Day 39	A Level Maths: A Tier 10-a-day
1 Car A passes P at constant speed 18 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.	
2 The line l has equation $2x + y = 1$. (a) Find the coordinates of the foot of the perpendicular from P$(-2, -3)$ to l. (b) Hence find the shortest distance from P to l, in exact form.	
3 Find the exact value of $\int_0^{\ln 2} (e^{2x} + 5e^{x})\,dx$.	
4 Expand $(1 - 2x)^{\frac{1}{3}}$ in ascending powers of x up to and including the term in x^2. State the range of values of x for which the expansion is valid.	
5 Solve $\cos 2x - 3\cos x = -1$ for $0 \leq x \leq 2\pi$.	

Day 39	A Level Maths: A Tier 10-a-day
6 A circle has equation $x^2 + y^2 - 8x - 12y + 32 = 0$. (a) Find the centre and radius of the circle. (b) Determine whether P(−1, 2) lies inside or outside the circle.	
7 P(A) = 0.5 and P(A ∪ B) = 0.65. (a) Given that A and B are independent, find P(B). (b) Given instead that A and B are mutually exclusive, find P(B). (c) In the case in (a), find P(A′ ∩ B).	
8 A curve has parametric equations $x = 3(t - \sin t)$, $y = 3(1 - \cos t)$. Find $\frac{dy}{dx}$ in terms of t and the exact equation of the tangent at the point where $t = \frac{2\pi}{3}$, in the form $y = mx + c$.	
9 A uniform ladder AB (15 m, 15 kg) rests with A on rough ground, $\mu = 0.4$, and B against a smooth wall, B being 12 m above the ground. A man of mass 50 kg climbs the ladder. How far along the ladder from A can he climb before it slips?	
10 Of 46 students, 26 study Maths (M), 16 Physics (P) and 20 Chemistry (C). 10 study M and P, 10 study M and C, 7 study P and C, and 4 study all three. One student is chosen at random. Given that a student studies exactly two subjects, find the probability that they study Physics.	