Answer on Question 42937, Physics, Mechanics | Kinematics | Dynamics

a) Let the beginning of the coordinate be at initial position of a cannon. Then, the x and y coordinates of cannon are $x = v_0 \cos\theta \cdot t$, $y = v_0 \sin\theta - \frac{g t^2}{2}$, where v_0 is the initial velocity, θ is the angle above the horizontal. Thus, differentiating coordinates as functions of time, obtain instant velocities $v_x = v_0 \cos\theta$, $v_y = v_0 \sin\theta - g t$.

For our case $v_0 = 200 \frac{m}{s}$, $\theta = 65$. Hence, $v_x(t=32) = 200 \cos 65 \approx 84.52 \frac{m}{s}$,

$v_y(t=32) = 200 \frac{m}{s} \cdot \sin 65 - 9.81 \frac{m}{s^2} \cdot 32 s = -132.66 \frac{m}{s}$. Hence, $\vec{v}(t=32) = (84.52; -132.66)$.

The speed is $v(t=32) = \sqrt{v_x^2(t=32) + v_y^2(t=32)} = 157.3 \frac{m}{s}$, and the angle is

$\alpha = \arctan\left(\frac{v_y}{v_x}\right) \approx -57.5$.

b) At maximum height, $v_y = 0$. Hence, at this moment $t = \frac{v_0 \sin\theta}{g}$. The time to land is double the time to reach maximum height. Hence, $T = 2t = \frac{2 v_0 \sin\theta}{g} \approx 36.95 s$.

c) $S = v_0 \cos\theta \cdot T \approx 3123.15 m$.