Day 73	A Level Maths: B Tier 10-a-day
1 Find the exact value of $\int_0^{\frac{\pi}{8}} (5 \sin 4x + 2 \cos 4x)\, dx$.	
2 A circle has centre $(-5, 2)$ and passes through the point $(-3, 1)$. Find an equation of the circle.	
3 The function $f(x) = e^x - 9x$. Show that $f(x) = 0$ has a root between $x = 3$ and $x = 3.5$.	
4 A particle is in equilibrium under three forces: P N at angle θ above the positive x-axis, a force of 12 N in the negative x-direction and a force of Q N in the negative y-direction. $\cos \theta = \frac{4}{5}$. Find P and Q.	
5 The curve C has equation $y = x^2 - 3x - 3$. C is stretched by scale factor 3 parallel to the y-axis. Find its new equation.	

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6 A drone moves so that its position vector relative to O at time t s is $\mathbf{r} = (t^2 + t)\mathbf{i} + (3t^3 - 5t)\mathbf{j}$ metres. Find the velocity when t = 1, and the speed at that time.	
7 A chord AB subtends an angle of 1.2 radians at the centre O of a circle of radius 9 cm. Find the perimeter of the minor segment, to 3 s.f.	
8 Prove by contradiction that $\sqrt{7}$ is irrational.	
9 The continuous random variable X has pdf $f(x) = kx^3$ for $0 \leq x \leq 4$, and 0 otherwise. (a) Find the value of k. (b) Find P(X > 3). (c) Find E(X).	
10 Data are modelled by $y = ab^x$, where a and b are constants. A plot of $\log_{10} y$ against x is a straight line with intercept 0.602 and gradient 0.301. Find a and b to 2 significant figures.	