Question 23382

1. Let oy axis has the same direction as $\vec{g}$. Then, y component of velocity $v_y(t)=v_0+g\,t$, where $v_0=70\frac{ft}{s}=70\cdot 0.3\frac{m}{s}=21\frac{m}{s}$ and $g=10\frac{m}{s}$. Integrating formula for y component of velocity, obtain: $y(t)=-h+v_0 t+\frac{g\,t^2}{2}, h=50\,ft=15\,m$. For moment when stone stops: $0=-h+v_0 t+\frac{g\,t^2}{2}; -15+21\,t+5t^2=0\Rightarrow t\approx 0.62\,s$. Hence, velocity at this moment is $v_y=21\frac{m}{s}+10\cdot 0.62=27.2\frac{m}{s}$.
2. Let oy axis be vertically up.
   Then, equations of motion are: $v_x(t)=v; v_y(t)=-g\,t$, $x(t)=v\,t; y(t)=h-\frac{g\,t^2}{2}$.
   Let t_1 be the moment when water strikes the ground. For this moment, $h=\frac{g\,t_1^2}{2}\Rightarrow t_1=\sqrt{2\frac{h}{g}}$, when for x-component of motion $4=v\,t_1\Rightarrow v=\frac{4}{t_1}=\sqrt{8\frac{g}{h}}\approx 7.3\frac{m}{s}$.
   Speed, when water strikes the ground is $v=\sqrt{v_x^2+v_y^2}|_{t=t_1}=\sqrt{v^2+2\,g\,h}=9.13\frac{m}{s}$. Initial speed is $v=7.3\frac{m}{s}$.