Day 207	A Level Maths: A Tier 10-a-day
1 A is $(-2, 2)$ and B is $(4, -2)$. (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 A driver at constant speed sees a hazard 26 m ahead. After a reaction time of 0.6 s she brakes with deceleration 2.5 m s^{-2} and stops exactly at the hazard. Find (a) her initial speed, (b) the total time from seeing the hazard to stopping.	
3 For small θ (in radians), use the small angle approximations to find the value that $\frac{1 - \cos 3\theta}{\theta \sin 4\theta}$ approaches as $\theta \to 0$.	
4 A group of 6 boys and 8 girls. A team of 3 is chosen at random. Find the probability that the team has exactly 2 of the girls.	
5 (a) Express $12 \sin \theta - 16 \cos \theta$ in the form $R \sin(\theta - \alpha)$, where $R > 0$ and $0° < \alpha < 90°$. Give α to 1 d.p. (b) Solve $12 \sin \theta - 16 \cos \theta = -18$ for $0° \leq \theta < 360°$, giving answers to 1 d.p.	

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6 X ~ B(120, 0.2). Use a normal approximation to estimate P(27 ≤ X ≤ 35) to 3 significant figures.	
7 Find the coefficient of x^7 in the expansion of $(3x^3 - \frac{3}{x})^5$.	
8 $g(\theta) = \frac{1}{9 + 4\sin\theta + 3\cos\theta}$ (a) Write $4\sin\theta + 3\cos\theta$ in the form $R\sin(\theta + \alpha)$, with α acute. (b) Find the greatest and least values of $g(\theta)$ and the smallest positive θ at which the greatest value occurs (1 d.p.).	
9 A circle touches both coordinate axes and passes through the point (−8, 9). Its centre lies in the second quadrant. Find the equations of the two possible circles.	
10 A 4 kg particle is in equilibrium on a rough plane inclined at α, $\tan\alpha = \frac{5}{12}$, $\mu = \frac{1}{3}$. 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.	