Day 52	A Level Maths: S Tier 10-a-day
1 Given that $\sin 3\theta \equiv 3\sin\theta - 4\sin^3\theta$, solve $\sin 3\theta = 2\sin\theta$ for $0 < \theta < \pi$, in terms of π.	
2 Customers arrive at a till at an average rate of 4 per hour, independently and at random. (a) Find the probability of at least 2 in a 20-minute period. (b) Find the probability that, of 9 separate 20-minute periods, exactly 2 have no arrivals.	
3 Use the trapezium rule with 4 strips to estimate $\int_0^1 \ln(1 + x^2)\,dx$, to 4 s.f. Is it an overestimate or an underestimate? Explain.	
4 $u_{n+1} = \frac{4}{5}u_n + 4$, $u_1 = 32$. (a) Find the limit L of the sequence. (b) Find the least n such that $\lvert u_n - L\rvert < 0.001$.	
5 A uniform plank AB of length 10 m and mass 30 kg rests on supports at C and D, where AC = 2 m and DB = 3 m. A girl of mass 50 kg stands on it at distance x m from A. Find the range of x for which the plank stays in equilibrium on both supports.	

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6 Find the exact coordinates of the stationary point of $y = x^4e^{-2x}$ for $x > 0$, and determine its nature.	
7 Solve $\sqrt{5x - 1} = x - 3$.	
8 A(−7, 4) and B(−8, −3). The point C lies on the x-axis and CA = CB. Find the coordinates of C and the area of triangle ABC.	
9 A particle P moves on a straight line. At time t seconds, where $t \geq 0$, its velocity is v m s^{-1}, where $v = 36\sqrt{t} - 6t$. Find (a) the greatest speed of P, (b) the greatest displacement of P from its starting point.	
10 X ~ B(200, 0.25). (a) State why a normal approximation is suitable for X. (b) Use a normal approximation to estimate $P(38 \leq X \leq 56)$, to 3 significant figures.	