Day 213	A Level Maths: B Tier 10-a-day
1 A football is projected from level ground with horizontal velocity component 36 m s^{-1} and vertical velocity component 9.8 m s^{-1} upwards. Take g = 9.8 m s^{-2}. Find (a) the time of flight, (b) the horizontal range.	
2 A circle has equation $x^2 + y^2 + 2x - 2y - 16 = 0$. Find the coordinates of its centre and its radius.	
3 Simplify $\frac{2 \sin 3x \cos 3x}{\cos 6x}$, giving your answer as a single trigonometric term.	
4 y = f(x) has a maximum point at (3, −3). Find the turning point on the curve: (a) y = 3f(x) (b) y = $f(\frac{x}{3})$ (c) y = f(x + 2)	
5 X has a binomial distribution with mean 12 and variance 4.8. (a) Find n and p. (b) Find P(X = 12) to 3 significant figures.	

Day 213	A Level Maths: B Tier 10-a-day

6 A population is modelled by $N = N_0e^{kt}$, where t is in hours. Initially N = 500 and after 3 hours N = 1250.
Find (a) k to 3 s.f., (b) when N reaches 4000, to 3 s.f.

7 A stone is projected from ground level with initial velocity components 39 m s^{-1} horizontally and 49 m s^{-1} vertically upwards. Take g = 9.8 m s^{-2}.
Find (a) the greatest height, (b) the speed at the greatest height.

8 The equation $x^2 + 2kx + (k + 6) = 0$ has real roots.
Find the possible values of k.

9 The random variable X is normally distributed. P(X < 48) = 0.0668 and P(X > 68) = 0.1587.
Find the mean and standard deviation (3 s.f.).

10 Line l_1: $\mathbf{r} = \begin{pmatrix} 1 \\ -1 \\ 0 \end{pmatrix} + \lambda \begin{pmatrix} 3 \\ 3 \\ 0 \end{pmatrix}$.

Line l_2: $\mathbf{r} = \begin{pmatrix} 3 \\ 3 \\ 2 \end{pmatrix} + \mu \begin{pmatrix} 1 \\ -1 \\ -2 \end{pmatrix}$.

Show that l_1 and l_2 intersect and find the point.