(b) If when A and B are 80 and 40 m from p, respectively, then A immediately accelerates at 0.1 m/s^2 and B decelerates at q m/s^2.

(i) Find the velocity of B relative to A in terms of time t.

(ii) Determine the value of q which causes them to arrive at p together.

A
$u = 3$
$a = 0.1$
$v = u + at$
$\therefore V_A = (3 + 0.1t)\vec{i}$

B
$u =$
$a =$
$v =$
$V_B = (\qquad)$

(i) $V_{BA} = (4 - qt)\vec{j} - (3 + 0.1t)\vec{i}$

(ii) If They arrive together Then time taken is The
same $\therefore S_A = 80$ when $S_B = 40$

$S_A = 80 \implies ut + \frac{1}{2}at^2 = 80$

$\implies 3t + \frac{1}{2}(0.1)t^2 = 80$

$\implies 3t + \frac{1}{20}t^2 = 80$

$\implies 60t + t^2 = 1600$

$\implies t^2 + 60t - 1600 = 0$

$\implies (t - 20)(t + 80) = 0 \implies t = 20, -80$

$S_B = 40 \implies 4t - \frac{1}{2}qt^2 = 40$
(at t = 20)
$\implies 4(20) - \frac{1}{2}q(400) = 40$

$\implies 80 - 200q = 40$

$\implies 40 = 200q$

$\implies q = 0.2$