Day 127	A Level Maths: S Tier 10-a-day
1 A stone is projected from a point O on horizontal ground with speed 63.7 m s^{-1} at an angle α above the horizontal, where $\tan\alpha = \frac{5}{12}$. Find the horizontal distance between the two points at which the stone is 11.025 m above the ground. Take g = 9.8 m s^{-2}.	
2 The first row of a theatre has 20 seats. Each row has 3 more seats than the row in front. Find (a) the number of seats in row 60, (b) the least number of rows for at least 1049 seats.	
3 Large Data Set, daily mean air temperature (°C), Hurn, October 2015 (n = 31): mean 11, sd 3.9. (F = 1.8C + 32) (a) Find the mean and sd in °F. (b) Is a reading of 21.5 more than 2 sd above the mean?	
4 A particle P moves on a straight line. At time t seconds its velocity is v m s^{-1}, where $v = 2t^2 - 18t + 36$ for $0 \le t \le 8$ Find (a) the times at which P is at instantaneous rest, (b) the total distance travelled by P in the first 8 seconds.	
5 A drink cools according to $\theta = 10 + Ae^{-kt}$, where θ °C is the temperature after t minutes. Initially $\theta = 80$, and after 10 minutes $\theta = 45$. Find A and k, then find when $\theta = 31$ (3 s.f.).	

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6 Express $\frac{-6-2\sqrt{2}}{4-3\sqrt{2}}$ in the form $p+q\sqrt{2}$, where p and q are rational numbers.	
7 The points A, B, C have coordinates $(-2, 0, -1)$, $(5, 2, -2)$, $(0, 3, 4)$. Find angle ABC to 1 d.p., and the exact area of triangle ABC.	
8 A circle passes through $P(-5, -10)$, $Q(16, -7)$ and $R(-8, 11)$. Find its equation.	
9 The curve C has equation $x^2 - 2xy + 5y^2 = 64$. Find the coordinates of the points on C where the tangent is parallel to the x-axis.	
10 A coin is said to land on blue with probability 0.5. In 40 trials it does so 24 times. Test at the 5% level whether the probability is different from 0.5.	