Day 47	A Level Maths: A Tier 10-a-day
1 Find the quotient and the remainder when $4x^3 + 18x^2 + 12x - 25$ is divided by $(2x + 5)$.	
2 Solve $4\text{cosec}^2 x - 18\cot x + 14 = 0$ for $0° < x < 360°$. Give answers to 1 d.p.	
3 A particle of mass 5 kg is acted on by forces $F_1 = (23\mathbf{i} + 19\mathbf{j})$ N and F_2. Its acceleration is $(4\mathbf{i} + 3\mathbf{j})$ m s^{-2}. Find (a) F_2, (b) the angle between F_2 and $\mathbf{i}$, to 1 d.p.	
4 A curve has parametric equations $x = 4 + 3\cos\theta$, $y = -4 + 3\sin\theta$. Find its Cartesian equation and describe the curve.	
5 The points A, B and C have coordinates (0, 2, 0), (3, 2, 4) and (−1, −1, 1). Find angle ABC, in degrees to 1 d.p.	

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6 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 6 s.	
7 X ~ Po(18). Use a suitable approximation to find $P(X \geq 14)$, to 3 significant figures.	
8 The line $y = kx + 5$ is a tangent to the curve $y = x^2 - x + 21$. (a) Find the possible values of k. (b) For the larger value of k, find the coordinates of the point of contact.	
9 X ~ B(23, p). H_0: p = 0.3 is tested against H_1: p > 0.3 using a 5% significance level. (a) Find the critical region. (b) State the probability of a Type I error. (c) Find the probability of a Type II error when p = 0.5 (3 s.f.).	
10 The line l has equation $\mathbf{r} = \begin{pmatrix} 5 \\ -4 \\ 2 \end{pmatrix} + t\begin{pmatrix} 1 \\ -2 \\ 2 \end{pmatrix}$. Find the coordinates of the foot of the perpendicular from P(1, −1, −2) to l, and the exact distance from P to l.	