Day 107	A Level Maths: A Tier 10-a-day
1 A circle has equation $x^2 + y^2 + 12x + 10y + 36 = 0$. (a) Find the centre and radius of the circle. (b) Determine whether P$(-4, -3)$ lies inside or outside the circle.	
2 A ball is projected from a point O on horizontal ground at 24.5 m s^{-1} at angle α above the horizontal, $\tan\alpha = \frac{4}{3}$, and lands at A. Find (a) the time of flight, (b) the greatest height, (c) OA. Take $g = 9.8$.	
3 Simplify fully $\frac{4x^2 + 6x - 10}{2x^2 + 2x - 4}$.	
4 (a) Express $\frac{-x - 1}{(x + 2)^2}$ in the form $\frac{A}{x + 2} + \frac{B}{(x + 2)^2}$. (b) Hence find the exact value of $\int_0^3 \frac{-x - 1}{(x + 2)^2}\,dx$.	
5 A driver at constant speed sees a hazard 70.4 m ahead. After a reaction time of 0.4 s she brakes with deceleration 2 m s^{-2} and stops exactly at the hazard. Find (a) her initial speed, (b) the total time from seeing the hazard to stopping.	

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6 For a sample of 8 pairs of values of hours of sunshine and plant height, $r = -0.839$. The critical value for a two-tailed test at the 5% level is 0.7067. Test, at this level, whether there is any correlation between the two variables.	
7 Find the set of values of k for which the line $y = x + k$ does not meet the curve $y = x^2 + 4x - 4$.	
8 Water pours into a cone, vertex down, at 50 cm^3s^{-1}. The surface radius is always $\frac{h}{3}$. Find the rate at which the depth is rising when h = 2 cm.	
9 Eggs are defective with probability 0.2, independently. A tray of 5 eggs is rejected if it has at least 2 defective. From 11 such trays, find the probability that exactly 4 are rejected (3 s.f.).	
10 A curve has parametric equations $x = 2\sec t$, $y = \tan t$. Find $\frac{dy}{dx}$ in terms of t and the exact equation of the tangent at the point where $t = \frac{\pi}{4}$, in the form $y = mx + c$.	