Day 30	A Level Maths: S Tier 10-a-day
1 A stone is thrown vertically upwards with speed 6 m s^{-1} from the top of a cliff. The top of the cliff is 140.4 m above the sea. Find (a) the time taken for the stone to reach the sea, (b) the total distance travelled by the stone, to 3 s.f. Take g = 9.8 m s^{-2}.	
2 Express $\frac{4-3\sqrt{2}}{4+2\sqrt{2}}$ in the form $p + q\sqrt{2}$, where p and q are rational numbers.	
3 A ball is thrown vertically upwards from ground level with speed 29.4 m s^{-1}. Find the length of time for which the ball is more than 39.2 m above the ground, and the greatest height it reaches. Take g = 9.8 m s^{-2}.	
4 A data set has lower quartile 36 and upper quartile 53. 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 36. The largest is 90, an outlier, and it is removed. Find the new mean.	
5 Find the exact value of $\tan(\tan^{-1}(\frac{1}{9}) + \tan^{-1}(\frac{3}{2}))$.	

Day 30	A Level Maths: S Tier 10-a-day
6 Each year Jo pays £200 into an account on 1 January. Interest of 4% is added each 31 December. Find the first year-end at which the balance exceeds £8,000.	
7 Find the exact coordinates of the stationary points of $y = 4x + 8\cos x$ for $0 \leq x \leq \pi$, and determine their nature.	
8 Prove that $4k = n^2 + 2$ has no integer solutions (k and n integers).	
9 X and Y are independent, X ~ Po(1) and Y ~ Po(4). (a) State the distribution of X + Y. (b) Given that X + Y = 5, find the probability that X = 4.	
10 $\frac{dy}{dx} = 2xy$, and y = 3 when x = 0. Solve the differential equation and find y when x = 2.	