Day 336	A Level Maths: B Tier 10-a-day
1 80 customers: 14 buy coffee, 22 buy tea, 51 do neither. (a) How many do both? (b) Given a person who buys tea, find P(this person buys coffee).	
2 The function $f(x) = x^3 - 4x - 11$. Show that $f(x) = 0$ has a root between $x = 2.5$ and $x = 3$.	
3 The random variable X has $E(X) = 4$ and $Var(X) = 5$. Find (a) $E(4X + 5)$, (b) $Var(4X + 5)$, (c) $E(X^2)$.	
4 Express $\frac{6}{2 + 2\sqrt{2}}$ in the form $p + q\sqrt{2}$, where p and q are integers.	
5 A has position vector $\begin{pmatrix} -1 \\ 4 \\ -1 \end{pmatrix}$ and B has position vector $\begin{pmatrix} 5 \\ 13 \\ -10 \end{pmatrix}$. The point P lies on AB with AP : PB = 2 : 1. Find the position vector of P.	

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6 A particle of mass 7 kg is suspended in equilibrium by two light strings attached to a horizontal ceiling. The strings make angles α and β with the ceiling, where $\tan\alpha = \frac{5}{12}$ and $\tan\beta = \frac{3}{4}$. Take $g = 9.8$ m s^{-2}. Find the tension in each string.	
7 Solve $25^{x-4} = 5^{-2x+5}$.	
8 A ball is projected from level ground with horizontal velocity component 39 m s^{-1} and vertical velocity component 44.1 m s^{-1} upwards. Take $g = 9.8$ m s^{-2}. Find (a) the time of flight, (b) the horizontal range.	
9 Given that $9\cos\theta + 12\sin\theta \equiv 15\cos(\theta - 53.1°)$, solve $9\cos\theta + 12\sin\theta = 0.5$ for $0 \leq \theta \leq 360°$. (1 d.p.)	
10 The line $4x + 3y = k$ is a tangent to the circle $(x-4)^2 + (y-3)^2 = 100$. Find the two possible values of k.	