Day 248	A Level Maths: A Tier 10-a-day
1 A is $(-4, 2)$ and B is $(6, -2)$. (a) Find the equation of the perpendicular bisector of AB, in the form $ax + by = c$. (b) The perpendicular bisector meets the x-axis at P. Find the area of triangle ABP.	
2 The vectors $\begin{pmatrix} k \\ k \\ 1 \end{pmatrix}$ and $\begin{pmatrix} k \\ 3 \\ -10 \end{pmatrix}$ are perpendicular. Find the possible values of k and, for the larger value, the exact length of the first vector.	
3 Forces $F_1 = (-5\mathbf{i} + 8\mathbf{j})$ N, $F_2 = (-24\mathbf{i} + 7\mathbf{j})$ N and $F_3 = (a\mathbf{i} + b\mathbf{j})$ N keep a 4 kg particle in equilibrium. Find (a) a and b. F_2 is then removed; (b) find the magnitude of the acceleration.	
4 A and B have position vectors $\begin{pmatrix} -1 \\ -3 \end{pmatrix}$ and $\begin{pmatrix} -4 \\ -3 \end{pmatrix}$. The point P lies on AB with AP : PB = 1 : 2. Find the position vector of P and the exact distance OP.	
5 Solve $\lvert x + 8 \rvert = -2x + 4$.	

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6 The mass of an egg is N(65, 5^2). An egg is classed as 'special' if its mass is less than 59. 10 eggs are chosen at random. Find the probability that exactly 4 are special (3 s.f.).	
7 Solve $x(\sqrt{6} - 2) = -3 - 4\sqrt{6}$, writing x in the form $p + q\sqrt{6}$.	
8 The radius of a sphere increases at 2 cm s^{-1}. Find the rate of increase of its volume when r = 2 cm, in terms of π.	
9 X ~ B(22, p). H_0: p = 0.5 is tested against H_1: p < 0.5 using a 5% significance level. (a) Find the critical region. (b) State the probability of a Type I error. (c) Find the probability of a Type II error when p = 0.35 (3 s.f.).	
10 A 2 kg particle is in equilibrium on a rough plane inclined at α, $\tan\alpha = \frac{8}{15}$, $\mu = 0.25$. A horizontal force of P N, in the vertical plane through a line of greatest slope, pushes it towards the plane. Find the least and greatest values of P. Take g = 9.8. Give answers to 3 s.f. if not exact.	