Question 24490

The equations of motion of bullet are: $s_y=\frac{4}{5}v_0t-\frac{gt^2}{2}; s_x=\frac{3}{5}v_0t$, where v_0 is initial velocity to be found. The vertical coordinate of stone as a function of time is $s_y=h_0-\frac{gt^2}{2}$. In order to hit the stone s_y of stone and bullet must be equal. This gives $\frac{4}{5}v_0t=50$ or $v_0t=50$. Time to move to vertically maximum position is $t=\frac{4}{5}\frac{v_0}{g}$. Hence, plugging this into latter expression, obtain $v_0=\frac{50\cdot5\cdot g}{4v_0}\approx63.7\,m/s$.