Day 99	A Level Maths: S Tier 10-a-day
1 $g(x) = x^2 + 5$. Also $fg(x) = 2x^2 + 7$, where f is a linear function. (a) Find f(x). (b) Solve gf(x) = 54.	
2 The tangent to $y = x\sqrt{2x + 5}$ at the point where $x = 2$ meets the axes at A and B. Find the exact area of triangle OAB, where O is the origin.	
3 Describe a sequence of two transformations that maps the curve $y = x^2$ onto the curve $y = 4x^2 + 16x + 19$.	
4 Solve $4\sec^2\theta + 13\tan\theta - 1 = 0$ for $0 \leq \theta < 360°$, giving answers to 1 d.p.	
5 Car A passes a point O travelling at a constant speed of 18 m s^{-1}. 9 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.	

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6 Prove that $(n + 7)^3 - n^3 - 343$ is a multiple of 21 for every integer n.	
7 For 25 pairs of values, $S_{xx} = 625$, $S_{yy} = 400$ and $S_{xy} = -318$. (a) Calculate the product moment correlation coefficient r. (b) The critical value for a one-tailed test at the 5% level with n = 25 is 0.3365. Carry out the test of H_0: $\rho = 0$ against H_1: $\rho < 0$.	
8 A lift of mass 500 kg, carrying a passenger of mass 85 kg, is supported by a vertical cable. The lift is moving downwards and decelerating at 0.4 m s^{-2}. Find (a) the force the floor exerts on the passenger, (b) the tension in the cable. Take g = 9.8 m s^{-2}.	
9 A binomial random variable X has mean 34 and variance $\frac{34}{3}$. (a) Find n and p. (b) Find P(X = 35), correct to 3 significant figures.	
10 $f(x) = \ln x + 6x - 8$. (a) Show that $f(x) = 0$ has a root α with $1 < \alpha < 2$. (b) Use Newton-Raphson with $x_0 = 2$ to find x_1 and x_2 to 4 decimal places.	