Day 96	A Level Maths: A Tier 10-a-day
1 Calls reach a switchboard at a mean rate of 1.5 per hour, as a Poisson process. Find the probability that in one such period there are (a) exactly 2 (b) at least 2 (c) fewer than 2 (3 s.f.).	
2 The radius of a sphere increases at 3 cm s^{-1}. Find the rate of increase of its volume when r = 6 cm, in terms of π.	
3 $f(x) = x^2 + 1$ and $g(x) = 3x + 2$. Solve $fg(x) = gf(x)$.	
4 X, the mass (g), is $N(63, 5^2)$. Find the symmetric limits about the mean between which the central 80% of values lie (3 s.f.).	
5 By writing 195° as 150° + 45°, find the exact value of cos 195°, in the form $\frac{\sqrt{a} \pm \sqrt{b}}{c}$.	

Day 96	A Level Maths: A Tier 10-a-day
6 A 4 kg particle rests on a smooth plane inclined at α, $\tan\alpha = \frac{5}{12}$, held by a string in the vertical plane through a line of greatest slope, at angle θ above the slope, $\tan\theta = \frac{3}{4}$. Find the tension and the normal reaction. Take g = 9.8. Give answers to 3 s.f. if not exact.	
7 $f(x) = x^2 - 2x + 6$, $x \in \mathbb{R}$, and $g(x) = \frac{8}{x-1}$, $x > 1$. (a) Find the range of f. (b) Show that gf is defined and find its range.	
8 A stone is projected from a cliff top 92.5 m above the sea at 10 m s^{-1}, at angle α above the horizontal, $\tan\alpha = \frac{3}{4}$. Find (a) the time to reach the sea, (b) the horizontal distance travelled, (c) the speed on impact. Take g = 9.8. Give answers to 3 s.f. if not exact.	
9 $y = x\sec(x)$. Find the exact gradient at $x = \frac{\pi}{3}$.	
10 (a) Expand $(1-2x)^{\frac{1}{2}}$ in ascending powers of x up to x^2. (b) Use x = 0.02 to estimate $\sqrt{96}$ to 3 decimal places.	