Day 38	A Level Maths: A Tier 10-a-day
1 X ~ B(18, 0.35). Find, to 3 significant figures: (a) P(8 ≤ X ≤ 9) (b) P(X > 8)	
2 A sector of a circle of radius 10 cm has angle 210°. Find, in terms of π, the arc length, the area and the perimeter of the sector.	
3 Of 33 students, 14 study Maths (M), 17 Physics (P) and 13 Chemistry (C). 7 study M and P, 5 study M and C, 4 study P and C, and 1 study all three. One student is chosen at random. Given that a student studies Chemistry, find the probability that they study all three.	
4 The 1st term of a geometric sequence is 3 and the 4th term is −81. Find the common ratio and the first term. Find the sum of the first 5 terms.	
5 A particle P has constant acceleration $(-\mathbf{i} + 3\mathbf{j})$ m s^{-2}. When t = 0, P is at $(2\mathbf{i} + 4\mathbf{j})$ m moving with velocity $(5\mathbf{i} - 5\mathbf{j})$ m s^{-1}. Find (a) when P moves parallel to $\mathbf{j}$, (b) its position vector then.	

Day 38	A Level Maths: A Tier 10-a-day
6 $y = \tan(3x)$. Find $\frac{dy}{dx}$ and its exact value at $x = \frac{\pi}{18}$.	
7 Expand $(9 + 2x)^{-\frac{1}{2}}$ in ascending powers of x, up to and including x^2. State the range of x for which the expansion is valid.	
8 A uniform rod AB (6 kg, 4 m) is smoothly hinged at A to a vertical wall, with a 4 kg particle at B. A light string from B to the wall above A holds the rod horizontal, at angle θ to it, $\tan\theta = \frac{4}{3}$. Find (a) the tension, (b) the magnitude of the hinge force. Take $g = 9.8$. Give answers to 3 s.f. if not exact.	
9 A sequence is defined by $u_1 = k$ and $u_{n+1} = 2u_n - 3$. Given that $u_3 = -5$, find (a) the value of k, (b) $\sum_{r=1}^{4} u_r$.	
10 A closed cylinder has radius r cm and volume 54π cm^3. Show that its surface area is $A = 2\pi r^2 + \frac{108\pi}{r}$, and find the minimum value of A in terms of π.	