Components of the initial velocity $v_i$ are:

- **Horizontal**: $v_{ix} = v_i \cos \theta$
- **Vertical**: $v_{iy} = v_i \sin \theta$

**Formula 1**

For the half of the projectile’s path OA we get: $v_{fy} = v_{iy} + a_y t_{up}$

At point A $v_{fy} = 0$ and $a_y = -g$, so we get: $0 = v_i \sin \theta - g t_{up}$, hence $t_{up} = \frac{v_i \sin \theta}{g}$.

Knowing that $t_{flight} = 2 t_{up}$ we can get the total time of flight for an angle projectile:

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

For the entire path of the projectile OB, the total horizontal distance \( D_x \) for an angle projectile is:

\[ D_x = v_x \cdot t \]

Plugging in \( v_x = v_{ix} = v_i \cos \theta \) and \( t_{up} = \frac{v_i \sin \theta}{g} \) we get:

\[ D_x = (v_i \cos \theta) \left( \frac{2v_i \sin \theta}{g} \right) = \frac{v_i^2 (2 \sin \theta \cos \theta)}{g} \]

From trigonometry: \( 2 \sin \theta \cos \theta = \sin 2 \theta \) (double angle formula), so we can finally write the formula for the horizontal displacement (or range) of an angle projectile:

\[
D_x = \frac{v_i^2 \sin 2\theta}{g}
\]

Formula 3

For the half of the projectile's path OA we get:

\[ D_y = v_{iy} t_{up} + \frac{1}{2} a_y t_{up}^2 \]

Plugging in \( v_{iy} = v_i \cos \theta \), \( t_{up} = \frac{v_i \sin \theta}{g} \) and \( a_y = -g \) we will get:

\[ D_y = (v_i \sin \theta) \left( \frac{v_i \sin \theta}{g} \right) - \frac{1}{2} g \left( \frac{v_i \sin \theta}{g} \right)^2 \]

Simplifying the formula \( (1 - \frac{1}{2} = \frac{1}{2}) \) we get the formula for the maximum height of an angle projectile:

\[
D_y = \frac{(v_i \sin \theta)^2}{2g}
\]