Task:
An artillery shell is fired at an angle of 26.8◦ above the horizontal ground with an initial speed of 1660 m/s.
Find the total time of flight of the shell, neglecting air resistance.

Solution:

We have a coordinate system where an axis Oy is perpendicular to the ground. This coordinate system is in the plane of flight of the shell. So, it's initial speed consists of two components: v_x and v_y:

$$v_x = v\cos\alpha$$

$$v_y = v\sin\alpha$$

When the half time of flight of the shell will pass, the speed v_y will become slower because of the action of the gravity force and its value will become zero:

$$v_y' = v_y - \frac{gt}{2}$$

$$v_y' = 0$$

$$v_y = \frac{gt}{2}$$

So, the total time of flight of the shell will be:

$$t = \frac{2v\sin\alpha}{g}$$

$$t = \frac{2\cdot 1660\ \text{m/s}\cdot\sin 26.8^\circ}{9.8\ \text{m/s}^2} = 152.75\ \text{s}$$

THE ANSWER: t=152.75 s.