Day 184	A Level Maths: B Tier 10-a-day
1 A has position vector $\begin{pmatrix}-2\\-5\\0\end{pmatrix}$ and B has position vector $\begin{pmatrix}-6\\-3\\4\end{pmatrix}$. The point P lies on AB with AP : PB = 1 : 1. Find the position vector of P.	
2 For 13 pairs of data, $S_{xx} = 60$, $S_{yy} = 125$ and $S_{xy} = 67$. Find the PMCC (3 s.f.) and describe the correlation.	
3 A cyclist travelling at 14 m s^{-1} brakes and comes to rest with constant deceleration 2 m s^{-2}. Find (a) the distance travelled while braking, (b) the time taken to stop.	
4 (a) Show that $e^x - x - 6 = 0$ can be written as $x = \ln(x + 6)$. (b) Use $x_{n+1} = \ln(x_n + 6)$ with $x_0 = 1$ to find x_1, x_2, x_3 to 4 d.p.	
5 Solve $(x - 1)(x + 2)(x - 5) > 0$.	

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6 The continuous random variable X has pdf f(x) = kx for $0 \leq x \leq 3$, and 0 otherwise. (a) Find the value of k. (b) Find P(X > 1). (c) Find E(X).	
7 A block of mass 5 kg is released from rest on a rough plane inclined at angle α to the horizontal, where $\tan \alpha = \frac{5}{12}$. The coefficient of friction is 0.2. Take g = 9.8 m s^{-2}. Find the acceleration down the plane, and the distance moved in 4 s.	
8 A population is modelled by $N = N_0 e^{kt}$, where t is in hours. Initially N = 2000 and after 3 hours N = 4000. Find (a) k to 3 s.f., (b) when N reaches 10000, to 3 s.f.	
9 Prove by contradiction that there are no integers x and y such that $x^2 - y^2 = 2$.	
10 The curve C has equation $y = x^2 - 4x - 1$. C is translated by $\begin{pmatrix} -1 \\ 1 \end{pmatrix}$ and then stretched by scale factor 2 parallel to the y-axis. Find its new equation.	