Day 63	A Level Maths: A Tier 10-a-day
1 Solve $\log_{10}(x + 6) + \log_{10}(x - 3) = 1$.	
2 A lift of mass 300 kg carries a person of mass 60 kg. The cable tension is 3456 N and the lift is accelerating. Find (a) the magnitude and direction of the acceleration, (b) the force of the floor on the person. Take g = 9.8.	
3 Find the coefficient of x^{-13} in the expansion of $(3x^3 + \frac{2}{x^2})^9$.	
4 $\lvert a\rvert = 8$, $\lvert b\rvert = 5$ and the angle between a and b is 135°. Find the exact values of $a \cdot b$ and $\lvert a + b\rvert$.	
5 $f(x) = x^2 + 6x + 4$, $x \geq -3$. Find $f^{-1}(x)$ and state its domain.	

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6 A is acute and B is obtuse, with $\sin A = \frac{8}{17}$ and $\cos B = -\frac{7}{25}$. Find the exact values of cos(A+B) and cos(A−B).	
7 Express $\frac{-7x^2 - 19x - 6}{(x+3)(x+1)^2}$ in the form $\frac{A}{(x+3)} + \frac{B}{(x+1)} + \frac{C}{(x+1)^2}$, and find A, B and C.	
8 Eggs are defective with probability 0.25, independently. A tray of 10 eggs is rejected if it has at least 3 defective. From 8 such trays, find the probability that exactly 2 are rejected (3 s.f.).	
9 X ~ B(38, p). H_0: p = 0.5 is tested against H_1: p < 0.5 using a 5% significance level. (a) Find the critical region. (b) State the probability of a Type I error. (c) Find the probability of a Type II error when p = 0.4 (3 s.f.).	
10 At t = 0, P and Q have position vectors $(9\mathbf{i} + 13\mathbf{j})$ m and $(-4\mathbf{i} + 4\mathbf{j})$ m and velocities $(-6\mathbf{i} + 5\mathbf{j})$ m s^{-1} and $(-2\mathbf{i} + 2\mathbf{j})$ m s^{-1}. Find (a) the time when they are closest, (b) the least distance between them.	