Day 152	A Level Maths: A Tier 10-a-day
1 Summary statistics for the daily mean visibility (Dm) in the same month are: Camborne: mean 13.5, standard deviation 1.8; Leeming: mean 16.5, standard deviation 1.7. Make two comparisons.	
2 Solve $\cos 2\theta + \sin \theta = 1$ for $0° \leq \theta \leq 360°$.	
3 A ball is thrown vertically upwards at 4.9 m s^{-1} from a point h m above horizontal ground, and hits the ground 3 s later. Find (a) h, (b) the greatest height above the ground. Take g = 9.8.	
4 Find the exact value of $\int_0^3 (3x + 2)^2 \, dx$.	
5 The mean fill volume of bottles (ml) is normally distributed with standard deviation 4; it was previously 89. A random sample of 64 has mean 89.3. Test, at the 10% level, whether the mean has increased.	

Day 152	A Level Maths: A Tier 10-a-day

6 The line l has equation $x - y = 5$.
(a) Find the coordinates of the foot of the perpendicular from P(6, −1) to l.
(b) Hence find the shortest distance from P to l, in exact form.

7 $g(\theta) = \dfrac{1}{19 + 15\sin\theta + 8\cos\theta}$
(a) Write $15\sin\theta + 8\cos\theta$ in the form $R\sin(\theta + \alpha)$, with α acute.
(b) Find the greatest and least values of $g(\theta)$ and the smallest positive θ at which the greatest value occurs (1 d.p.).

8 $u_1 = -6$ and $u_{n+1} = \frac{1}{3}u_n + 4$.
(a) Find the limit L of the sequence as $n \to \infty$.
(b) Find the least n for which $|u_n - L| < 0.1$.

9 A particle P moves on the x-axis with velocity $v = (6t^2 - 36t + 48)$ m s^{-1} at time t s, $t \geq 0$, and starts at O. Find (a) the times when P is at instantaneous rest, (b) the total distance P travels in the first 7 s.

10 Find the coefficient of x^{-1} in the expansion of $\left(2x^3 - \frac{1}{x^2}\right)^8$.