Day 124	A Level Maths: S Tier 10-a-day
1 The curve $y = ax^n$ passes through (9, 216) and (16, 512). Find the values of a and n.	
2 Given that $\sqrt{35}$ is irrational, prove by contradiction that $\sqrt{5} + \sqrt{7}$ is irrational.	
3 $P(X = x) = kx^2$ for x = 1, 2, ..., 5, and 0 otherwise. (a) Show that $k = \frac{1}{55}$. (b) Find E(X) and Var(X). (c) Find Var(3X + 5).	
4 The curve $y = x^2 + 5x + 1$ is translated by $\begin{pmatrix} 3 \\ 4 \end{pmatrix}$ and then a stretch, scale factor $\frac{1}{2}$, parallel to the x-axis. Find the equation of the resulting curve in the form $y = ax^2 + bx + c$.	
5 A curve has parametric equations $x = 3t^2 - t$, $y = t^3 - t$. Find the equation of the tangent at the point where t = 1, in the form y = mx + c.	

Day 124	A Level Maths: S Tier 10-a-day
6 Prove that $n^2 + 3$ is never a multiple of 5, for any integer n.	
7 A particle of weight W N is on a rough plane inclined at α to the horizontal, where $\sin\alpha = \frac{12}{13}$. A force P N acts up a line of greatest slope; the particle stays at rest for $88 \leq P \leq 176$. Find (a) W, (b) the coefficient of friction, (c) the acceleration when P = 352. Take g = 9.8 m s^{-2}.	
8 A curve has parametric equations $x = 3\sin t$, $y = 2\cos t$, for $0 \leq t \leq \frac{\pi}{2}$. Find the exact area bounded by the curve and the coordinate axes.	
9 A particle P moves on a straight line. At time t = 0, P passes through the fixed point O with velocity 12 m s^{-1}. At time t seconds, P has acceleration $(3t - 11)$ m s^{-2}. Find (a) the times at which P is at O again, (b) the greatest distance of P from O before it first returns to O.	
10 The scores in an aptitude test are normally distributed. 20% are less than 55 and 15% are greater than 91. Find the mean and standard deviation, each correct to 3 significant figures.	