Day 177	A Level Maths: A Tier 10-a-day
1 The 2nd term of an arithmetic sequence is 12 and the 9th term is -9. Find the first term and common difference, and the sum of the first 15 terms.	
2 A lift of mass 500 kg carries a person of mass 60 kg. The cable tension is 5264 N and the lift is accelerating. Find (a) the magnitude and direction of the acceleration, (b) the force of the floor on the person. Take g = 9.8.	
3 A curve has equation $x^2 - xy + 2y^2 = 63$. Find the coordinates of the points where the tangent is parallel to the x-axis.	
4 A$(-9, 8)$ and B$(15, -2)$ are the ends of a diameter of a circle. (a) Find the equation of the circle, in the form $x^2 + y^2 + ax + by + c = 0$. (b) Show that C$(-9, -2)$ lies on the circle.	
5 A crate of mass 6 kg is pushed at constant speed along rough horizontal ground, $\mu = 0.2$, by a force of P N at angle θ below the horizontal, $\tan\theta = \frac{3}{4}$. Find P and the normal reaction. Take g = 9.8. Give answers to 3 s.f. if not exact.	

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6 A sequence is defined by $u_1 = k$ and $u_{n+1} = -3u_n - 1$. Given that $u_3 = -7$, find (a) the value of k, (b) $\sum_{r=1}^{4} u_r$.	
7 A claim is that the probability p that a seed germinates is 0.3. In a sample of 19, the number of successes is 12. Test at the 1% level whether p has increased.	
8 A curve has equation $x^2y + y^3 - 3x = 7$. Find $\frac{dy}{dx}$ in terms of x and y, and the gradient of the normal at (1, 2).	
9 X ~ B(21, 0.1). Find the smallest value of c such that $P(X \geq c) < 0.1$.	
10 $l_1: r = \begin{pmatrix} -1 \\ 0 \\ 2 \end{pmatrix} + \lambda \begin{pmatrix} 3 \\ 2 \\ -2 \end{pmatrix}$ $l_2: r = \begin{pmatrix} -1 \\ 0 \\ 2 \end{pmatrix} + \mu \begin{pmatrix} 3 \\ -2 \\ 0 \end{pmatrix}$ Determine whether l_1 and l_2 intersect. If they do, find the point of intersection.	