Day 252	A Level Maths: S Tier 10-a-day
1 Solve $e^{2x} - 15 \times e^{x} + 56 = 0$, giving each answer exactly and, where not an integer, to 3 s.f.	
2 $X \sim B(6, p)$. It is given that $P(X = 2) = \frac{1}{2} \times P(X = 1)$. (a) Find the value of p. (b) Find $P(X = 0)$, correct to 3 significant figures.	
3 A drink cools according to $\theta = 18 + Ae^{-kt}$, where θ °C is the temperature after t minutes. Initially $\theta = 90$, and after 8 minutes $\theta = 54$. Find A and k, then find when $\theta = 43$ (3 s.f.).	
4 Find the binomial expansion of $(4 - x)^{-1}$ in ascending powers of x up to and including the term in x^3. State the values of x for which it is valid.	
5 For 20 observations x, $\Sigma(x - 30) = 70$ and $\Sigma(x - 30)^2 = 325$. (a) Find the mean of x. (b) Find the standard deviation of x. (c) Find the value of Σx^2.	

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6 Express $\frac{-10x^2 + 32x + 6}{(x + 3)(x - 3)^2}$ in the form $\frac{A}{(x + 3)} + \frac{B}{(x - 3)} + \frac{C}{(x - 3)^2}$.	
7 A particle P moves on a straight line. At time t seconds its velocity is v m s^{-1}, where $v = 2t^2 - 8t + 6$ for $0 \leq t \leq 5$ Find (a) the times at which P is at instantaneous rest, (b) the total distance travelled by P in the first 5 seconds.	
8 A rectangle has its base on the x-axis and its upper vertices on the curve $y = 3 - x^2$, symmetric about the y-axis. Find the maximum area of the rectangle, with justification.	
9 A box of mass 10 kg is at rest on rough horizontal ground ($\mu = 0.25$). A horizontal force of 38.5 N acts on it for 7 s and is then removed. Find (a) the speed when the force is removed, (b) the total distance travelled before the box stops. Take g = 9.8 m s^{-2}.	
10 The first term of an arithmetic sequence is 3 and its common difference d is non-zero. The 1st, 3rd and 13th terms are the first three terms of a geometric sequence. Find d and the common ratio.	