Day 118	A Level Maths: A Tier 10-a-day
1 A cyclist passes P with speed 5 m s^{-1} and accelerates uniformly. She travels 75 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.	
2 A curve has parametric equations $x = 3t^2 - 5$, $y = t(t^2 - 4)$. Find the coordinates of the points where the curve meets the x-axis.	
3 A lift of mass 250 kg carries a person of mass 70 kg. The cable tension is 2880 N and the lift is accelerating. Find (a) the magnitude and direction of the acceleration, (b) the force of the floor on the person. Take g = 9.8.	
4 For small x (in radians), use the small angle approximations to find the value that $\frac{\sin 4x \tan 2x}{1 - \cos 2x}$ approaches as $x \to 0$.	
5 A(10, −10) and B(−2, 6) 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(14, −2) lies on the circle.	

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6 A curve has parametric equations $x = \frac{1}{t}$, $y = t^2$. Find $\frac{dy}{dx}$ in terms of t, and the equation of the normal at the point where $t = -\frac{1}{2}$, in the form $ax + by + c = 0$ (integers).	
7 $X \sim N(52, 6^2)$. Find $P(X > 59 \mid X > 52)$ to 3 significant figures.	
8 A curve has equation $-x^2 + 4xy - x - 3y = -51$. Show that $P(-3, 3)$ 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.	
9 Parts are defective with probability 0.2, independently. A box of 7 parts is rejected if it has at least 3 defective. From 6 such boxes, find the probability that exactly 4 are rejected (3 s.f.).	
10 A sequence is defined by $u_1 = \frac{1}{2}$ and $u_{n+1} = 1 - \frac{1}{u_n}$. (a) Find u_2 and u_3. (b) Find u_{200} and $\sum_{r=1}^{200} u_r$.	