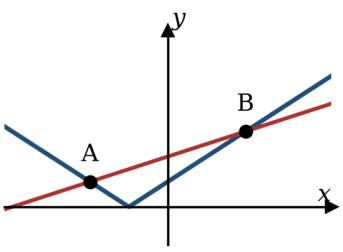
Day 48	A Level Maths: A Tier 10-a-day
1 Solve $2\log_2 x - \log_2(x + 4) = 1$.	
2 Solve $3 \times 3^{2x} - 12 \times 3^x + 9 = 0$.	
3 A 2 kg particle rests on a rough plane inclined at α, $\tan\alpha = \frac{24}{7}$, $\mu = \frac{1}{3}$. A force of P N acts up a line of greatest slope and the particle stays at rest. Find the range of values of P. Take g = 9.8. Give answers to 3 s.f. if not exact.	
4 Calls reach a switchboard at a mean rate of 3 per minute, as a Poisson process. Find the probability that in one such period there are (a) exactly 2 (b) at least 2 (c) fewer than 2 (3 s.f.).	
5 The diagram shows the graphs of $y = \|x + 1\|$ and $y = \frac{1}{2}x + 2$. The graphs meet at A and B. Find the coordinates of A and B. 	

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6 A curve has parametric equations $x = t^2 - 1$, $y = t^3 - 3t$. Find $\frac{dy}{dx}$ in terms of t, and the equation of the normal at the point where $t = 2$, in the form $ax + by + c = 0$ (integers).	
7 $X \sim B(20, 0.6)$. Find $P(X = 6 \mid X \geq 4)$ to 3 significant figures.	
8 $f(x) = x^2 + 6x + 12$, $x \in \mathbb{R}$, and $g(x) = \frac{4}{x+1}$, $x > -1$. (a) Find the range of f. (b) Show that gf is defined and find its range.	
9 Water drains from a tank so that the depth h metres falls at a rate proportional to $\sqrt{h}$. Initially $h = 49$, and after 5 hours $h = 9$. Form and solve a differential equation to find how long, in total, the tank takes to empty.	
10 A 5 kg block is released from rest on a rough plane inclined at α, $\tan\alpha = \frac{3}{4}$, $\mu = 0.25$, and slides 2 m down a line of greatest slope. Use work and energy to find (a) the work done against friction, (b) its speed after 2 m. Take $g = 10$.	