6 The first four terms in ascending powers of x in the expansion $(3+ax)^4$ can be written as $81+bx+cx^2+\frac{3}{2}x^3$. Find the values of the constants a, b and c. [6]

7 Given that ${}^nC_4 = 13\times {}^nC_2$, find the value of ${}^nC_8$. [5]

8 **(a)** Particle A starts from the point with position vector $\begin{pmatrix} 3 \\ -2 \end{pmatrix}$ and travels with speed $26\,\text{ms}^{-1}$ in the direction of the vector $\begin{pmatrix} 12 \\ 5 \end{pmatrix}$. Find the position vector of A after t seconds. [3]

(b) At the same time, particle B starts from the point with position vector $\begin{pmatrix} 67 \\ -18 \end{pmatrix}$. It travels with speed $20\,\text{ms}^{-1}$ at an angle of α above the positive x-axis, where $\tan\alpha = \frac{3}{4}$. Find the position vector of B after t seconds. [4]

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