Day 301	A Level Maths: S Tier 10-a-day
1 The breaking strength of a cable is N(μ, 16) with known variance 16. The mean was claimed to be 30 kN. A random sample of 9 has mean 33.75. Test at the 5% level whether the mean is greater than 30.	
2 Find the sum of all the integers from 1 to 284 inclusive that are divisible by 3 or by 7, but not by both.	
3 A stone is projected from a point O on horizontal ground with speed 49 m s^{-1} at an angle θ above the horizontal, where $\tan\theta = \frac{3}{4}$. Find (a) the greatest height, (b) the speed when it is at half of this height (3 s.f.). Take g = 9.8 m s^{-2}.	
4 Find the exact gradient of the curve $y = 5^{x+1}$ at the point where x = 3.	
5 For 20 observations x, $\Sigma(x - 60) = 10$ and $\Sigma(x - 60)^2 = 185$. (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 A curve has parametric equations $x = 2t^2$, $y = 2t^3 - 18t$. Find the coordinates of the points on the curve where the gradient is -3.	
7 Given that $\sum_{r=1}^{n}(3r - 4) = 300$, find n.	
8 A ball is projected from a point O on horizontal ground at 30 m s^{-1}, at angle θ above the horizontal. It passes through the point P, 54 m horizontally and 29 m vertically from O. Find the two possible values of $\tan\theta$, and the two possible values of θ to 1 d.p. Take g = 9.8 m s^{-2}.	
9 Two boats P and Q move so that, t hours after noon, their position vectors in km are $\mathbf{r}_P = \begin{pmatrix} 1 \\ -5 \end{pmatrix} + t\begin{pmatrix} 0 \\ -2 \end{pmatrix}$ and $\mathbf{r}_Q = \begin{pmatrix} -8 \\ 10 \end{pmatrix} + t\begin{pmatrix} 3 \\ -5 \end{pmatrix}$. Find the time at which they are closest and the exact minimum distance between them.	
10 Express $\frac{-39x^2 + 57x - 48}{(x + 4)(3x - 3)^2}$ in the form $\frac{A}{(x + 4)} + \frac{B}{(3x - 3)} + \frac{C}{(3x - 3)^2}$.	