Day 365	A Level Maths: S Tier 10-a-day
1 A(2, −5) and B(−2, −3). The point C lies on the x-axis and CA = CB. Find the coordinates of C and the area of triangle ABC.	
2 A particle P moves with constant acceleration. At t = 0 seconds P is at $(2\mathbf{i} - \mathbf{j})$ m with velocity $(-6\mathbf{i} - 14\mathbf{j})$ m s^{-1}. At t = 8, P has velocity $(10\mathbf{i} + 10\mathbf{j})$ m s^{-1}. Find (a) the acceleration of P, (b) the time at which P moves parallel to $(\mathbf{i} - \mathbf{j})$, (c) the position vector of P at that time.	
3 Solve $2x^{\frac{2}{3}} + 2x^{\frac{1}{3}} - 12 = 0$.	
4 A ball is projected from a point O on horizontal ground with speed 24.5 m s^{-1} at an angle α above the horizontal, where $\tan\alpha = \frac{3}{4}$. Find (a) the time of flight, (b) the range, (c) the greatest height. Take g = 9.8 m s^{-2}.	
5 Scores are N(64, 4^2). The highest 10% and the lowest 10% of scores are discarded. Find the range of scores that remain, correct to 3 significant figures.	

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6 The curve C has equation $x e^y + 3y = 3$. Find the equation of the normal to C at the point (3, 0), in the form $ax + by + c = 0$ with integers a, b, c.	
7 Find the binomial expansion of $(8 - x)^{\frac{2}{3}}$ in ascending powers of x up to and including the term in x^3. State the values of x for which it is valid.	
8 $y = e^{2x} \cos 2x$. Show that $dy/dx = e^{2x}(2 \cos 2x - 2 \sin 2x)$. Find the x coordinate of the stationary point with the smallest positive x (3 s.f.), and its nature.	
9 Each shot Amira takes scores with probability $\frac{3}{4}$, independently. (a) Find the probability that her fourth score comes on shot number 11. (b) Find the probability that her fourth score comes on or before shot number 11.	
10 Line l_1: $\mathbf{r} = \begin{pmatrix} 0 \\ -3 \\ -1 \end{pmatrix} + s\begin{pmatrix} 2 \\ 1 \\ -3 \end{pmatrix}$, line l_2: $\mathbf{r} = \begin{pmatrix} -4 \\ -4 \\ 2 \end{pmatrix} + t\begin{pmatrix} -2 \\ 0 \\ 0 \end{pmatrix}$. Show whether the lines meet, giving the point of intersection if they do, and find the acute angle between them to 1 d.p.	