Day 176	A Level Maths: A Tier 10-a-day
1 Emails arrive at a mean rate of 3 per minute, as a Poisson process. Find the probability that in one such period there are (a) exactly 4 (b) at least 4 (c) fewer than 4 (3 s.f.).	
2 A particle P has constant acceleration $(-\mathbf{i} + 4\mathbf{j})$ m s^{-2}. When t = 0, P is at $(2\mathbf{i} + 5\mathbf{j})$ m moving with velocity $(2\mathbf{i} + 2\mathbf{j})$ m s^{-1}. Find (a) when P moves parallel to $\mathbf{j}$, (b) its position vector then.	
3 A sector of a circle has area 100 cm^2 and angle 2 radians. Find the radius, the arc length and the perimeter of the sector.	
4 $f(x) = x^2 - 2x + 4$, $x \geq 1$. Find $f^{-1}(x)$ and state its domain.	
5 Solve $5^{2x} = 3^{2x-2}$. Give your answer to 3 significant figures.	

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6 The line $5x + 12y = k$ is a tangent to the circle $(x - 2)^2 + (y - 2)^2 = 4$. Find the two possible values of k.	
7 Solve $3\text{cosec}^2 x - 9\cot x - 15 = 0$ for $0° < x < 180°$. Give answers to 1 d.p.	
8 A particle is projected up a line of greatest slope of a smooth plane inclined at α. It passes A, 29.4 m from the start, after 3 s and again after 5 s. Find (a) the speed of projection, (b) α to 1 d.p. Take $g = 9.8$.	
9 The random variable X has $P(X = x) = k(9 - x)$ for $x = 2, 3, 4, 5, 6$. (a) Show that $k = \frac{1}{25}$. (b) Find E(X) and Var(X). (c) Find $P(X \geq 3)$.	
10 A sequence is defined by $u_1 = \frac{1}{3}$ and $u_{n+1} = \frac{1}{1 - u_n}$. (a) Find u_2 and u_3. (b) Find u_{101} and $\sum_{r=1}^{101} u_r$.	