Day 345	A Level Maths: S Tier 10-a-day
1 A sector of a circle has radius r cm and angle θ radians, where $\theta < 2\pi$. Its perimeter is 52 cm and its area is 168 cm^2. Find the two possible pairs of values of r and θ.	
2 $u_{n+1} = \frac{1}{3}u_n + 8$, $u_1 = -4$. (a) Find the limit L of the sequence. (b) Find the least n such that $\lvert u_n - L \rvert < 0.001$.	
3 $f(x) = e^x + 2x - 11$. (a) Show that $f(x) = 0$ has a root α with $1 < \alpha < 2$. (b) Use Newton-Raphson with $x_0 = 2$ to find x_1 and x_2 to 4 decimal places.	
4 A shell is projected from a point O on horizontal ground with speed 63.7 m s^{-1} at an angle θ above the horizontal, where $\tan\theta = \frac{12}{5}$. 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 The equation $e^x = 5x + 8$ has a root α. (a) Show that the equation can be written as $x = \ln(5x + 8)$. (b) Use $x_{n+1} = \ln(5x_n + 8)$ with $x_0 = 3$ to find x_1, x_2, x_3 to 4 d.p., and hence state α to 3 d.p.	

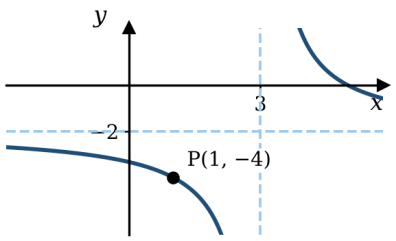
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6 X ~ B(150, 0.2).
(a) State why a normal approximation is suitable for X.
(b) Use a normal approximation to estimate P(X ≥ 40), to 3 significant figures.

7 $f(x) = -x - 1$ and $g(x) = x^2 - 3$.
Solve $fg(x) = gf(x)$.

8 A non-uniform rod AB of length 5 m and mass 8 kg rests on supports at C and D, where AC = 2 m and AD = 4 m, with R_C = 3 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.

9 The diagram shows the curve C, its asymptotes (dashed) and a point P. C has equation $y = \frac{a}{x + p} + q$. Find a, p and q.



10 The tree diagram shows two games played in turn.
Given the second is a H, P(first was a H) = $\frac{1}{3}$.
Find x.

