

- 5.3** A cricket ball of mass 150 g has an initial velocity $\mathbf{u} = (3\hat{\mathbf{i}} + 4\hat{\mathbf{j}}) \text{ m s}^{-1}$ and a final velocity $\mathbf{v} = -(3\hat{\mathbf{i}} + 4\hat{\mathbf{j}}) \text{ m s}^{-1}$ after being hit. The change in momentum (final momentum-initial momentum) is (in kg m s^{-1})
- (a) zero
 - (b) $-(0.45\hat{\mathbf{i}} + 0.6\hat{\mathbf{j}})$
 - (c) $-(0.9\hat{\mathbf{i}} + 1.2\hat{\mathbf{j}})$
 - (d) $-5(\hat{\mathbf{i}} + \hat{\mathbf{j}})$.

$$\textcircled{3} \quad m = 150 \text{ g}$$

$$u = (3\hat{i} + 4\hat{j}) \text{ m s}^{-1}$$

$$v = -(3\hat{i} + 4\hat{j}) \text{ m s}^{-1}$$

$$\Rightarrow \text{Change in momentum} = m (\vec{v} - \vec{u})$$

$$= \frac{150}{1000} (-3\hat{i} - 4\hat{j} - 3\hat{i} - 4\hat{j})$$

$$= 0.15 (-6\hat{i} - 8\hat{j})$$

$$= -(0.9\hat{i} + 1.2\hat{j}) \quad \Rightarrow \text{(C)}$$