(ii)

	Before	(Mass)	After
B:	$3\vec{i}$	M	$a\vec{i}$
C:	$0\vec{i}$	M	$b\vec{i}$

$M(3) + M(0) = Ma + Mb$

$\Rightarrow a + b = 3$

$\frac{a-b}{3-0} = -\frac{1}{2}$

$\Rightarrow a - b = -\frac{3}{2}$

Solving these gives $a = \frac{3}{4}$, $b = 2\frac{1}{4}$.

Speed of B is $\frac{3}{4}$ m/s.

Yes, because A will catch up with B, since $v_A > v_B$

Q. 8. (i)

	Before	(Mass)	After
A:	v	4	0
B:	$-v$	2	p

$4(v) + 2(-v) = 4(0) + 2(p)$

$\Rightarrow 2p = 2v \quad \Rightarrow \quad p = v$

Speed of B after impact is the same as the speed before but in the opposite direction.

(ii) $\frac{0-p}{v-(-v)} = -e$

$\Rightarrow \frac{-v}{2v} = -e \quad \Rightarrow \quad e = \frac{1}{2}$

(iii) $\text{K.E.}_{\text{before}} = \frac{1}{2}(4)(v)^2 + \frac{1}{2}(2)(-v)^2$

$= 2v^2 + v^2 = 3v^2$

$\text{K.E.}_{\text{after}} = \frac{1}{2}(4)(0)^2 + \frac{1}{2}(2)(v)^2$

$= v^2$

Loss $= 3v^2 - v^2 = 2v^2$

% Loss $= \frac{2v^2}{3v^2} \times 100 = 66\frac{2}{3}\%$

Q. 9. (i)

Before	(Mass)	After
$2\vec{i}$	M	$11k\vec{i}$
$\vec{i}$	M	$13k\vec{i}$

$M(2) + M(1) = M(11k) + M(13k)$

$\Rightarrow k = \frac{1}{8}$

$\therefore$ Their speeds will be $\frac{11}{8}$ and $\frac{13}{8}$.

(ii) $\frac{\frac{11}{8} - \frac{13}{8}}{2-1} = -e$

$\Rightarrow e = \frac{1}{4}$

Q. 10. (i)

	Before	(Mass)	After
A:	$6\vec{i}$	M	$p\vec{i}$
B:	$0\vec{i}$	M	$q\vec{i}$

$M(6) + M(0) = Mp + Mq$

$\Rightarrow p + q = 6$

$\frac{p-q}{6-0} = \frac{-2}{3}$

$\Rightarrow p - q = -4$

Solving these gives $p = 1$, $q = 5$

Their speeds are (1, 5, 0) m/s.

(ii)

	Before	(Mass)	After
B:	$5\vec{i}$	M	$a\vec{i}$
C:	$0\vec{i}$	M	$b\vec{i}$

$M(5) + M(0) = Ma + Mb$

$\Rightarrow a + b = 5$

$\frac{a-b}{5-0} = \frac{-2}{3}$

$\Rightarrow a - b = \frac{-10}{3}$

Solving these gives $a = \frac{5}{6}$, $b = \frac{25}{6}$.

Their speeds now are $\left(1, \frac{5}{6}, \frac{25}{6}\right)$ m/s.

(iii)

	Before	(Mass)	After
A:	$1\vec{i}$	M	$c\vec{i}$
B:	$\frac{5}{6}\vec{i}$	M	$d\vec{i}$

$M(1) + M\left(\frac{5}{6}\right) = Mc + Md$

$\Rightarrow c + d = \frac{11}{6}$

$\frac{c-d}{1-\frac{5}{6}} = -\frac{2}{3}$

$\Rightarrow c - d = -\frac{1}{9}$

Solving these gives: $c = \frac{31}{36}$, $d = \frac{35}{36}$

Their speeds are $\left(\frac{31}{36}, \frac{35}{36}, \frac{25}{6}\right)$ m/s

Since $v_A < v_B < v_C$, there will be no further collisions.