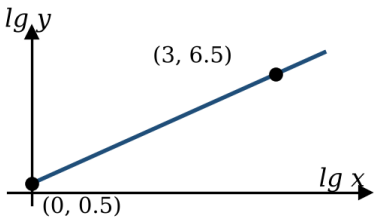
Day 353 **A Level Maths: S Tier 10-a-day**

1 $y = ax^n$. The graph of lg y against lg x is the straight line shown.
Find a and n, giving a to 3 s.f.



2 Solve the simultaneous equations
$\log_2 x - \log_2 y = 1$
$x + y = 30$

3 A ball is dropped from a height of 8 m. After each bounce it rises to $\frac{2}{3}$ of its previous height.
(a) Find the total distance it travels before it stops.
(b) After how many bounces does it rise less than 0.1 m?

4 Find the exact value of
$$\int_0^2 \frac{2x - 2}{x^2 - 2x + 3}\,dx$$

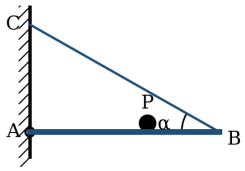
5 A lift of mass 400 kg, carrying a passenger of mass 90 kg, is supported by a vertical cable. The lift is moving downwards and accelerating at 2 m s^{-2}.
Find (a) the force the floor exerts on the passenger, (b) the tension in the cable. Take g = 9.8 m s^{-2}.

Day 353 **A Level Maths: S Tier 10-a-day**

6 $X \sim N(97, 121^2)$. Find the value k such that $P(97 - k < X < 97 + k) = 0.60$.
Give k to 3 significant figures.

7 Solve $|2x + 2| \leq |-4x + 5|$.

8 A uniform rod AB (2 m, 40 N) is hinged at A to a vertical wall and held horizontal by a string BC, C on the wall above A, with $\tan \alpha = \frac{4}{3}$, where α is the angle between string and rod. A 40 N particle hangs at P, AP = 0.5 m.
Find (a) the tension, (b) the magnitude and direction of the hinge force (3 s.f. and 1 d.p.).



9 A geometric series has first term 4 and common ratio $\frac{3}{2}$.
Find the least n for which $S_n > 55841$.

10 The line l has equation $\mathbf{r} = \begin{pmatrix} 1 \\ -10 \\ 2 \end{pmatrix} + t\begin{pmatrix} 2 \\ 3 \\ -3 \end{pmatrix}$.
The point P has coordinates $(5, -5, -5)$.
Find the coordinates of the foot F of the perpendicular from P to l, and the exact distance PF.