Day 209 **A Level Maths: A Tier 10-a-day**

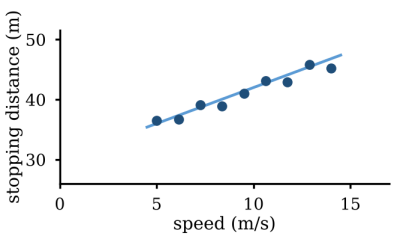
1 A(−1, −7) and B(7, −1) are the ends of a diameter of a circle.
(a) Find the equation of the circle, in the form $x^2 + y^2 + ax + by + c = 0$.
(b) Show that C(0, −8) lies on the circle.

2 A cyclist passes P with speed 3 m s^{-1} and accelerates uniformly. She travels 90 m in the next 10 s, reaching Q. Find (a) her acceleration, (b) her speed at Q, (c) her speed at the midpoint of PQ. Give answers to 3 s.f. if not exact.

3 The equation $x^2 + (2k - 4)x + (k - 2) = 0$ has two distinct real roots.
Find the set of possible values of k.

4 A curve has equation $3x^2 + 2xy - 2x - 3y = 15$.
Show that P(−1, −2) lies on the curve and find the equation of the tangent at P in the form ax + by + c = 0 with integer a, b, c.

5 The diagram shows data and the regression line y = 30 + 1.2x.
(a) Interpret the gradient.
(b) Estimate y when x = 11 and comment.



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6 Use integration by parts twice to find the exact value of $\int_0^1 x^2 e^x \, dx$.	
7 Faults occur as a Poisson process at a mean rate of 4 per roll of cloth. After a change, the number recorded in one roll of cloth is 5. Test at the 1% level whether the mean rate has increased.	
8 $f(x) = 2 \arcsin(2x)$. State the domain and range of f, and find $f^{-1}(x)$.	
9 (a) Expand $(1 + 2x)^{\frac{1}{2}}$ in ascending powers of x up to x^2. (b) Use $x = 0.02$ to estimate $\sqrt{26}$ to 3 decimal places.	
10 Particle A (3 kg) rests on a smooth table, joined by a light string over a smooth pulley at the edge to particle B (7 kg), hanging 0.5 m above the floor. Released from rest. Find (a) the tension, (b) the speed of B as it hits the floor. Take g = 9.8. Give answers to 3 s.f. if not exact.	