Day 9	A Level Maths: S Tier 10-a-day
1 $f(x) = x^3 - x^2 + 5x - 14$. Show that $(x - 2)$ is a factor of f(x), and that the equation f(x) = 0 has exactly one real root.	
2 The times taken by a bus, in minutes are normally distributed. 10% are less than 56 and 40% are greater than 74. Find the mean and standard deviation, each correct to 3 significant figures.	
3 A tennis ball is projected from a point O on horizontal ground with speed 24.5 m s^{-1} at an angle α above the horizontal, where $\tan\alpha = \frac{4}{3}$. Find (a) the time of flight, (b) the range, (c) the greatest height. Take g = 9.8 m s^{-2}.	
4 The function f is defined by $f(x) = 3x^2 - 24x + 49$ for $x \geq k$. Given that k is the least value for which f is one-one, find k, $f^{-1}(x)$, and the domain of f^{-1}.	
5 A drink cools according to $\theta = 18 + Ae^{-kt}$, where θ °C is the temperature after t minutes. Initially $\theta = 90$, and after 5 minutes $\theta = 72$. Find A and k, then find when $\theta = 22$ (3 s.f.).	

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6 The breaking strength of a cable is N(μ, 25) with known variance 25. The mean was claimed to be 55 kN. A random sample of 36 has mean 56.5. Test at the 10% level whether the mean is less than 55.	
7 The points A, B, C have coordinates (−2, 3, 2), (3, 1, 2), (2, −3, −1). Find angle ABC to 1 d.p., and the exact area of triangle ABC.	
8 The line l has equation $\mathbf{r} = \begin{pmatrix}3\\2\\4\end{pmatrix} + t\begin{pmatrix}2\\2\\2\end{pmatrix}$. The point P has coordinates (0, −6, 3). Find the coordinates of the foot F of the perpendicular from P to l, and the exact distance PF.	
9 Evaluate $\sum_{r=6}^{11}(5 \times 3^r + 4r)$.	
10 Car A passes a point O travelling at a constant speed of 8 m s^{-1}. 6 s later, car B leaves O from rest with constant acceleration 2 m s^{-2}, travelling in the same direction. B overtakes A at the point X. Find (a) the time B takes to reach X, (b) the distance OX, (c) the speed of B at X.	