Day 8	A Level Maths: A Tier 10-a-day
1 The curve y = f(x), where $f(x) = \frac{4}{x+4} + 2$, is translated by $\begin{pmatrix} 2 \\ 3 \end{pmatrix}$. Write down the equations of the asymptotes of the new curve, and find where it crosses the x-axis.	
2 A club has 288 members: 60 Bronze, 96 Silver and 132 Gold. A stratified sample of size 24 is taken. Find the number of members sampled from each group.	
3 Solve $4^x + 2^x - 20 = 0$. Give your answer to 3 significant figures if not exact.	
4 Solve $9^{x-2} = 27^{x-1}$.	
5 Water pours into a cone, vertex down, at 30 cm^3s^{-1}. The surface radius is always $\frac{h}{3}$. Find the rate at which the depth is rising when h = 2 cm.	

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6 Ball A is dropped from rest 29.4 m above the ground. At the same instant ball B is projected upwards at 14.7 m s^{-1} from the ground directly below A. Find (a) the time when they collide, (b) the height of the collision. Take g = 9.8.	
7 A(−8, −9) and B(4, 7) are the ends of a diameter of a circle. (a) Find the equation of the circle, in the form $x^2 + y^2 + ax + by + c = 0$. (b) Show that C(−10, −7) lies on the circle.	
8 X ~ B(23, p). H_0: p = 0.2 is tested against H_1: p ≠ 0.2 at the 5% level. (a) Find the critical region. (b) Find the actual significance level of the test (3 s.f.).	
9 A curve has equation $3x^2y - 2y^3 - 4x = 2$. Find $\frac{dy}{dx}$ in terms of x and y, and the gradient of the normal at (0, −1).	
10 A uniform rod AB (12 kg, 2 m) is smoothly hinged at A to a vertical wall, with a 5 kg particle at B. A light string from B to the wall above A holds the rod horizontal, at angle θ to it, $\tan\theta = \frac{4}{3}$. Find (a) the tension, (b) the magnitude of the hinge force. Take g = 9.8. Give answers to 3 s.f. if not exact.	