Day 115	A Level Maths: S Tier 10-a-day
1 A ball is thrown vertically upwards from ground level. It is more than 191.1 m above the ground for 10 s. Find the speed of projection and the greatest height reached. Take g = 9.8 m s^{-2}.	
2 The curve $y = ab^x$ passes through (0, 4) and (3, 256). Find the exact values of a and b, and the value of y when x = 4.	
3 A particle of weight W N is on a rough plane inclined at α to the horizontal, where $\sin\alpha = \frac{12}{13}$. A force P N acts up a line of greatest slope; the particle stays at rest for $20 \leq P \leq 28$. Find (a) W, (b) the coefficient of friction, (c) the acceleration when P = 56. Take g = 9.8 m s^{-2}.	
4 $f(x) = -2x + 3$ and $g(x) = x^2 - 2$. Solve fg(x) = gf(x).	
5 A is acute and B is acute. $\sin A = \frac{5}{13}$ and $\sin B = \frac{7}{25}$. Find the exact values of cos(A + B) and sin(A − B).	

Day 115	A Level Maths: S Tier 10-a-day
6 $f(x) = \frac{kx - 3}{x - 5}$ for $x \neq 5$. Given that f is self-inverse, find k, and hence solve $f(x) = x$.	
7 The cdf of X is $F(x) = 0$ for $x < 0$, $F(x) = \frac{x^4}{16}$ for $0 \leq x \leq 2$, and $F(x) = 1$ for $x > 2$. (a) Find the pdf of X. (b) Find E(X). (c) Find $P(0.5 < X < 1)$ and the median, to 3 significant figures.	
8 A and B take turns, A first, to score; the first to score wins. P(A scores) = $\frac{1}{5}$, P(B scores) = $\frac{1}{2}$ each attempt. Find P(A wins (a) on attempt 1 or 2, (b) overall).	
9 The curve C has equation $y = \frac{2x - 8}{x - 3}$. (a) Write down the equations of the asymptotes of C. (b) The line $y = 2x + k$ is a tangent to C. Find the possible values of k.	
10 The line l has equation $\mathbf{r} = \begin{pmatrix} -4 \\ 2 \\ -3 \end{pmatrix} + t\begin{pmatrix} -3 \\ 3 \\ -3 \end{pmatrix}$. The point P has coordinates $(-2, -2, 0)$. Find the coordinates of the foot F of the perpendicular from P to l, and the exact distance PF.	