Day 145	A Level Maths: A Tier 10-a-day
1 The 2nd term of an arithmetic sequence is -1 and the 6th term is 15. Find the first term and common difference, and the sum of the first 30 terms.	
2 A systematic sample is taken from a numbered list of 500 items. The 5th item chosen is number 98 and the 6th item chosen is number 118. Find the sampling interval, the number of the first item chosen and the size of the sample.	
3 A ball is thrown vertically upwards at 34.3 m s^{-1} from a point h m above horizontal ground, and hits the ground 10 s later. Find (a) h, (b) the greatest height above the ground. Take g = 9.8.	
4 The curve with equation $y = 2x^2 - 5x + 4$ is transformed by a reflection in the x-axis, followed by a stretch, scale factor 2, parallel to the y-axis. Find the equation of the image curve.	
5 Particles A (8 kg) and B (4 kg) move towards each other on a smooth horizontal line at 8 m s^{-1} and 7 m s^{-1}. They collide and coalesce. Find (a) the speed of the combined particle, (b) the kinetic energy lost in the collision.	

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6 Solve $4\text{cosec}^2 x + 6\cot x - 22 = 0$ for $0° < x < 360°$. Give answers to 1 d.p.	
7 $X \sim Po(20)$. Use a suitable approximation to find $P(X \leq 27)$, to 3 significant figures.	
8 A curve has equation $x^2 + 2xy + 2y^2 = 1$. Find the coordinates of the points where the tangent is parallel to the x-axis.	
9 $f(x) = \frac{25x - 10}{(1 - 2x)(1 - 3x)}$. (a) Express f(x) in partial fractions. (b) Hence expand f(x) up to x^2. (c) State the range of x for which the expansion is valid.	
10 A drink at 90°C is left in a room at 20°C. Its temperature θ °C satisfies $\frac{d\theta}{dt} = -k(\theta - 20)$. After 5 minutes the temperature is 60°C. Find k, then the time for it to reach 35°C, to 3 s.f.	