Day 129	A Level Maths: A Tier 10-a-day
1 A and B have position vectors $\begin{pmatrix}-2\\2\end{pmatrix}$ and $\begin{pmatrix}-5\\-4\end{pmatrix}$. The point P lies on AB with AP : PB = 2 : 1. Find the position vector of P and the exact distance OP.	
2 A particle is projected at 14 m s^{-1} up a line of greatest slope of a rough plane inclined at α, where $\tan\alpha = \frac{5}{12}$. The coefficient of friction is 0.25. Find (a) the greatest distance it moves up the plane, (b) its speed on returning to the start. Take g = 9.8.	
3 P(A) = 0.35, P(B) = 0.75 and P(A ∩ B) = 0.25. Find (a) P(A ∪ B) (b) P(B′ | A′) (c) P(A | B)	
4 Solve $x^4 - 14x^2 - 32 = 0$.	
5 For 25 values of x, the coded variable $y = \frac{x - 30}{10}$ gives $\Sigma y = 125$ and $\Sigma y^2 = 725$. Find the mean and standard deviation of x.	

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6 A 8 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 $g(x) = \frac{1}{18 + 15\sin x + 8\cos x}$

(a) Write $15\sin x + 8\cos x$ in the form $R\sin(x + \alpha)$, with α acute.

(b) Find the greatest and least values of g(x) and the smallest positive x at which the greatest value occurs (1 d.p.).

8 $u_1 = 18$ 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 $|u_n - L| < 0.01$.

9 The region bounded by the curve $y = \frac{1}{x}$, the x-axis, x = 1 and x = 3 is rotated through 360° about the x-axis.

Find the exact volume of the solid formed.

10 A curve has parametric equations $x = 2t^2$, $y = -t(t^2 - 9)$.

Find the coordinates of the points where the curve meets the x-axis.