Day 280	A Level Maths: A Tier 10-a-day
1 A cyclist passes P with speed 3 m s^{-1} and accelerates uniformly. She travels 43.2 m in the next 8 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 Solve $7^{4x-3} = 2^{3x-3}$. Give your answer to 3 significant figures.	
3 The 296 items in a list are numbered 1 to 296. A systematic sample of 37 items is taken, starting with a random item among the first few. The first item selected is number 2. Find the sampling interval and the number of the last item selected.	
4 The volume of a spherical balloon increases at a constant rate of 100 cm^3s^{-1}. Find the rates of increase of its radius and of its surface area when r = 10 cm.	
5 A sequence is defined by $u_1 = k$ and $u_{n+1} = -u_n + 6$. Given that $u_3 = -3$, find (a) the value of k, (b) $\sum_{r=1}^{4} u_r$.	

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6 A car costs £18000 new. Its value falls by 8% each year, so after t years its value is £V. (a) Write down V in terms of t. (b) Find, to 3 s.f., the time when the value is £6000.	
7 5% of people have a fault. The inspection test is positive for 95% of those who have it and for 10% of those who do not. (a) Find the probability that a person tests positive. (b) Given a positive test, find the probability that the person has the fault (3 s.f.).	
8 The line $4x - 3y = 1$ meets the circle $(x - 2)^2 + (y + 2)^2 = 36$ at the points A and B. Find the exact length of AB.	
9 A particle is projected at 9.8 m s^{-1} up a line of greatest slope of a rough plane inclined at α, where $\tan\alpha = \frac{5}{12}$. The coefficient of friction is 0.4. Find (a) the greatest distance it moves up the plane, (b) its speed on returning to the start. Take g = 9.8.	
10 Solve $x(\sqrt{2} - 1) = 2 - 4\sqrt{2}$, writing x in the form $p + q\sqrt{2}$.	