Day 100	A Level Maths: S Tier 10-a-day
1 Prove by contradiction that $\log_6 10$ is irrational.	
2 Solve $\log_2(x + 1) + \log_2(x - 1) = 3$, justifying clearly any root that you reject.	
3 The curve $y = x^2 - x - 1$ is translated by $\begin{pmatrix} -2 \\ 3 \end{pmatrix}$ and then a stretch, scale factor 3, parallel to the x-axis. Find the equation of the resulting curve in the form $y = ax^2 + bx + c$.	
4 The curve $y = 2^x - 3x$ has one stationary point. Find its coordinates to 3 s.f. and show that it is a minimum.	
5 Express $\frac{1 - 3\sqrt{3}}{4 - \sqrt{3}}$ in the form $p + q\sqrt{3}$, where p and q are rational numbers.	

Day 100	A Level Maths: S Tier 10-a-day
6 A is acute and B is obtuse. $\cos A = \frac{7}{25}$ and $\cos B = -\frac{21}{29}$. Find the exact values of $\tan(A - B)$ and $\cos(A - B)$.	
7 A disease is present in 5% of a population. A test is positive for 90% of those with it and for 10% of those without it. Find P(positive) and P(has it | positive).	
8 Car A passes a point O travelling at a constant speed of 12.1 m s^{-1}. 4 s later, car B leaves O from rest with constant acceleration 3 m s^{-2}, travelling in the same direction. B overtakes A at the point X. Find (a) the time B takes to reach X, (b) the distance OX, (c) the speed of B at X.	
9 A box holds 7 components, each faulty with probability 0.15, independently. A box is rejected if it has at least 3 faulty components. (a) Find the probability that a box is rejected. (b) 9 boxes are inspected. Find the probability that at least 3 are rejected.	
10 At time t = 0 hours, ship A is at the point with position vector $(-8\mathbf{i} + 36\mathbf{j})$ km relative to a port O, and moves with constant velocity $(-3\mathbf{i} + 3\mathbf{j})$ km h^{-1}. Ship B leaves O at t = 0 with constant speed 13 km h^{-1} and intercepts A. Find (a) the time at which B intercepts A, (b) the velocity of B as a vector.	