10 In this question, time is in seconds.

(a) At time $t = 0$, particle P starts from the point with position vector $-30\mathbf{j}$.
P travels with speed $58\,\text{ms}^{-1}$ in the direction $20\mathbf{i} + 21\mathbf{j}$.

Find the position vector of P at time t. [3]

(b) Also at time $t = 0$, particle Q starts from the point with position vector $-10\mathbf{i} + 18\mathbf{j}$.

Q travels with speed $75\,\text{ms}^{-1}$ at an angle α above the positive x-axis, where $\tan\alpha = \frac{7}{24}$.

Find the position vector of Q at time t. [4]

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(c) Determine whether P and Q collide. [2]

11 Given that $\frac{{}^{n+1}\mathrm{P}_5}{437} = {}^{n}\mathrm{P}_3$, use an algebraic method to find the value of n. [4]

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