Day 237	A Level Maths: A Tier 10-a-day
1 Solve $\sin 2\theta = -\sin\theta$ for $-180° \leq \theta \leq 180°$.	
2 A stone is projected from a cliff top 104.4 m above the sea at 20 m s^{-1}, at angle α above the horizontal, $\tan\alpha = \frac{3}{4}$. Find (a) the time to reach the sea, (b) the horizontal distance travelled, (c) the speed on impact. Take g = 9.8. Give answers to 3 s.f. if not exact.	
3 Find the exact value of $\int_1^4 \left(2\sqrt{x} + \frac{5}{\sqrt{x}}\right) dx$.	
4 Particles A (6 kg) and B (4 kg) hang on a light string over a smooth pulley, A being 2 m above the ground. Released from rest; A lands without rebounding. Find (a) the tension while both move, (b) the greatest height of B above its start. Take g = 9.8.	
5 Solve $\sec^2 x - \tan x - 3 = 0$ for $0° \leq x \leq 180°$. Give answers to 1 d.p.	

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6 The curve y = f(x), where $f(x) = \frac{4}{x-3} - 2$, is translated by $\begin{pmatrix} 2 \\ -2 \end{pmatrix}$. Write down the equations of the asymptotes of the new curve, and find where it crosses the x-axis.	
7 X, the journey time (minutes), is $N(29, 6^2)$. The highest 5% of values exceed k. Find k to 3 significant figures.	
8 $f(x) = \frac{-12x-3}{(1-x)(1+2x)}$. (a) Express f(x) in partial fractions. (b) Hence expand f(x) up to x^2. (c) State the range of x for which the expansion is valid.	
9 A circle touches both coordinate axes and passes through the point $(-2, -1)$. Its centre lies in the third quadrant. Find the equations of the two possible circles.	
10 The length of a plank is $N(70, 4^2)$. A plank is classed as 'special' if its length is less than 63. 12 planks are chosen at random. Find the probability that exactly 3 are special (3 s.f.).	