Answer on question #63654, Physics / Mechanics — Relativity

Question A roof tile falls from rest from the top of a building. An observer inside the building notices that it takes 0.20s for the tile to pass her window, which has a height of 1.8m. How far above the top of this window is the roof

Solution Equation for moving along window is:

$$\Delta s = v\Delta t + g\Delta t^2/2$$

where v is speed when start passing the window. From it we find

$$v = \frac{\Delta s - g\Delta t^2/2}{0.2} = \frac{1.8 - 9.8 \cdot 0.2^2/2}{0.2} = 8.019\, m/s$$

Knowing this speed we can find how far above the top of this window is the roof

$$v = \sqrt{2gh}$$

$$h = \frac{v^2}{2g} = \frac{8.019^2}{2 \cdot 9.8} \approx 3.28\, m$$