5) At the max. height the velocity is 0.

This happens when

$$0 = v = -9.8t + 98$$

So max. height occurs when $t = 10$.

Distance travelled by time T is

$$\text{distance} = \int_0^T -9.8t + 98 \, dt$$

$$\text{Max height} = \int_0^{10} -9.8t + 98 \, dt$$

$$= -\frac{9.8t^2}{2} + 98t \Big|_0^{10}$$

$$= \frac{-9.8(10)^2}{2} + 980 - 0$$

$$= 490 \text{ Metres}$$

Q6) Volume of water flowing into tank is

$$V = \int_{10}^{20} 100 - 3t \; dt$$

$$= 100t - \frac{3t^2}{2}\Big|_{10}^{20}$$

$$= (2000 - 600) - (1000 - 150)$$

$$= 2000 + 150 - 1000 - 600$$

$$= 550 \text{ gallons}$$

Q7) Total number of births between 1960 and 1980 is

$$B = \int_0^{20} 13 + t \; dt$$

$$= 13t + \frac{t^2}{2} \Big|_0^{20}$$

$$= 260 + 200 - 0$$

$$= 460$$ thousands

Q8) Population in 1980 is

$$P = 125 + \int_0^{20} 13 + t - 5\sin\frac{t}{2}\, dt$$

$$= 125 + \int_0^{20} 8 - \frac{t}{2}\, dt$$

$$= 125 + \left(8t - \frac{t^2}{4} \Big|_0^{20} \right)$$

$$= 125 + 160 - 100 - 0$$

$$= 385 \text{ thousand.}$$

Q9) The velocity of the dropped rock at time T is

$$v = \int_0^T 1.6 \, dt = 1.6T$$

or, velocity at time t is

$$v = 1.6t .$$

Final velocity is

$$v = 1.6 \times 30 = 48 \text{ m/s}$$

Q10) Velocity of object at time t is

$$v = \int_0^t 9.8\, dt = 9.8t$$

Distance travelled by time t is

$$D = \int_0^t 9.8t\, dt = \frac{9.8t^2}{2} = 4.9t^2$$

The required time satisfies

$$324 = D = 4.9\, t^2$$

$$t^2 = \frac{324}{4.9}$$

$$t = \sqrt{\frac{324}{4.9}} \text{ sec}$$

$$t = 8.13 \text{ sec.}$$