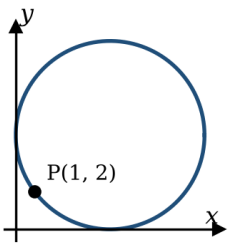
Day 130	A Level Maths: S Tier 10-a-day

1 The circle in the diagram touches both axes and passes through P. Find the equation of the circle, giving it in the form $x^2 + y^2 + ax + by + c = 0$.



2 A tennis ball is projected from a point O on horizontal ground with speed 49 m s^{-1} at an angle α above the horizontal, where $\tan\alpha = \frac{3}{4}$. Find (a) the greatest height, (b) the speed when it is at half of this height (3 s.f.). Take g = 9.8 m s^{-2}.

3 $f(x) = \frac{kx - 9}{x - 4}$ for $x \neq 4$. Given that f is self-inverse, find k, and hence solve f(x) = x.

4 A train accelerates uniformly from rest at 1 m s^{-2} to a speed of V m s^{-1}, travels at this speed, then decelerates uniformly at 2 m s^{-2} to rest. The journey takes 67 s and covers 1040 m. Find V and the time spent at constant speed.

5 Solve $2\sec^2\theta + 9\tan\theta + 7 = 0$ for $0 \leq \theta < 360°$, giving answers to 1 d.p.

Day 130	A Level Maths: S Tier 10-a-day
6 The size of a rod is N(120, 3^2) mm. A rod is 'large' if it exceeds 122. (a) Find the probability that a rod is large. (b) 18 rods are chosen at random. Find the probability that at least 2 are large.	
7 Use integration by parts to find the exact value of $\int_0^1 xe^{-x}\,dx$	
8 The circle with equation $(x + 3)^2 + (y + 2)^2 = 169$ passes through P(−15, −7). The tangent at P meets the axes at A and B. Find the area of triangle OAB.	
9 A biased coin lands on 'win' with the same unknown probability p each time. It is used 5 times in round 1 and 9 times in round 2. Given that exactly 6 wins occur altogether, find the probability that exactly 3 of them were in round 1.	
10 Two boats P and Q move so that, t hours after noon, their position vectors in km are $\mathbf{r}_P = \begin{pmatrix}-5\\-5\end{pmatrix} + t\begin{pmatrix}-3\\2\end{pmatrix}$ and $\mathbf{r}_Q = \begin{pmatrix}-11\\-5\end{pmatrix} + t\begin{pmatrix}0\\-1\end{pmatrix}$. Find the time at which they are closest and the exact minimum distance between them.	