Free Fall

1. $u = 10 m/s$ height of building = 50m

(i) Velocity with which the ball will strike the ground. $= v^2 - u^2 = 2as$

$0^2 - 10^2 = -2 \times 10 \times h$

$= -100 = -20 \times h$

$h = \frac{-100}{-20} = 5m$

So the ~~velocity~~ ~~of~~ the ball will be ~~5m/s~~ 5m within attaining max. height

Distance of ball when coming down $= 50 + 5 = 55 m$

$u = 0$. $v = \sqrt{v^2 - u^2} = 2as$

$v^2 - 0^2 = 2 \times 10 \times 55$

$= 10\sqrt{11} m$

2. $t = 5s$ $u = 0$.

(i) height of the bridge $= \frac{1}{2} gt^2$

$= \frac{1}{2} \times 9.8 \times 25$

$= 4.9 \times 25$

$= 61.25 m$

(ii) Distance covered by stone in last second

Distance covered in 4th sec. $= 35\ m$

$$S_n = u + \frac{a}{2}(2n-1)$$

$$u + \frac{10}{2}(8-1)$$

$$= 5 \times 7 = 35\ m$$

(3) $u = 22\ m/s$

$v = 0\ m/s$

$v = u + at$

$v = u - gt$

$0 = 22 - 10t$

$-22 = -10$

$t = 2.2\ s$

u when coming down $= 0\ m/s$

$v = 15\ m/s$

$v = u + gt \qquad 15 = 0 + 10t$

$t = 1.5\ s$

Time after which it will be falling at 15 m/s

$= 1.5 + 2.2 = 3.7\ s$