Day 7	A Level Maths: A Tier 10-a-day
1 Find the coefficient of x^3 in the expansion of $(-2 - 2x)^8$.	
2 A circular ripple has area A cm^2 increasing at a constant 6 cm^2s^{-1}. Find the rate at which the circumference is increasing when the radius is 10 cm.	
3 A systematic sample is taken from a numbered list of 520 items. The 4th item chosen is number 76 and the 7th item chosen is number 136. Find the sampling interval, the number of the first item chosen and the size of the sample.	
4 $f(x) = 3x^2 - 18x + 30$, $x \geq 3$. Find $f^{-1}(x)$ and state its domain.	
5 A lift of mass 250 kg carries a person of mass 75 kg. The cable tension is 3022.5 N and the lift is accelerating. Find (a) the magnitude and direction of the acceleration, (b) the force of the floor on the person. Take g = 9.8.	

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6 Find the coordinates of the stationary points of $y = \frac{x}{x^2 + 9}$.	
7 $f(x) = x^2 + 6x + 14$, $x \in \mathbb{R}$, and $g(x) = \frac{3}{x - 2}$, $x > 2$. (a) Find the range of f. (b) Show that gf is defined and find its range.	
8 A stone is projected from a cliff top 8.4 m above the sea at 35 m s^{-1}, at angle α above the horizontal, $\tan\alpha = \frac{4}{3}$. 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.	
9 The line l has equation $\mathbf{r} = \begin{pmatrix}1\\5\\2\end{pmatrix} + t\begin{pmatrix}0\\3\\-1\end{pmatrix}$. Find the coordinates of the foot of the perpendicular from P(−2, −1, 4) to l, and the exact distance from P to l.	
10 The random variable X has pdf $f(x) = \frac{3}{125}x^2$ for $0 \leq x \leq 5$, and 0 otherwise. (a) Find the cumulative distribution function F(x) for $0 \leq x \leq 5$. (b) Find $P(X > \frac{5}{2})$. (c) Find the median of X to 3 s.f.	