Day 181	A Level Maths: A Tier 10-a-day
1 $f(x) = x^2 - 3$ and $g(x) = 3x + 3$. Solve $fg(x) = gf(x)$.	
2 $\|a\| = 6$, $\|b\| = 4$ and the angle between a and b is 150°. Find the exact values of $a \cdot b$ and $\|a + b\|$.	
3 Customers enter a shop at random at an average of 4 per hour. Find the probability that in a 30-minute period there are (a) zero events (b) at least 3. (c) Find the probability that at least one occurs in each of two separate 30-minute periods.	
4 A sector of a circle has area 96.8 cm^2 and angle 1.6 radians. Find the radius, the arc length and the perimeter of the sector.	
5 $X \sim Po(18)$. Use a suitable approximation to find $P(X \leq 25)$, to 3 significant figures.	

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6 Use integration by parts, with $u = \ln x$ and $\frac{dv}{dx} = 1$, to find the exact value of $\int_1^3 \ln x \, dx$.	
7 $u_1 = 40$ and $u_{n+1} = \frac{1}{2} u_n + 10$. (a) Find the limit L of the sequence as $n \to \infty$. (b) Find the least n for which $\lvert u_n - L \rvert < 0.01$.	
8 A uniform plank AB (mass 10 kg, length 4 m) rests horizontally on supports at C and D, where AC = 1.5 m and DB = 1 m. A 4 kg particle is placed at E, AE = x m, and the plank is about to tilt about C. Find x.	
9 Find the set of values of k for which the line $y = 2x + k$ does not meet the curve $y = 2x^2 - 4x + 5$.	
10 Car A passes P at constant speed 4 m s^{-1}. 8 s later car B leaves P from rest, in the same direction, with acceleration 2 m s^{-2}. B overtakes A at Q. Find (a) the time B takes to reach Q, (b) PQ, (c) the speed of B at Q.	