Day 309	A Level Maths: S Tier 10-a-day
1 Solve $\operatorname{cosec}(2\theta - 15°) = \frac{2}{\sqrt{3}}$ for $0° \leq \theta \leq 360°$.	
2 Express $\frac{12x^2 - 27x + 23}{(x-3)(3x-4)^2}$ in the form $\frac{A}{(x-3)} + \frac{B}{(3x-4)} + \frac{C}{(3x-4)^2}$.	
3 A bag has 4 red counters and some white counters, n in total. Two are taken without replacement. P(at least one red) = $\frac{34}{55}$. Find n.	
4 A drink cools according to $\theta = 25 + Ae^{-kt}$, where θ °C is the temperature after t minutes. Initially $\theta = 80$, and after 10 minutes $\theta = 58$. Find A and k, then find when $\theta = 54$ (3 s.f.).	
5 X ~ B(200, 0.45). (a) State why a normal approximation is suitable for X. (b) Use a normal approximation to estimate P(X ≥ 112), to 3 significant figures.	

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6 A chord AB of a circle, centre O and radius 4 cm, subtends an angle of $\frac{2\pi}{3}$ at O. Find the exact area and the exact perimeter of the minor segment cut off by AB.	
7 A particle P of mass 4 kg moves under a single force F N, where F = $(24t + 12)\mathbf{i} + (12t^2 + 16)\mathbf{j}$ and t is the time in seconds. At t = 0, P is at the origin with velocity $(3\mathbf{i} - 4\mathbf{j})$ m s^{-1}. Find (a) the velocity of P at t = 2, (b) the position vector of P at t = 2.	
8 $u_{n+1} = \frac{1}{4}u_n + \frac{3}{2}$, $u_1 = -4$. (a) Find the limit L of the sequence. (b) Find the least n such that $\lvert u_n - L\rvert < 0.01$.	
9 At time t = 0 hours, ship A is at the point with position vector $(32\mathbf{i} + 48\mathbf{j})$ km relative to a port O, and moves with constant velocity $(-2\mathbf{i} - 4\mathbf{j})$ km h^{-1}. Ship B leaves O at t = 0 with constant speed 10 km h^{-1} and intercepts A. Find (a) the time at which B intercepts A, (b) the velocity of B as a vector.	
10 Solve simultaneously: $x + y = 1$ $2x^2 - xy + 2y^2 = 12$	