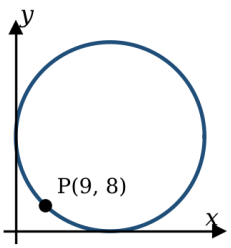
Day 193	A Level Maths: S Tier 10-a-day
1 (a) Express $9 \sin \theta + 12 \cos \theta$ in the form $R \sin(\theta + \alpha)$, where $R > 0$ and $0 < \alpha < 90°$. Give α to 1 d.p. (b) Hence solve $9 \sin \theta + 12 \cos \theta = 10$ for $0 \leq \theta < 360°$, giving answers to 1 d.p.	
2 Solve $\frac{4x - 2}{x + 2} \leq 3$.	
3 $X \sim B(10, \frac{3}{10})$. (a) Show that $P(X = r + 1) \div P(X = r) = \frac{10 - r}{r + 1} \times \frac{3}{7}$. (b) Find the most likely value of X and its probability (3 s.f.).	
4 Find the exact coordinates of the stationary point of $y = x^3 e^{-2x}$ for $x > 0$, and determine its nature.	
5 A box of mass 8 kg is at rest on rough horizontal ground ($\mu = 0.5$). A horizontal force of 50.4 N acts on it for 7 s and is then removed. Find (a) the speed when the force is removed, (b) the total distance travelled before the box stops. Take $g = 9.8$ m s^{-2}.	

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6 The line l has equation $\mathbf{r} = \begin{pmatrix} -8 \\ -2 \\ -2 \end{pmatrix} + t\begin{pmatrix} 3 \\ 0 \\ 2 \end{pmatrix}$.
The point P has coordinates $(0, 1, -1)$.
Find the coordinates of the foot F of the perpendicular from P to l, and the exact distance PF.

7 A non-uniform rod AB of length 8 m and mass 12 kg rests on supports at C and D, where AC = 2 m and AD = 5 m, with $R_C = 0.5 R_D$.
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 circle in the diagram touches both axes and passes through P. Find the equation of the circle, giving it in the form $x^2 + y^2 + ax + by + c = 0$.



9 A test of H_0: $p = 0.2$ against H_1: $p < 0.2$ uses a sample of 25 at the 5% level.
(a) Find the critical region for X, the number of successes.
(b) Find the actual significance level.
(c) Find P(Type II error) when in fact $p = 0.1$.

10 The curve C has equation $y = \frac{2x - 3}{x + 3}$.
(a) Write down the equations of the asymptotes of C.
(b) The line $y = x + k$ is a tangent to C.
Find the possible values of k.