Day 43	A Level Maths: A Tier 10-a-day
1 l_1: $\mathbf{r} = \begin{pmatrix} 2 \\ 6 \\ -9 \end{pmatrix} + \lambda \begin{pmatrix} 2 \\ 0 \\ -3 \end{pmatrix}$ l_2: $\mathbf{r} = \begin{pmatrix} -2 \\ 6 \\ -3 \end{pmatrix} + \mu \begin{pmatrix} 0 \\ -3 \\ 2 \end{pmatrix}$ Determine whether l_1 and l_2 intersect. If they do, find the point of intersection.	
2 Find the coefficient of x^4 in the expansion of $(2 + 3x)^8$.	
3 Solve $2\log_3 x - \log_3(x + 54) = 2$.	
4 Solve $16^{3x+2} = 8^{3x-3}$.	
5 $f(x) = x^2 - 10$. Show that the Newton-Raphson formula gives $x_{n+1} = \frac{1}{2}(x_n + \frac{10}{x_n})$, and use it with $x_0 = 3$ to find x_2 as an approximation to $\sqrt{10}$, to 4 d.p.	

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6 A claim is that the probability p that a seed germinates is 0.4. In a sample of 24, the number of successes is 6. Test at the 5% level whether p has decreased.	
7 A particle P moves on the x-axis with velocity v = $(6t^2 - 24t + 18)$ 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 4 s.	
8 X, the score (marks), is normally distributed with mean 54 and standard deviation 12. Find (a) $P(X > 73.2)$ (b) $P(73.2 < X < 92.4)$, each to 3 s.f.	
9 (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 4 decimal places.	
10 A 1200 kg car tows a 200 kg trailer by a light tow-bar on a horizontal road. Driving force 930 N; resistances 500 N (car), 150 N (trailer). Find (a) the acceleration and the tow-bar tension. At 12 m s^{-1} the tow-bar breaks. (b) How far does the trailer then travel?	