Day 180	A Level Maths: S Tier 10-a-day
1 Each battery is faulty with probability 0.12, independently. Find the least number n of batterys that must be tested so that the probability of finding at least two faulty is greater than 0.95.	
2 Solve $\sqrt{2x + 1} = 2x - 1$.	
3 Three forces $(-8\mathbf{i} - 7\mathbf{j})$ N, $(2\mathbf{i} + k\mathbf{j})$ N and $(-6\mathbf{i} - 8\mathbf{j})$ N act on a particle of mass 4 kg. The resultant is parallel to $(-12\mathbf{i} - 7\mathbf{j})$. Find (a) the value of k, (b) the magnitude of the acceleration of the particle, to 3 s.f.	
4 A is acute and B is acute. $\sin A = \frac{12}{13}$ and $\cos B = \frac{21}{29}$. Find the exact values of $\tan(A + B)$ and $\sin(A - B)$.	
5 A uniform plank AB of length 8 m and mass 50 kg rests on supports at C and D, where AC = 3 m and DB = 3 m. A girl of mass 50 kg stands on it at distance x m from A. Find the range of x for which the plank stays in equilibrium on both supports.	

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6 A bag has 6 yellow counters and some white counters, n in total. Two are taken without replacement. P(at least one yellow) = $\frac{17}{22}$. Find n.	
7 Use integration by parts to find the exact value of $\int_0^{\pi/2} e^{2x} \sin x \, dx$	
8 Solve simultaneously: $x + y = -1$ $2x^2 + 2xy + y^2 = 37$	
9 $f(\theta) = \frac{4}{17 + 6 \sin \theta + 8 \cos \theta}$ (a) Write $6 \sin \theta + 8 \cos \theta$ as $R \sin(\theta + \alpha)$, $R > 0$, $0 < \alpha < 90°$. (b) Find the greatest and least values of $f(\theta)$, and the smallest positive θ at which the greatest value occurs, to 1 d.p.	
10 The circle with equation $(x - 2)^2 + (y + 3)^2 = 169$ passes through P(14, −8). The tangent at P meets the axes at A and B. Find the area of triangle OAB.	