Day 291	A Level Maths: S Tier 10-a-day
1 A data set has lower quartile 14 and upper quartile 26. An outlier is a value more than 1.5 × IQR beyond the nearest quartile. (a) Find the range of values that are not outliers. (b) 12 observations have mean 24. The largest is 47, an outlier, and it is removed. Find the new mean.	
2 A box of mass 25 kg is at rest on rough horizontal ground ($\mu = 0.1$). A horizontal force of 59.5 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}.	
3 Solve the simultaneous equations $\log_2 x + \log_2 y = 4$ $x - y = 6$	
4 Find the term independent of x in the expansion of $(x - \frac{3}{x^2})^9$.	
5 A bag has 6 red counters and some white counters, n in total. Two are taken without replacement. P(both red) $= \frac{5}{22}$. Find n.	

Day 291	A Level Maths: S Tier 10-a-day
6 Each year Jo pays £1000 into an account on 1 January. Interest of 2% is added each 31 December. Find the first year-end at which the balance exceeds £8,000.	
7 The line l has equation $\mathbf{r} = \begin{pmatrix} -6 \\ 6 \\ -3 \end{pmatrix} + t\begin{pmatrix} 2 \\ -1 \\ 1 \end{pmatrix}$. The point P has coordinates $(-2, 7, -4)$. Find the coordinates of the foot F of the perpendicular from P to l, and the exact distance PF.	
8 (a) Express $21\cos\theta + 20\sin\theta$ in the form $R\cos(\theta - \alpha)$, where $R > 0$ and $0 < \alpha < 90°$. Give α to 1 d.p. (b) Hence solve $21\cos\theta + 20\sin\theta = -9$ for $0 \leq \theta < 360°$, giving answers to 1 d.p.	
9 A curve has parametric equations $x = 4 + 5\cos t$, $y = -4 + 5\sin t$. Find its Cartesian equation.	
10 A ball is projected from a point O on horizontal ground at 45° to the horizontal. The ball just passes over the top of a vertical wall of height 40.8 m, at a horizontal distance of 80 m from O. Find (a) the speed of projection, (b) the greatest height of the ball above the ground, to 3 s.f. Take $g = 9.8$ m s^{-2}.	