Day 310	A Level Maths: S Tier 10-a-day
1 Solve $\cot(2\theta - 30°) = \frac{1}{\sqrt{3}}$ for $0° \leq \theta \leq 180°$.	
2 For n = 8 pairs of values: $\Sigma x = 120$, $\Sigma y = 264$, $\Sigma x^2 = 1962$, $\Sigma xy = 3636$. (a) Find the equation of the regression line of y on x. (b) The x values lie between 11 and 20. Estimate y when x = 24 and comment on its reliability.	
3 Express $\frac{2 + 2\sqrt{2}}{2 - 2\sqrt{2}}$ in the form $p + q\sqrt{2}$, where p and q are rational numbers.	
4 Class S has 30 students with mean mark 65 and standard deviation 3. Class P has 40 students with mean mark 71 and standard deviation 9. (a) Find the mean mark of all 70 students. (b) Find the standard deviation of all 70 students.	
5 A drink cools according to $\theta = 25 + Ae^{-kt}$, where θ °C is the temperature after t minutes. Initially $\theta = 85$, and after 10 minutes $\theta = 55$. Find A and k, then find when $\theta = 31$ (3 s.f.).	

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6 Solve $\sqrt{4x + 4} = x - 7$.	
7 A non-uniform rod AB of length 8 m and mass 5 kg rests on supports at C and D, where AC = 2 m and AD = 6 m, with R_C = 1.5 R_D. Find (a) the distance of the centre of mass from A. A particle of mass m kg at B puts the rod on the point of tilting about D. (b) Find m.	
8 The points A, B, C have coordinates $(-2, 4, 1)$, $(2, 3, -3)$, $(-3, 1, 2)$. Find angle ABC to 1 d.p., and the exact area of triangle ABC.	
9 The line $5y = 12x + k$ is a tangent to the circle $(x - 1)^2 + (y - 1)^2 = 1$. Find the two possible values of k.	
10 A plank of mass 8 kg lies on a smooth horizontal table, with a block of mass 2 kg on it ($\mu = 0.4$ between them). A horizontal force P N acts on the block. (a) Find the greatest P for which the block does not slip. (b) Find the accelerations of block and plank when P = 29.4. Take g = 9.8 m s^{-2}.	