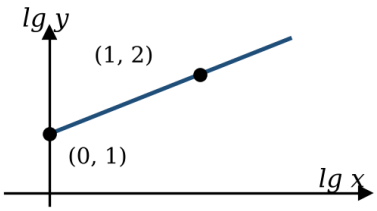
Day 270 **A Level Maths: S Tier 10-a-day**

1 Solve $e^{2x} - 8 \times e^{x} + 12 = 0$,
giving each answer exactly and, where not an integer, to 3 s.f.

2 $y = ax^n$. The graph of lg y against lg x is the straight line shown.
Find a and n, giving a to 3 s.f.



3 The roots of $x^2 + kx + 12 = 0$ are in the ratio 3 : 1. Find the possible values of k.

4 A ball is projected from a point O on horizontal ground with speed 63.7 m s^{-1} at an angle θ above the horizontal, where $\tan\theta = \frac{5}{12}$. Find (a) the greatest height, (b) the speed when it is at half of this height (3 s.f.). Take g = 9.8 m s^{-2}.

5 Prove that $n^2 + 6$ is never a multiple of 8, for any integer n.

Day 270	A Level Maths: S Tier 10-a-day
6 Find the exact coordinates of the stationary points of $y = \frac{x}{x^2 + 25}$, and determine the nature of each.	
7 The pdf of X is $f(x) = kx^2$ for $0 \leq x \leq 5$, and 0 otherwise. (a) Find k. (b) Find E(X) and the standard deviation of X. (c) Find the median, to 3 significant figures.	
8 $g(x) = x^2 + 3$. Also $fg(x) = 2x^2 + 7$, where f is a linear function. (a) Find f(x). (b) Solve $gf(x) = 28$.	
9 Line l_1: $\mathbf{r} = \begin{pmatrix} -8 \\ 1 \\ 0 \end{pmatrix} + s\begin{pmatrix} -3 \\ -2 \\ 1 \end{pmatrix}$, line l_2: $\mathbf{r} = \begin{pmatrix} -5 \\ 5 \\ 3 \end{pmatrix} + t\begin{pmatrix} 3 \\ 0 \\ -3 \end{pmatrix}$. Show whether the lines meet, giving the point of intersection if they do, and find the acute angle between them to 1 d.p.	
10 A plank of mass 6 kg lies on a smooth horizontal table, with a block of mass 6 kg on it ($\mu = 0.5$ between them). A horizontal force P N acts on the plank. (a) Find the greatest P for which the block does not slip. (b) Find the accelerations of block and plank when P = 88.2. Take g = 9.8 m s^{-2}.	