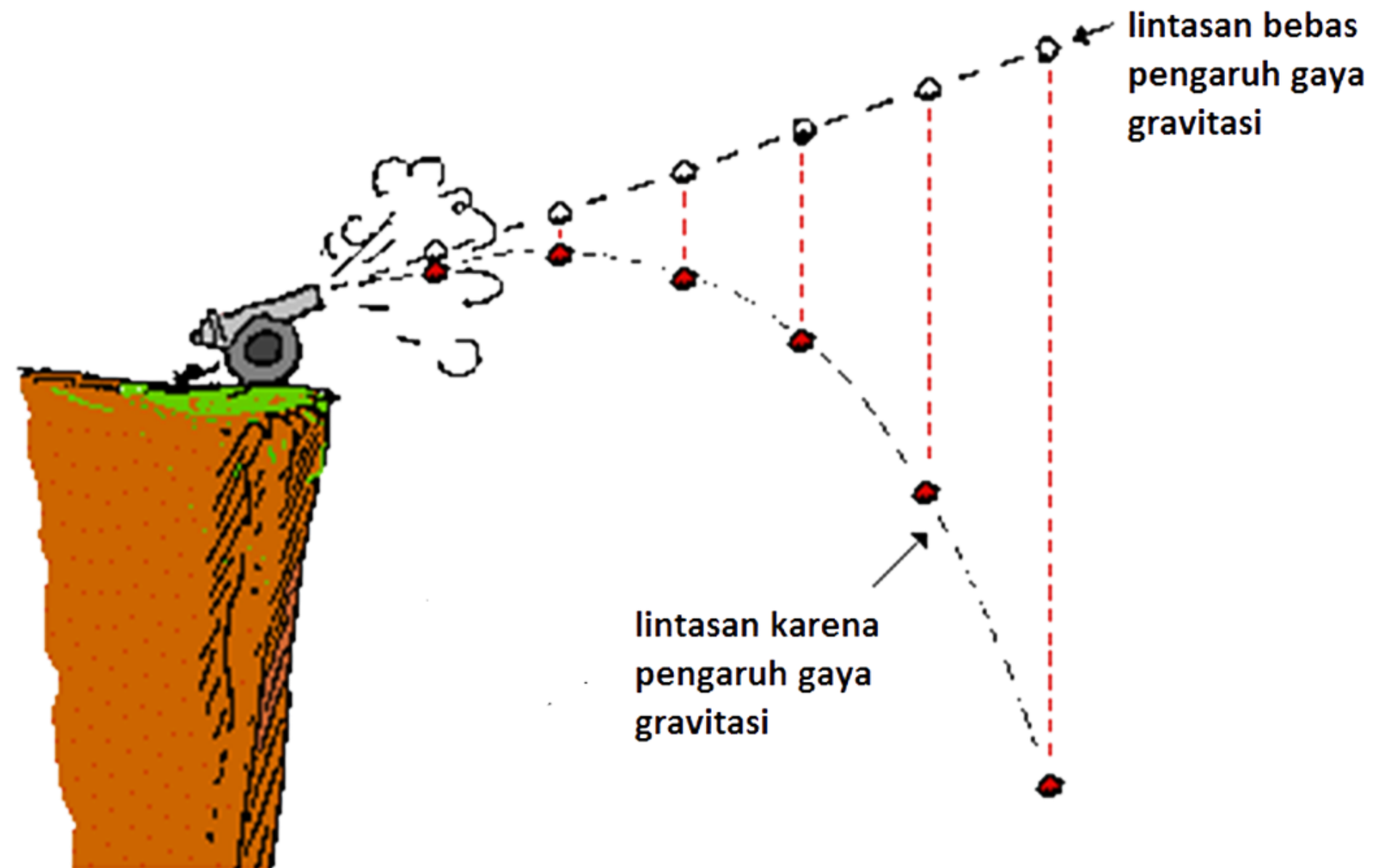
Hanifah Zakiya, M.Pd



Aplikasi Gerak Parabola



Eksplorasi Konsep: Ada dan Tidak Ada Gravitasi



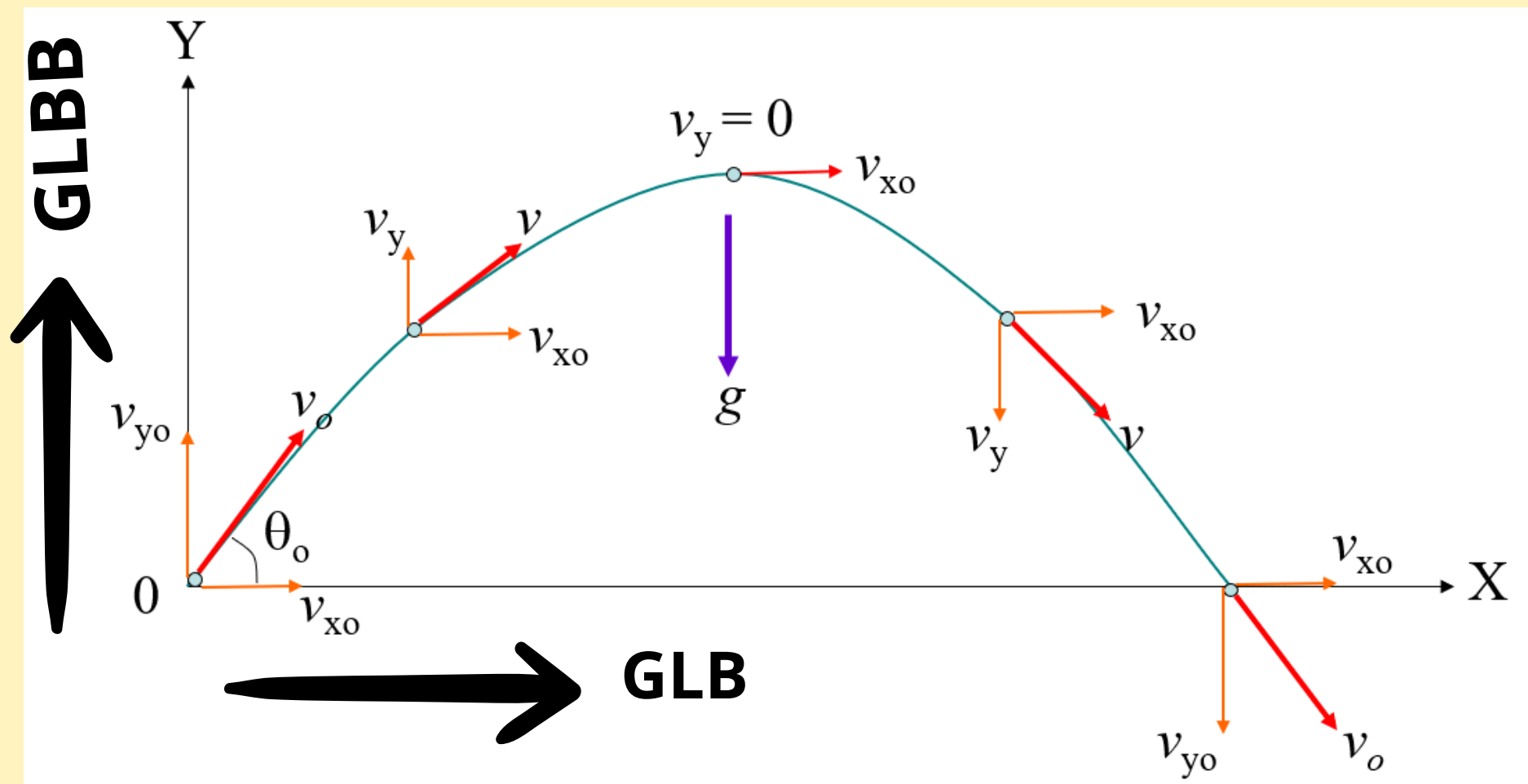
Lengkungan parabola gerak disebabkan oleh percepatan akibat **gaya gravitasi (g)** bekerja pada benda, yang arahnya ke bawah.

Asumsi-asumsi dalam Analisis Gerak Parabola

- Selama bergerak percepatan gravitasi, g , adalah konstan dan arahnya ke bawah
- Tidak ada percepatan dalam arah horisontal
- Pengaruh gesekan udara dapat diabaikan
- Benda tidak mengalami rotasi

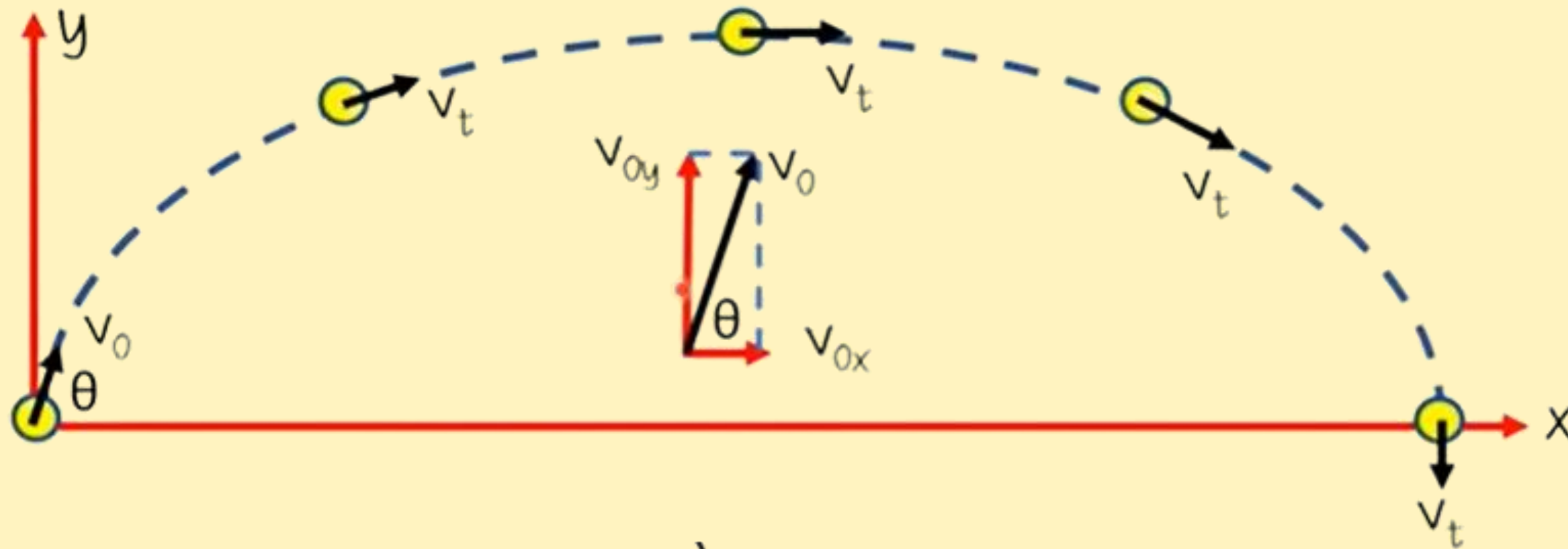
Definisi Gerak Parabola

- Lintasan parabola terjadi ketika suatu benda di tembakkan dengan **membentuk sudut** terhadap sumbu-x. (Tidak lurus ke atas)
- Gerak benda di analisis dengan analisis dua dimensi. Dimensi sb-x GLB, dan Dimensi sb-y GLBB



- Arah kecepatan berbeda-beda (selalu berubah arahnya)

Besaran Dasar Gerak Parabola : Kecepatan Awal

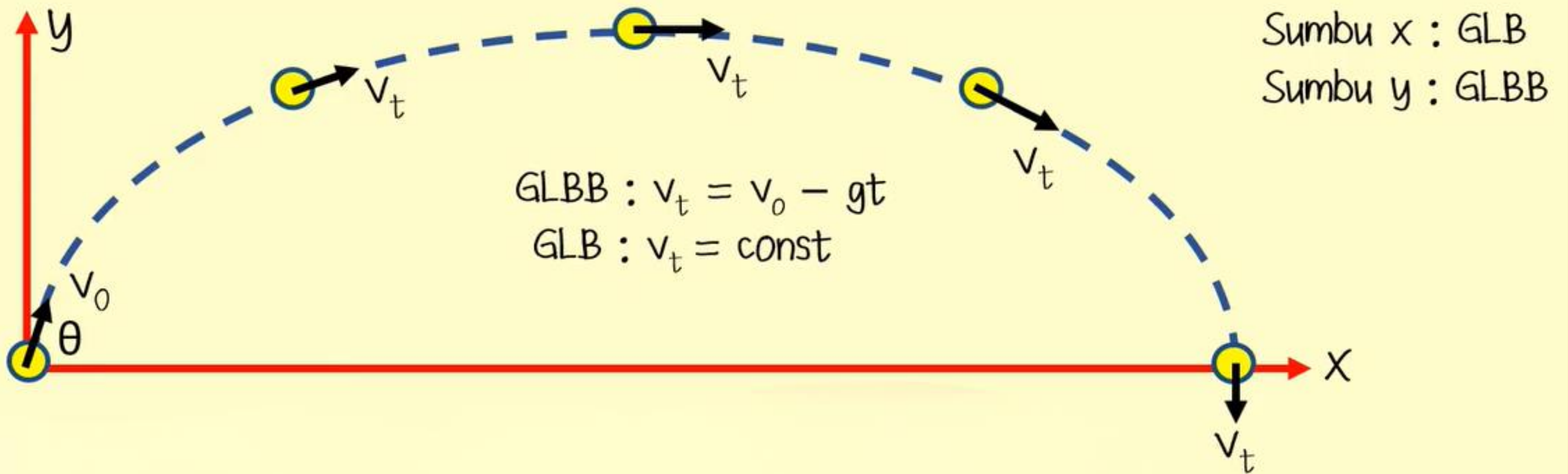


$$v_{0y} = v_0 \sin \theta$$

$$v_{0x} = v_0 \cos \theta$$

Kecepatan Awal (v_0) : $v_0^2 = v_{0x}^2 + v_{0y}^2$

Besaran Gerak Parabola : Kecepatan Sesaat



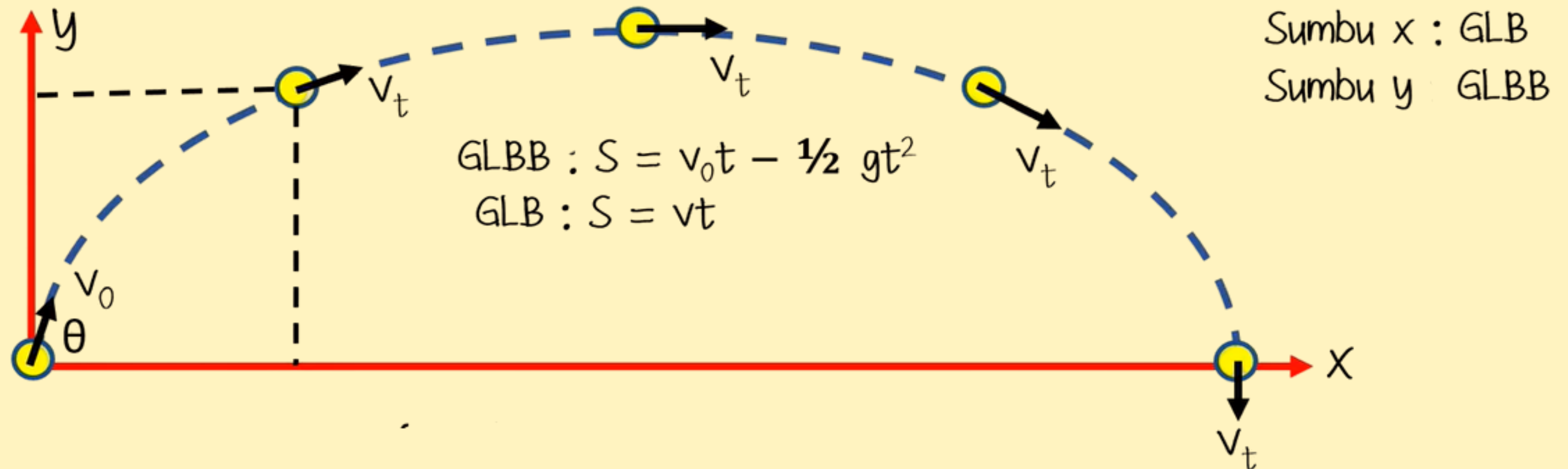
$$v_{tx} = v_{0x} = v_0 \cos \theta$$

$$v_{ty} = v_{0y} - gt = v_0 \sin \theta - gt$$

Kecepatan Sesaat (v_t) :

$$|\vec{v}_t| = \sqrt{(\vec{v}_{tx})^2 + (\vec{v}_{ty})^2}$$

Besaran Gerak Parabola : Posisi Sesaat

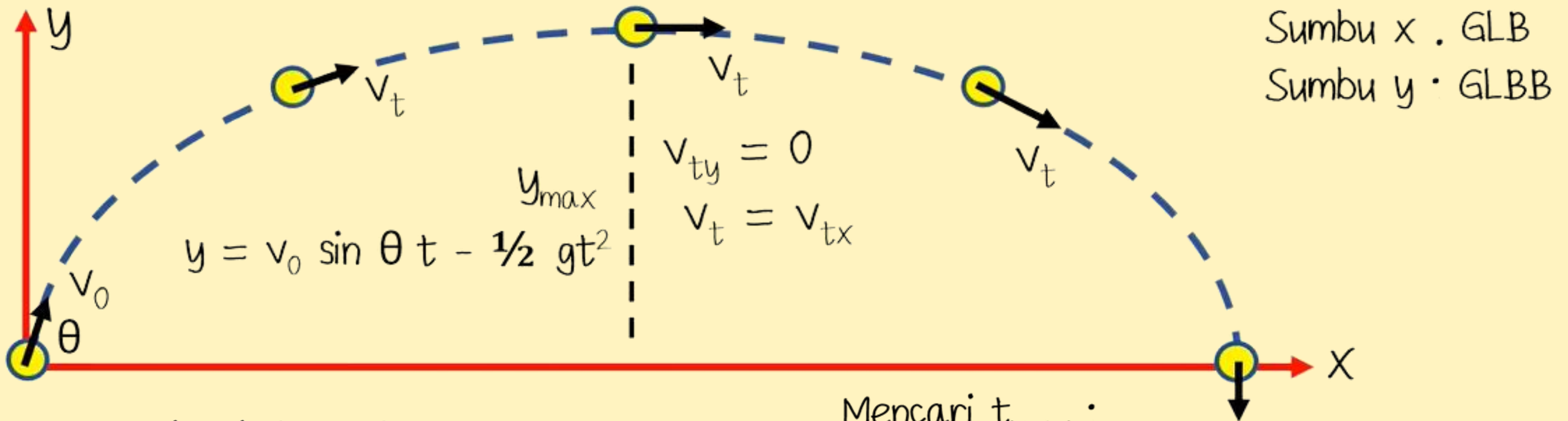


Posisi sesaat (x,y) :

$$x = v_{tx} t = v_0 \cos \theta t$$

$$y = v_{0y} t - \frac{1}{2} g t^2 = v_0 \sin \theta t - \frac{1}{2} g t^2$$

Besaran Gerak Parabola : Ketinggian Maksimum



Saat ketinggian max

$$y_{max} = v_0 \sin \theta t_{y_{max}} - \frac{1}{2} g t_{y_{max}}^2$$

Mencari $t_{y_{max}}$:

$$v_{ty} = v_0 \sin \theta - g t$$

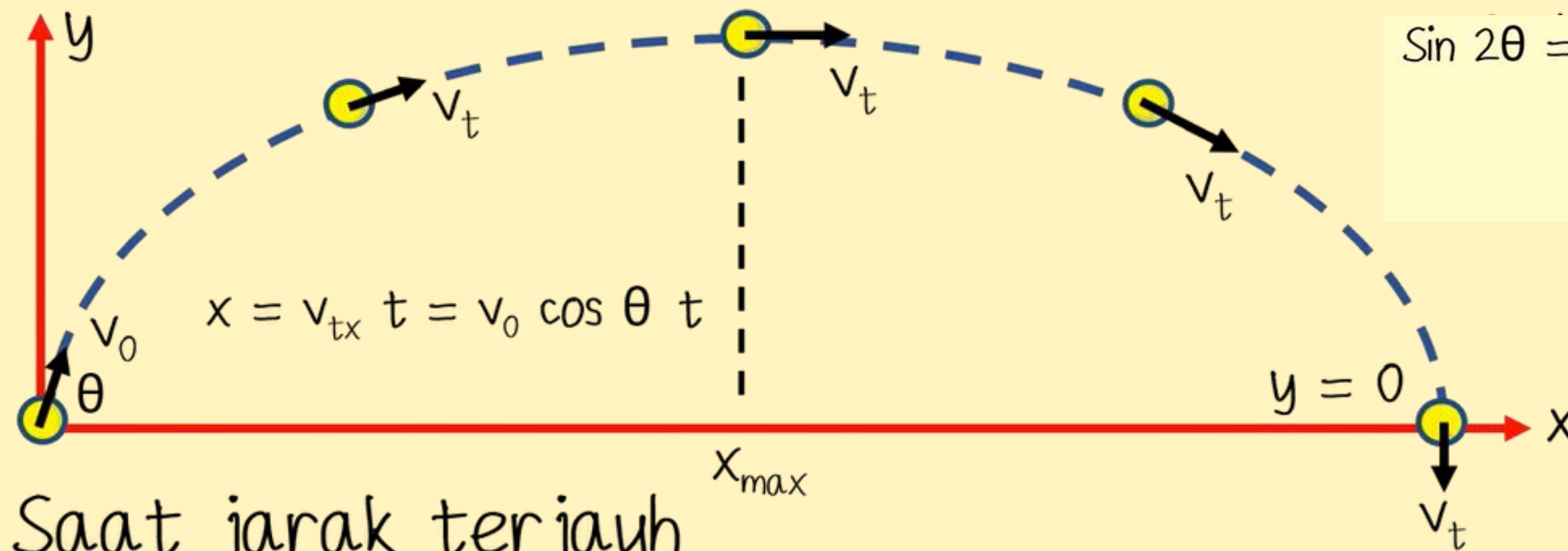
$$0 = v_0 \sin \theta - g t_{y_{max}}$$

$$t_{y_{max}} = v_0 \sin \theta / g$$

$$\begin{aligned} y_{max} &= v_0 \sin \theta (v_0 \sin \theta / g) - \frac{1}{2} g (v_0 \sin \theta / g)^2 \\ &= v_0^2 \sin^2 \theta / g - \frac{1}{2} v_0^2 \sin^2 \theta / g \end{aligned}$$

$$y_{max} = v_0^2 \sin^2 \theta / 2g$$

Besaran Gerak Parabola : Jangkauan Maksimum



$$\begin{aligned}\sin 2\theta &= \sin (\theta + \theta) \\ &= \sin \theta \cos \theta + \cos \theta \sin \theta \\ &= 2 \sin \theta \cos \theta\end{aligned}$$

Saat jarak terjauh

$$x_{max} = v_0 \cos \theta t_{xmax}$$

$$\begin{aligned}x_{max} &= v_0 \cos \theta (2v_0 \sin \theta / g) \\ &= v_0^2 2 \sin \theta \cos \theta / g\end{aligned}$$

$$x_{max} = v_0^2 \sin 2\theta / g$$

Mencari t_{xmax} :

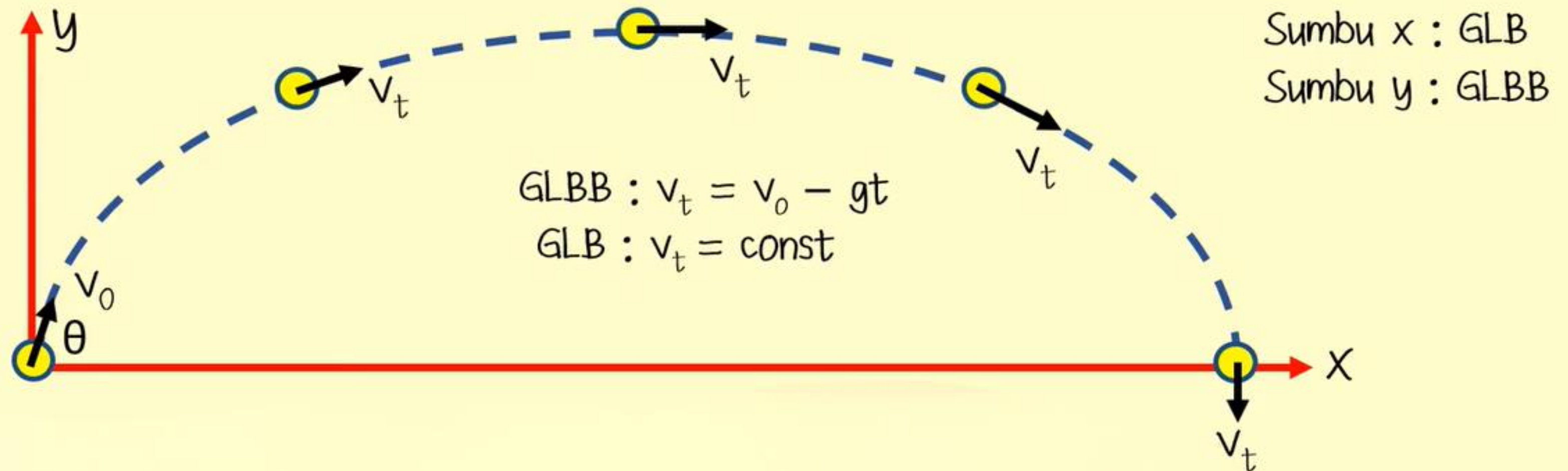
$$y = v_0 \sin \theta t - \frac{1}{2} g t^2$$

$$0 = v_0 \sin \theta t_{xmax} - \frac{1}{2} g t_{xmax}^2$$

$$\frac{1}{2} g t_{xmax} = v_0 \sin \theta$$

$$t_{xmax} = 2v_0 \sin \theta / g$$

Besaran Gerak Parabola : Sudut/ arah



Mencari sudut (arah)

$$\tan \theta = v_{0y} / v_{0x} = v_0 \sin \theta / v_0 \cos \theta = \sin \theta / \cos \theta$$

$$\tan \alpha = v_{ty} / v_{tx} = (v_0 \sin \theta - gt) / v_0 \cos \theta$$

$$\tan \alpha = \frac{v_0 \sin \theta}{v_0 \cos \theta} - \frac{gt}{v_0 \cos \theta} = \tan \theta - \frac{gt}{v_0 \cos \theta}$$

