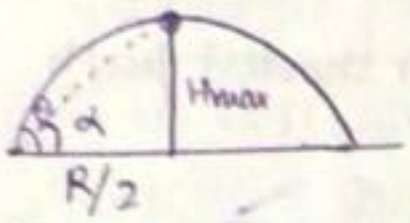
⑦ Elevation angle of Max. Point from point of projection



$$\tan\alpha = \frac{\tan\theta}{2}$$

⑧ Relation b/w Hmax and Range

$$\tan\theta = \frac{4H}{R}$$

⑨ Speed at any point :-

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

$$\vec{V} = U\cos\theta\,\hat{i} + U\sin\theta - gt\,\hat{j}$$

$$|\vec{V}| = \sqrt{(U\cos\theta)^2 + (U\sin\theta - gt)^2}$$

⑩ Speed at $\frac{H_{max}}{2}$

$$V = \sqrt{(U\cos\theta)^2 + \left[\frac{U\sin\theta}{\sqrt{2}}\right]^2}$$

⑪ Condition of Max horizontal Range

$$R_{max} = \frac{U^2}{g}$$

$\theta = 45°$ is upar R↓

$$H = \frac{U^2}{4g}$$

⑫ Complementary Angle :-

$\alpha + \beta = 90°$; $R_1 = R_2$

$$\frac{H_1}{H_2} = \tan^2\alpha$$

$$\frac{T_1}{T_2} = \tan\alpha$$

$$H_1 H_2 = \frac{R^2}{16}$$

$$R = 4\sqrt{H_1 H_2}$$

$$R = \frac{1}{2} g t_1 t_2$$

⑬ Equation of Trajectory in Projectile Motion

$$y = x\tan\theta\left[1 - \frac{x}{R}\right]$$

$$R = \frac{2U^2\cos\theta\sin\theta}{g}$$

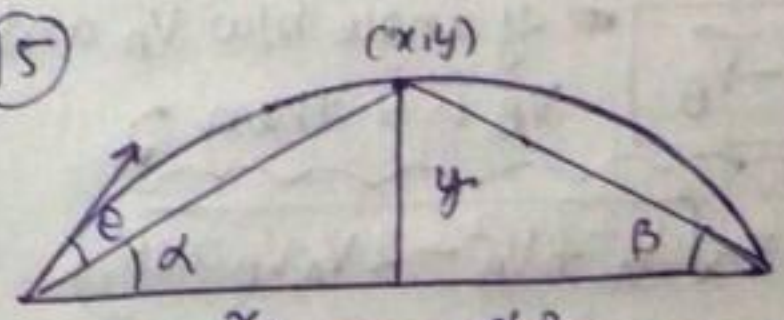
$$y = x\tan\theta - \frac{1}{2}\frac{gx^2}{U^2\cos^2\theta}$$

⑭ Time at which particle moving ⊥r to initial velocity

$$t = \frac{U}{g\sin\theta}$$

→ only valid when $\theta \geq 45°$. For $\theta < 45°$ Kabhi ⊥r nhi hoga.

⑮



$$y = \frac{x_1 x_2 \tan\theta}{x_1 + x_2}$$

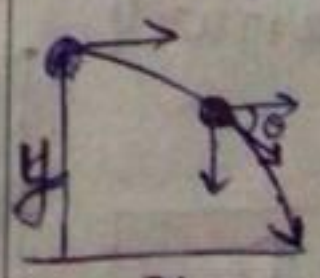
$$\tan\theta = y\left[\frac{1}{x_1} + \frac{1}{x_2}\right]$$

$\tan\theta = \tan\alpha + \tan\beta$

- Ball is projected with same speed at 42° and 47° then Range R_1 and R_2 respectively $[R_1 < R_2]$

↳ Angle 45° ke jitna pas range utna zaola

⑯ Horizontal Projectile motion from some height



$$y = \frac{1}{2}\frac{gx^2}{U^2}$$

$$x = U_x t$$

$$R = U_x\sqrt{\frac{2H}{g}}$$

$$\tan\theta = \frac{gt}{U}$$ (horizontal)

$$T_f = \sqrt{\frac{2H}{g}}$$

$$|V|_g = \sqrt{U^2 + 2gH}$$

$$|V|_t = \sqrt{U^2 + (gt)^2}$$

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