Day 59	A Level Maths: S Tier 10-a-day
1 A drug dose of 100 mg decays by 20% each hour. Find the first whole number of hours after which less than 2 mg remains.	
2 The curve C has parametric equations $x = t$, $y = 3t^2$. The line $y = -15x - 18$ meets C at A and B. Find the exact length AB.	
3 Three forces $(2\mathbf{i} - \mathbf{j})$ N, $(2\mathbf{i} + k\mathbf{j})$ N and $(-8\mathbf{i} - 4\mathbf{j})$ N act on a particle of mass 3 kg. The resultant is parallel to $(-\mathbf{i} - \mathbf{j})$. Find (a) the value of k, (b) the magnitude of the acceleration of the particle, to 3 s.f.	
4 Solve $3\sec^2\theta + 4\tan\theta - 2 = 0$ for $0 \leq \theta < 360°$, giving answers to 1 d.p.	
5 The lengths of a component, in mm are modelled by $N(82, \sigma^2)$. The probability of a value above 97 is 0.10. (a) Find σ. (b) Find the probability of a value below 98.	

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6 Use the trapezium rule with 5 strips to estimate $\int_0^2 \frac{1}{\sqrt{1+x}}\,dx$, to 4 s.f. Is it an overestimate or an underestimate? Explain.	
7 Solve $\frac{5}{(x-4)} > \frac{4}{(x-1)}$.	
8 A test of H_0: p = 0.5 against H_1: p > 0.5 uses a sample of 50 at the 10% level. (a) Find the critical region for X, the number of successes. (b) Find the actual significance level. (c) Find P(Type II error) when in fact p = 0.7.	
9 A particle P moves on a straight line. At time t = 0, P passes through the fixed point O with velocity 60 m s^{-1}. At time t seconds, P has acceleration $(3t - 23)$ m s^{-2}. Find (a) the times at which P is at O again, (b) the greatest distance of P from O before it first returns to O.	
10 A curve has parametric equations x = 3 sin t, y = 2 cos 2t. Find y in terms of x.	