Day 159	A Level Maths: S Tier 10-a-day
1 Solve $2x^{\frac{2}{3}} + 6x^{\frac{1}{3}} + 4 = 0$.	
2 Solve $\log_2(x + 5) + \log_2(x - 2) = 3$, justifying clearly any root that you reject.	
3 Each shot Amira takes scores with probability $\frac{3}{5}$, independently. (a) Find the probability that her fourth score comes on shot number 6. (b) Find the probability that her fourth score comes on or before shot number 6.	
4 A river is 80 m wide and flows at 12 m s^{-1}. A boatman can row at 13 m s^{-1} in still water and wants to reach the point directly opposite his starting point. Find (a) the angle to the bank at which he should head, to 1 d.p., (b) the time taken, to 3 s.f.	
5 $f(x) = x^3 - 5x^2 + 12x - 18$. Show that $(x - 3)$ is a factor of f(x), and that the equation f(x) = 0 has exactly one real root.	

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6 For 20 observations x, $\Sigma(x - 50) = 30$ and $\Sigma(x - 50)^2 = 265$.
(a) Find the mean of x.
(b) Find the standard deviation of x.
(c) Find the value of Σx^2.

7 A non-uniform rod AB of length 8 m and mass 5 kg rests on supports at C and D, where AC = 1 m and AD = 5 m, with R_C = 1.5 R_D.
Find (a) the distance of the centre of mass from A. A particle of mass m kg at B puts the rod on the point of tilting about D. (b) Find m.

8 The region bounded by $y = e^{2x}$, the x-axis and the lines
$x = 0$ and $x = 1$ is rotated through 2π about the x-axis.
Find the exact volume of the solid formed.

9 Solve simultaneously:
$x + y = 1$
$3x^2 + y^2 = 13$

10 Line l_1: $\mathbf{r} = \begin{pmatrix} 11 \\ -10 \\ -2 \end{pmatrix} + s\begin{pmatrix} -2 \\ 3 \\ 0 \end{pmatrix}$,
line l_2: $\mathbf{r} = \begin{pmatrix} -4 \\ 0 \\ -11 \end{pmatrix} + t\begin{pmatrix} 3 \\ 0 \\ 3 \end{pmatrix}$.
Show whether the lines meet, giving the point of intersection if they do, and find the acute angle between them to 1 d.p.