Day 188	A Level Maths: A Tier 10-a-day
1 The 3rd term of an arithmetic sequence is 5 and the 7th term is 21. Find the first term and common difference, and the sum of the first 12 terms.	
2 A and B have position vectors $\begin{pmatrix}-3\\-5\end{pmatrix}$ and $\begin{pmatrix}5\\3\end{pmatrix}$. The point P lies on AB with AP : PB = 3 : 1. Find the position vector of P and the exact distance OP.	
3 A cyclist passes P with speed 8 m s^{-1} and accelerates uniformly. She travels 100 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.	
4 Solve $x^4 - 17x^2 + 16 = 0$.	
5 Forces $F_1 = (-2\mathbf{i} + 5\mathbf{j})$ N, $F_2 = (8\mathbf{i} - 15\mathbf{j})$ N and $F_3 = (a\mathbf{i} + b\mathbf{j})$ N keep a 2 kg particle in equilibrium. Find (a) a and b. F_2 is then removed; (b) find the magnitude of the acceleration.	

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6 X is normally distributed with mean 71 and standard deviation σ. Given that P(X > 79) = 0.1587, find σ to 3 significant figures.	
7 A curve has equation $2x^2 - 2xy - 2y^2 + x - 4y = 4$. Show that P(−2, 1) 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.	
8 X, the score (marks), is normally distributed with mean 62 and standard deviation 12. Find (a) P(X > 53.6) (b) P(53.6 < X < 63.2), each to 3 s.f.	
9 Given that (x + 4) is a factor of $f(x) = -x^3 + x^2 + 14x - 24$, solve $f(x) \geq 0$.	
10 Water drains from a tank so that the depth h metres falls at a rate proportional to $\sqrt{h}$. Initially h = 49, and after 3 hours h = 4. Form and solve a differential equation to find how long, in total, the tank takes to empty.	