Day 15	A Level Maths: S Tier 10-a-day
1 A lift of mass 600 kg, carrying a passenger of mass 90 kg, is supported by a vertical cable. The lift is moving upwards 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}.	
2 The curve $y = 5^x - x$ has one stationary point. Find its coordinates to 3 s.f. and show that it is a minimum.	
3 The circle $x^2 + y^2 - 6x - 2y - 90 = 0$ passes through P(9, −7). The tangent at P meets the axes at A and B. Find the area of triangle OAB.	
4 Solve $2^{2x} - 14 \times 2^x + 40 = 0$, giving each answer exactly and, where not an integer, to 3 s.f.	
5 $f(x) = \frac{kx + 4}{x - 2}$ for $x \neq 2$. Given that f is self-inverse, find k, and hence solve f(x) = x.	

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6 A particle P moves on a straight line. The velocity of P is v m s^{-1} and its acceleration is $-0.1v^2$ m s^{-2}. At t = 0, v = 20. Find (a) the time taken for the speed of P to halve, (b) the distance P travels in this time, to 3 s.f.	
7 Given that $\cos 3\theta \equiv 4\cos^3\theta - 3\cos\theta$, solve $\cos 3\theta = 0$ for $0 < \theta < 360°$.	
8 The masses of apples, in grams are normally distributed. 5% are less than 38 and 20% are greater than 69. Find the mean and standard deviation, each correct to 3 significant figures.	
9 A sequence is defined by $u_1 = 7$ and $u_{n+1} = \frac{u_n - 2}{u_n - 1}$. Show that the sequence is periodic and find $\sum_{r=1}^{99} u_r$.	
10 X ~ B(60, 0.25). (a) State why a normal approximation is suitable for X. (b) Use a normal approximation to estimate P(X ≥ 26), to 3 significant figures.	