Day 84	A Level Maths: A Tier 10-a-day

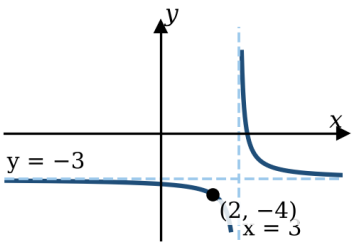
1 A systematic sample is taken from a numbered list of 384 items.
The 5th item chosen is number 55 and the 8th item chosen is number 91.
Find the sampling interval, the number of the first item chosen and the size of the sample.

2 Solve $2\sin^2\theta + 3\cos\theta - 3 = 0$
for $0° \leq \theta \leq 180°$.

3 A curve has parametric equations $x = t - 1$, $y = 4t^2$.
Find a Cartesian equation of the curve.

4 The equation $x^3 = 2x + 6$ has a root α. Use the iteration $x_{n+1} = \sqrt[3]{2x + 6}$ with $x_0 = 3$
to find x_1, x_2 and x_3 to 4 d.p., and hence the value of α to 2 d.p. (continue until the 2 d.p. value is settled).

5 The diagram shows the curve $y = \frac{k}{x - a} + b$
with asymptotes as shown. Find the values of k, a and b, and the coordinates where the curve crosses the axes.



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6 Particle A (3 kg) lies on a rough table, $\mu = 0.2$, joined by a light string over a smooth pulley to particle B (2 kg), 1.5 m above the floor. Released from rest; B lands without rebounding. Find (a) the acceleration of A before B lands, (b) the further distance A moves. Take g = 9.8.	
7 $X \sim N(\mu, \sigma^2)$, with $P(X < 84) = 0.1587$ and $P(X > 96) = 0.1587$. Find μ and σ.	
8 $y = (\ln x)^4$ for $x > 0$. Find $\frac{dy}{dx}$ and its exact value at $x = e^2$.	
9 $f(x) = x^2 + 2x - 4$, $x \geq -1$. Find $f^{-1}(x)$ and state its domain.	
10 A ball is projected from a point O on horizontal ground at angle α above the horizontal, $\tan\alpha = \frac{12}{5}$, and passes through A, 5 m horizontally from O and 7.1 m above the ground. Find the speed of projection. Take g = 9.8.	