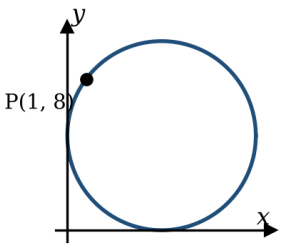
Day 63 **A Level Maths: S Tier 10-a-day**

1 A golf ball is hit from a point O on horizontal ground. It lands 60 m from O, and reaches a maximum height of 15 m above the ground. Find the angle of projection and the speed of projection, to 3 s.f. Take g = 9.8 m s^{-2}.

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



3 Use integration by parts to find the exact value of

$$\int_1^2 x \ln x \, dx$$

4 Prove that $n^3 + 2n$ is divisible by 3 for every positive integer n.

5 Solve $3\text{cosec}^2\theta + 4\cot\theta - 7 = 0$ for $0 \leq \theta < 360°$, giving answers to 1 d.p.

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6 A ball is dropped from a height of 8 m. After each bounce it rises to $\frac{3}{5}$ of its previous height. (a) Find the total distance it travels before it stops. (b) After how many bounces does it rise less than 0.01 m?	
7 Each shot Amira takes scores with probability $\frac{1}{4}$, independently. (a) Find the probability that her third score comes on shot number 7. (b) Find the probability that her third score comes on or before shot number 7.	
8 A box holds 8 components, each faulty with probability 0.1, independently. A box is rejected if it has at least 2 faulty components. (a) Find the probability that a box is rejected. (b) 12 boxes are inspected. Find the probability that at least 3 are rejected.	
9 Three forces $(-2\mathbf{i} - 3\mathbf{j})$ N, $(-3\mathbf{i} + k\mathbf{j})$ N and $(-8\mathbf{j})$ N act on a particle of mass 3 kg. The resultant is parallel to $(-5\mathbf{i} - 11\mathbf{j})$. Find (a) the value of k, (b) the magnitude of the acceleration of the particle, to 3 s.f.	
10 The line l has equation $\mathbf{r} = \begin{pmatrix} -5 \\ -3 \\ -2 \end{pmatrix} + t\begin{pmatrix} 3 \\ 3 \\ 1 \end{pmatrix}$. The point P has coordinates (−5, 2, 2). Find the coordinates of the foot F of the perpendicular from P to l, and the exact distance PF.	