Day 116	A Level Maths: B Tier 10-a-day
1 Statement: "The sum of two irrational numbers is always irrational." Use the numbers $5 + \sqrt{2}$ and $3 - \sqrt{2}$ to show this is false.	
2 Use the trapezium rule with 4 strips to estimate $\int_1^3 \frac{\ln x}{x}\,dx$, giving your answer to 3 significant figures.	
3 $P(X = x) = k(8 - x)$ for $x = 1, 2, ..., 6$. (a) Find k. (b) Find E(X) and Var(X).	
4 A stone is projected horizontally at 294 m s^{-1} from a point high above the ground. Take g = 9.8 m s^{-2}. Find the speed and the direction of motion 16 s later, to 1 d.p. below the horizontal.	
5 A geometric series has second term -64 and fifth term 1. Find (a) the common ratio, (b) the first term, (c) the sum to infinity.	

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6 A stone is projected from ground level with initial velocity components 14 m s^{-1} horizontally and 19.6 m s^{-1} vertically upwards. Take g = 9.8 m s^{-2}. Find (a) the greatest height, (b) the speed at the greatest height.	
7 (a) Write 2 cos θ + sin θ in the form R cos(θ − α), with R > 0 and 0 < α < 90°. (b) Hence find its maximum value and the smallest θ ≥ 0 at which it occurs. Give α to 1 d.p.	
8 A curve has parametric equations x = t + 3, y = $2t^2$ + 3t − 1. The line y = x meets the curve at two points. Find the coordinates of these points.	
9 X ~ B(200, 0.3). Use a normal approximation to find P(X ≤ 56), to 3 significant figures.	
10 Given that $y = \frac{e^{2x}}{x+2}$, find $\frac{dy}{dx}$, and its value when x = 0.	