Day 64	A Level Maths: A Tier 10-a-day
1 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 7. Find the sampling interval and the number of the last item selected.	
2 A cyclist passes P with speed 8 m s^{-1} and accelerates uniformly. She travels 255 m in the next 15 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.	
3 Calls reach a switchboard at a mean rate of 2 per hour, as a Poisson process. Find the probability that in one such period there are (a) exactly 5 (b) at least 5 (c) fewer than 5 (3 s.f.).	
4 Find the sum of all the multiples of 6 that lie strictly between 30 and 466.	
5 A circular ripple has area A cm^2 increasing at a constant 3 $cm^2 s^{-1}$. Find the rate at which the circumference is increasing when the radius is 5 cm.	

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6 Find the coefficient of x^4 in the expansion of $(3 + 2x)(2 - 2x)^5$.	
7 Particle A (1 kg) lies on a rough table, $\mu = 0.4$, joined by a light string over a smooth pulley to particle B (4 kg), 1 m above the floor. Released from rest; B lands without rebounding. Find (a) the acceleration of A before B lands, (b) the further distance A moves. Take $g = 9.8$.	
8 Solve the differential equation $\frac{dy}{dx} = 3y \sin x$, given that $y = 1$ when $x = \frac{\pi}{2}$. Give y in terms of x.	
9 Solve $e^{2x} - 11e^x + 28 = 0$, giving exact answers.	
10 The second term of a geometric series is 6 and its sum to infinity is 32. Find the two possible values of the first term.	