Day 330	A Level Maths: B Tier 10-a-day
1 Solve $e^{-2x} = 25$, giving your answer to 3 s.f.	
2 A ship moves with constant velocity $(2\mathbf{i} - \mathbf{j})$ m s^{-1}. At time t = 0 its position vector relative to a fixed origin O is $(7\mathbf{j})$ m. Find (a) its position vector when t = 5, (b) the value of t when it crosses the line through O in the direction of $\mathbf{i}$.	
3 The curve C has equation $y = x^2e^{2-2x} - 2$. Find the equation of the tangent to C at the point where x = 1, in the form y = mx + c.	
4 X ~ Po(3), modelling the number of emails received per hour. Find, to 3 significant figures, (a) $P(X \geq 2)$ (b) $P(X = 2)$	
5 Express $\frac{6+\sqrt{6}}{7-3\sqrt{6}}$ in the form $p + q\sqrt{6}$, where p and q are integers.	

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6 $X \sim B(50, p)$. H_0: $p = 0.3$ is to be tested against H_1: $p < 0.3$ at the 10% significance level. Find the critical region and the actual significance level.	
7 A particle P moves on a straight line from O. At time t s its velocity is $3t^2 - 30t + 72$ m s^{-1}. Find the first time P is at instantaneous rest, and its distance from O then.	
8 Line l_1: $\mathbf{r} = \begin{pmatrix} 5 \\ 0 \\ -5 \end{pmatrix} + \lambda \begin{pmatrix} 2 \\ 3 \\ -2 \end{pmatrix}$. Line l_2: $\mathbf{r} = \begin{pmatrix} 4 \\ -5 \\ -5 \end{pmatrix} + \mu \begin{pmatrix} 1 \\ -2 \\ -2 \end{pmatrix}$. Show that l_1 and l_2 intersect and find the point.	
9 Find the coefficient of x^2 in the expansion of $(1 - 4x)(1 - 3x)^5$.	
10 A circle passes through A(−3, −8) and B(5, −4), and its centre lies on the y-axis. Find the centre and the equation of the circle.	