Day 20	A Level Maths: A Tier 10-a-day
1 Summary statistics for the daily mean windspeed (knots) in the same month are: Camborne: mean 15, standard deviation 5.1; Leeming: mean 7.5, standard deviation 3.3. Make two comparisons.	
2 A driver at constant speed sees a hazard 88.2 m ahead. After a reaction time of 0.4 s she brakes with deceleration 2 m s^{-2} and stops exactly at the hazard. Find (a) her initial speed, (b) the total time from seeing the hazard to stopping.	
3 A group of 7 boys and 6 girls. A team of 3 is chosen at random. Find the probability that the team has exactly 1 of the girls.	
4 $y = (4x - 6)^{-2}$. Find $\frac{dy}{dx}$ and the gradient of the curve at $x = -1$.	
5 The sum of the first n terms of an arithmetic series is $S_n = n^2 + n$. (a) Find the first term and the common difference. (b) Find u_{18}.	

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6 (a) Express $12\cos x - 5\sin x$ in the form $R\cos(x + \alpha)$, where $R > 0$ and $0° < \alpha < 90°$. Give α to 1 d.p.
(b) Solve $12\cos x - 5\sin x = -11$ for $0° \leq x < 360°$, giving answers to 1 d.p.

7 $u_1 = 0$ and $u_{n+1} = \frac{1}{3}u_n + 8$.
(a) Find the limit L of the sequence as $n \to \infty$.
(b) Find the least n for which $|u_n - L| < 0.001$.

8 A particle slides from rest down a rough plane inclined at α to the horizontal, where $\tan\alpha = \frac{8}{15}$. It moves 19.6 m in 4 s. Find (a) the coefficient of friction, (b) the speed after 4 s. Take $g = 9.8$.

9 l_1: $\mathbf{r} = \begin{pmatrix} 2 \\ 2 \\ -3 \end{pmatrix} + \lambda \begin{pmatrix} 3 \\ 2 \\ -3 \end{pmatrix}$
l_2: $\mathbf{r} = \begin{pmatrix} -1 \\ 0 \\ 0 \end{pmatrix} + \mu \begin{pmatrix} -2 \\ -3 \\ 2 \end{pmatrix}$
Determine whether l_1 and l_2 intersect. If they do, find the point of intersection.

10 An arithmetic series has first term 4 and common difference 1.
The sum of the first n terms is 85. Find n.