Day 244	A Level Maths: A Tier 10-a-day
1 For a sample of 17 pairs of values of daily rainfall and ice cream sales, r = 0.693. The critical value for a two-tailed test at the 1% level is 0.6055. Test, at this level, whether there is any correlation between the two variables.	
2 Express $\frac{-3x + 3}{(3x + 3)(3x + 1)}$ in partial fractions.	
3 The line l has equation $\mathbf{r} = \begin{pmatrix} 0 \\ 7 \\ 3 \end{pmatrix} + t\begin{pmatrix} -1 \\ 3 \\ 0 \end{pmatrix}$. Find the coordinates of the foot of the perpendicular from P(5, 2, 0) to l, and the exact distance from P to l.	
4 A stone is dropped from rest from the top of a cliff. In the last 3 seconds before it hits the sea it falls 235.2 m. Find the height of the cliff. Take g = 9.8.	
5 A is $(-6, -1)$ and B is $(4, -3)$. (a) Find the equation of the perpendicular bisector of AB, in the form ax + by = c. (b) The perpendicular bisector meets the x-axis at P. Find the area of triangle ABP.	

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6 $X \sim N(\mu, \sigma^2)$, with $P(X < 45) = 0.1587$ and $P(X > 53) = 0.1587$. Find μ and σ.	
7 Use the substitution $u = 4 + \sin x$ to find the exact value of $\int_0^{\frac{\pi}{2}} \frac{\cos x}{4 + \sin x}\, dx$.	
8 A particle P moves on the x-axis with velocity $v = (6t^2 - 48t + 90)$ m s^{-1} at time t s, $t \geq 0$, and starts at O. Find (a) the times when P is at instantaneous rest, (b) the total distance P travels in the first 6 s.	
9 $f(x) = \frac{7x - 4}{(1 - x)(1 + 2x)}$. (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.	
10 Solve $e^x + 27\, e^{-x} = 12$, giving exact answers.	