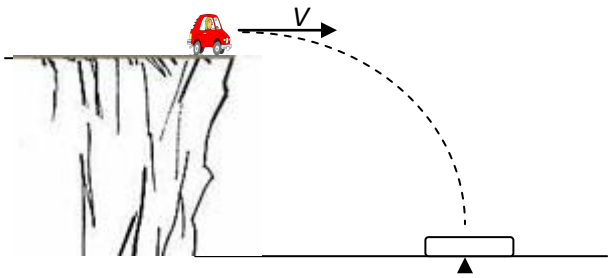
SPH4U **Projectile Motion – Review Problems**

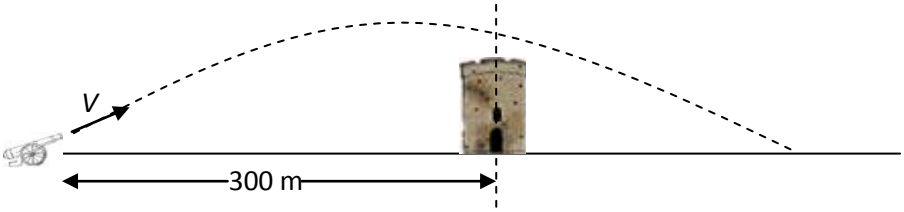
$v_{2y} = v_{1y} + a\Delta t$ $v_{2y}^2 = v_{1y}^2 + 2a\Delta d_y$ $\Delta d_y = v_{1y}\Delta t + \frac{1}{2}a\Delta t^2$ $\Delta d_y = v_{2y}\Delta t - \frac{1}{2}a\Delta t^2$

$\Delta d_x = v_{1x}\Delta t$ [Include a well labelled diagram for each problem]

1. A stunt car drives off a 60 m high, level cliff with a speed of 60 km/h. How from the base of the cliff should the centre of a 2 m high crash mat be placed to ensure the car and more importantly the driver survive the fall? [Ans: $\Delta d_x \cong 57\ m$]



2. A cannon is discharged towards a castle tower (near the time when the ancient world was meeting the modern world). The cannon ball flies 5 m above the top of the 10 metre tall tower and lands on level ground (same level as cannon) behind the tower. The cannon was positioned 300 m from the tower and was angled at 50° to the horizontal. What was the muzzle velocity of the cannon ball? How far behind the tower did it land? [Ans: $V \cong 56\frac{m}{s}$; $\Delta d \cong 15\ m$] Hint: up + and right +



3. A 1.5 m tall archer is standing on a 65 m cliff. Trying to maximize impact force while clearing a castle wall below he fires his arrow with a speed of 55 m/s at an angle of 20° below the horizontal. The castle wall is 100 m from the cliff and is 10 m high. Does the arrow clear the castle wall (and by how much if it does)? [Ans: $\Delta d_{above} \cong 1.8\ m$]