Day 348	A Level Maths: A Tier 10-a-day
1 A cyclist passes P with speed 6 m s^{-1} and accelerates uniformly. She travels 85 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 £5000 is invested at 5% compound interest per year. Find the smallest whole number of years for the value to exceed £10000.	
3 Summary statistics for the daily mean visibility (Dm) in the same month are: Perth: mean 26, standard deviation 1.6; Jacksonville: mean 23, standard deviation 3.9. Make two comparisons.	
4 Forces $F_1 = (3\mathbf{i} - 4\mathbf{j})$ N, $F_2 = (-12\mathbf{i} - 5\mathbf{j})$ 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.	
5 X is normally distributed with mean μ and standard deviation 8. Given that $P(X < 38) = 0.3085$, find μ to 3 significant figures.	

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6 $f(x) = \frac{3x + 2}{3x - 1}$, $x \in \mathbb{R}$, $x \neq \frac{1}{3}$. Find $f^{-1}(x)$ and state its domain.	
7 A window is a rectangle of width 2x m and height h m, topped by a semicircle of radius x m. Its perimeter is 40 m. Show that its area is $A = 40x - (2 + \frac{\pi}{2})x^2$, and find the maximum area to 3 s.f.	
8 Prove by contradiction that there are no integers m and n such that $6m + 15n = 118$.	
9 Solve $2\text{cosec}^2\theta - 7\cot\theta + 1 = 0$ for $-180° < \theta < 180°$, $\theta \neq 0$. Give answers to 1 d.p.	
10 A sequence is defined by $u_1 = 3$ and $u_{n+1} = 1 - \frac{1}{u_n}$. (a) Find u_2 and u_3. (b) Find u_{150} and $\sum_{r=1}^{150} u_r$.	