Day 25	A Level Maths: A Tier 10-a-day
1 Show that $\frac{2}{\sqrt{3}-1} + \frac{5}{\sqrt{3}+1}$ can be written as $p + q\sqrt{3}$, and find p and q.	
2 $f(x) = \ln x + x - 7$. Show that the equation $f(x) = 0$ has a root α in the interval [5, 6].	
3 (a) Solve $4x + 6 \leq 6$. (b) Solve $x^2 + x - 20 < 0$. (c) Hence find the values of x satisfying both inequalities.	
4 On each independent trial, the probability that a basketball player scores is $\frac{1}{6}$. X is the number of trials up to and including the first success. (a) Find $P(X = 6)$ and $E(X)$. (b) Find the least m with $P(X \leq m) > 0.9$.	
5 The line $5x + 12y = k$ is a tangent to the circle $(x + 2)^2 + (y - 4)^2 = 36$. Find the two possible values of k.	

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6 A particle is projected at 10.5 m s^{-1} up a line of greatest slope of a rough plane inclined at α, where $\tan\alpha = \frac{12}{5}$. The coefficient of friction is 0.1. Find (a) the greatest distance it moves up the plane, (b) its speed on returning to the start. Take g = 9.8. Give answers to 3 s.f. if not exact.

7 $g(\theta) = \frac{1}{19 + 8\sin\theta + 15\cos\theta}$

(a) Write $8\sin\theta + 15\cos\theta$ in the form $R\sin(\theta + \alpha)$, with α acute.

(b) Find the greatest and least values of $g(\theta)$ and the smallest positive θ at which the greatest value occurs (1 d.p.).

8 P(B) = 0.35, P(A) = 0.65 and P(A | B) = 0.15.

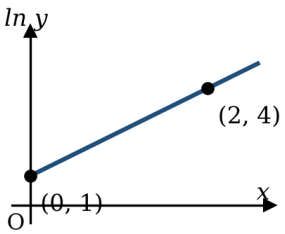
(a) Find $P(A \cap B)$ and $P(A \cup B)$.

(b) Find P(B | A).

(c) Determine whether A and B are independent.

9 The diagram shows the graph of ln y against x for $y = A e^{kx}$.

Find the exact values of A and k.



10 A particle P has position vector $\mathbf{r} = (2t^3 + 3t)\mathbf{i} + (t^2 - 6t)\mathbf{j}$ metres at time t s. Find (a) the speed of P when t = 2, (b) the value of t when P is moving parallel to $\mathbf{i}$. Give answers to 3 s.f. if not exact.