Question I

① Time taken in the air.

$h = \frac{1}{2} g t^2$.

horizontal distance $= vt$.

$35 = \frac{1}{2} \times 9.8 \times t^2$.

$\frac{35}{4.9} = t^2$.

$t = 2.65$ seconds.

Initial Speed $= 2.6 \times 5 = 13.36$ m/s.

② 1

② $h = ut + \frac{1}{2} a t^2$

$h = 0 \times 0.416 + \frac{1}{2} (9.8)(0.416)^2$.

$h = 0 + 0.85$m

The bullet will miss the target by 0.85m

③ Calculation of the speed of maximum height obtained

$v = u + at$

$h = \frac{1}{2} g t^2 = 4.5 = \frac{1}{2} \times 9.8 \times t^2$

$t = 0.96$ seconds.

$v = \frac{s}{t} = \frac{5}{0.95 \text{ sec}} = 5.263$ m/s

Question 2.

① $y = 6.60m$.
Speed $= 3.50m$.

$X = V \times t$.

$6.50 = \frac{1}{2} g t^2$.

$t^2 = \frac{6.50}{4.9} = 1.152 seconds$.

② Initial speed $= gt$
" " $= -gt$ indicating it's moving downward.
How long will it be in the air

Initial velocity $= X = \frac{1}{2} a_x t^2 + V_{x_0} t + X_0$

$t = 7 \quad X = 4.9$.
$X_0 = 0$

$X = \frac{1}{2} 0 \times t^2 + V_{x_0} t + 0$.
$X = V_{x_0} t$.

Determining time taken
$\frac{45}{4.9} = t^2$. $t = 3.034 seconds$.

Initial velocity $= \frac{29.0}{3.05} = 7.9 m/s$.

$7.9 m/s = 9.8 t$.
$t = 0.808 Seconds$.

③ $x = v_{x0} t$.

$36.0\,m = 22.2\,m/s \cdot t$.

$t = \frac{36.0\,m}{22.2\,m/s} = 1.62\,seconds$.

$h_y = \frac{1}{2} g t^2$

$height = \frac{1}{2} \times 9.8 \times (1.62)^2$

$height = 12.86\,m$ high.

④ Height of the cliff.

$y = \frac{1}{2} g t^2 \quad t = 3.0\,seconds$

$y = \frac{1}{2} \times 9.8 \times (3.05)^2$.

$y = 45.56\,meters$ high.

horizontal distance

$x = v_{x0} t$

$x = 1.80 \times 3.00$

$x = 5.4\,m$.

⑤ How many seconds before it directly overhead.

We know $y = -160\,m$

$g = +9.8\,m/s^2$.

$y = v_{0y} t - \frac{1}{2} g t^2$

$t = [-2(-160\,m)/(9.8\,m/s^2)]^{1/2}$.

$= 5.71\,sec$.

6. height $= \frac{1}{2} g t^2$.

$78 = \frac{1}{2} \times 9.8 \times t^2$.

$t = 3.95$ seconds.

Velocity required $= 100 \times 3.95 m = 395$ m/second.

7. Speed of water when it hits the bottom.

$y = \frac{1}{2} g t^2$.

$108 = \frac{1}{2} 9.8 t^2$.

$t = 4.69$ seconds.

$$\text{Acceleration} = \frac{\text{Change } V_y}{\text{Change in time}}$$

$$9.8 = \frac{[V_{Fy} - 0]}{4.98} = 46.00$$

$V_{Fg} = 46.00$

$V^2 = V_x^2 + V_y^2$.

$V^2 = (3.60)^2 + (46.00)^2$.

$V^2 = 12.96 + 2116$

$V = 46.14$ m/s.

8) Finding the Initial velocity of projectile (magnitude and direction)

Time of flight of projectile

$$T = \frac{2U\sin\theta}{g} \quad \text{------(i)}$$

Maximum height of projectile

$$H = \frac{U^2\sin^2\theta}{2g} \quad \text{------(ii)}$$

Range of projectile

$$R = \frac{U^2\sin 2\theta}{g} \quad \text{----(iii)}$$

Time of flight

$T = 2t$

$$\frac{2V\sin\theta}{g} = t \quad \text{----eq 6.}$$

$V\sin\theta = gt$ ------eq (5).

Maximum height $H = h$.

$$\frac{V^2\sin^2\theta}{2g} = H$$

$V^2\sin^2\theta = 2gH$ ---- eq 6

From eqn 5 and 6

$$\frac{V^2\sin^2\theta}{V^2\sin\theta\cos\theta} = \frac{2gH}{gt}$$

$$\frac{\sin\theta}{\cos\theta} = \frac{2H}{t}$$

$$\tan\theta = \frac{2H}{t}$$

$$= \frac{2\times 155}{195} =$$

$\theta = 57.83°$

From eqtn 4.

$V \sin(57.83°) = 9.8 ms^{-2} \times (9.25)$

$V = 106.5 ms^{-1}$

Initial velocity of the projectile is $V = 106.5 m/s$ making $\theta = 57.83°$ with horizontal.

Quiz 3.

1 a) How high was the bridge

$h = \frac{1}{2} g t^2$.

$h = \frac{1}{2} \times 9.8 \times (1.50)^2$.

$h = 11.025\text{m}$.

b) How fast was the Simmers.

$V = gt$

$11.025 \times 1.50 = 16.537\text{m/s}$.

2 a) How fast the ball travelled from the side walk.

$V = U + gt$.

$U = 2.57\text{m/s}$.

$g = -9.8\text{m/s}$.

$65.6\text{m} = 4.9t^2$.

$t = 3.6\text{seconds}$.

$V = 2.57 + 3.6 \times 9.8$.

$V = 38.42\text{m/s}$.

b) How much time does it take

$V = gt$. $= \frac{38.42}{9.8} = 3.92\text{seconds}$.

$V/g = t$

(3) Velocity after 3.05s after it's launched.

$V = 28.0\text{m/s} + 9.8 \times 3.50$

$= 62.3\text{m/s}$.

b) height after 3.50 seconds.

$y = \frac{1}{2} g t^2$

$\frac{1}{2} \times 9.8 (3.50)^2$

$= 60.00$ metres.

g) Maximum height.

$(62.3)^2 = (28.0)^2 + 2(9.8)h$

$3881.29 = 78.4 + 19.6h$

$h = 194.025m$.