Day 92	A Level Maths: S Tier 10-a-day
1 A disease is present in 3% of a population. A test is positive for 90% of those with it and for 10% of those without it. Find P(positive) and P(has it | positive).	
2 Solve $\cos 2\theta + 5\sin\theta - 3 = 0$ for $0 \leq \theta < 2\pi$, giving answers in terms of π.	
3 Prove that $n^3 + 14n$ is divisible by 3 for every positive integer n.	
4 X ~ B(400, 0.005). (a) Explain why a Poisson approximation is suitable and state its distribution. (b) Use it to estimate P(X > 2), to 4 s.f. (c) Find the exact value of P(X > 2), to 4 s.f.	
5 A box of mass 10 kg is at rest on rough horizontal ground ($\mu = 0.2$). A horizontal force of 33.6 N acts on it for 7 s and is then removed. Find (a) the speed when the force is removed, (b) the total distance travelled before the box stops. Take $g = 9.8$ m s^{-2}.	

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6 A curve has parametric equations $x = 2 \sin t$, $y = 4 \cos 2t$. Find a cartesian equation of the curve in the form $y = f(x)$.	
7 Solve $2^{2x} - 10 \times 2^{x} + 16 = 0$.	
8 The curve C has equation $x^2 - 3xy + 5y^2 = 11$. Find the coordinates of the points on C where the tangent is parallel to the x-axis.	
9 A sequence is defined by $u_1 = \frac{1}{3}$ and $u_{n+1} = \frac{1}{1 - u_n}$. Show that the sequence is periodic and find $\sum_{r=1}^{60} u_r$.	
10 A box of weight 45 N is pulled at constant speed up a line of greatest slope of a rough plane ($\tan \alpha = \frac{7}{24}$, $\mu = \frac{3}{4}$) by a force P N at angle β above the plane. (a) Find P when $\tan \beta = \frac{4}{3}$. (b) Find the least possible value of P as β varies.	