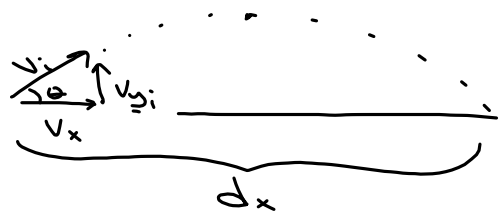
Symmetrical Projectile – Range



$d_y = v_{iy}t - \frac{1}{2}gt^2$

$0 = (v_i \sin\theta - \frac{1}{2}gt)t$

$t = 0 \quad v_i \sin\theta = \frac{1}{2}gt$

$t = \frac{2v_i \sin\theta}{g}$

$d_x = v_x t$

$= v_i \cos\theta \left(\frac{2v_i \sin\theta}{g}\right)$

$d_x = \frac{2v_i^2 \sin\theta\cos\theta}{g}$

$2\sin\theta\cos\theta = \sin 2\theta$

$d_x = \frac{v_i^2 \sin 2\theta}{g}$

$\sin\phi$ is max ($= 1$) when $\phi = 90°$

So $\sin 2\theta$ is max when $2\theta = 90°$

$\theta = 45°$

$\sin\theta = \sin(180 - \theta)$

Since $0° \le \theta \le 90°$

$0° \le 2\theta \le 180°$

So assume

$\sin 2\theta = 0.9$ ← calc

$2\theta = 64.15°$ OR $115.85°$

$\theta = 32.3°$ OR $57.7°$

← Same v_i, same d_x
BUT different h_{max}, t.