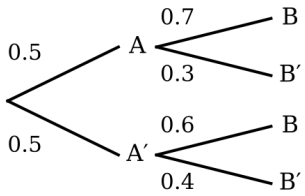
Day 325	A Level Maths: A Tier 10-a-day
1 Find the coefficient of x^2 in the expansion of $(1 + 3x)^7$.	
2 The tree diagram shows probabilities for events A and B. (a) Find P(B′). (b) Find P(A′ | B′). 	
3 A 12 kg box is pulled along rough horizontal ground, $\mu = 0.1$, by a rope at angle θ above the horizontal, where $\tan\theta = \frac{5}{12}$. The tension is 40 N. Find (a) the normal reaction, (b) the acceleration of the box. Take $g = 9.8$. Give answers to 3 s.f. if not exact.	
4 The number of fish in a lake is modelled by $N = 100\,e^{kt}$, where t is time in years. After 6 years, N = 600. Find (a) the exact value of k, (b) the time for N to reach 1000, to 3 s.f.	
5 A geometric series has first term 3 and common ratio 2. Find the smallest n for which the sum of the first n terms exceeds 10000.	

Day 325 **A Level Maths: A Tier 10-a-day**

6 The vectors $\begin{pmatrix} k \\ k \\ 5 \end{pmatrix}$ and $\begin{pmatrix} k \\ -6 \\ 1 \end{pmatrix}$ are perpendicular.
Find the possible values of k and, for the larger value, the exact length of the first vector.

7 Accidents occur as a Poisson process at a mean rate of 3 per week.
After a change, the number recorded in one week is 9.
Test at the 1% level whether the mean rate has increased.

8 A ball is projected from the ground at 10 m s^{-1} at angle α above the horizontal, $\tan\alpha = \frac{24}{7}$. At time T s, while in flight, it is moving perpendicular to its initial direction. Find (a) T, (b) the height of the ball then. Take g = 9.8. Give answers to 3 s.f. if not exact.

9 $u_1 = 0$ and $u_{n+1} = \frac{1}{2}u_n + 2$.
(a) Find the limit L of the sequence as $n \to \infty$.
(b) Find the least n for which $|u_n - L| < 0.01$.

10 The volume of a cube of edge x cm is increasing at 27 cm^3s^{-1}.
Find the rate of increase of its total surface area when x = 2.