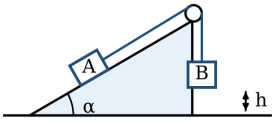
Day 23 **A Level Maths: S Tier 10-a-day**

1 Particles A (4 kg) and B (8 kg) are joined by a light string over a smooth pulley (see diagram). A lies on a smooth slope, $\alpha = 30°$, and B is 2.75 m above the ground.
Released from rest, find the further distance A moves up the slope after B lands (A does not reach the pulley).

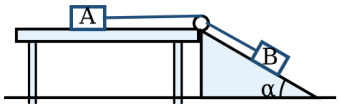


2 Solve simultaneously, giving integer x and y:
$8^x \times 4^y = 2048$
$9^x \div 3^y = 243$

3 Given that $\cos 3\theta \equiv 4\cos^3\theta - 3\cos\theta$, solve $\cos 3\theta = -2\cos\theta$ for $0 < \theta < 2\pi$, in terms of π.

4 The cdf of X is $F(x) = 0$ for $x < 0$, $F(x) = \frac{x^3}{125}$ for $0 \leq x \leq 5$, and $F(x) = 1$ for $x > 5$.
(a) Find the pdf of X.
(b) Find E(X).
(c) Find $P(1.25 < X < 2.5)$ and the median, to 3 significant figures.

5 The region bounded by $y = \frac{1}{\sqrt{x+3}}$, the x-axis and the lines
$x = 0$ and $x = 6$ is rotated through 2π about the x-axis.
Find the exact volume of the solid formed.

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6 Particle A (2 kg) lies on a rough table with $\mu = 0.5$, and is joined by a light string over a smooth pulley (see diagram) to particle B (6 kg) on a smooth slope, $\alpha = 30°$. Released from rest, the string is cut when B has moved 1.5 m. Find the further distance A slides before stopping. 	
7 Prove by contradiction that $\sqrt{3}$ is irrational.	
8 Solve $x^{\frac{2}{3}} - 5x^{\frac{1}{3}} + 6 = 0$.	
9 Find the coordinates of the points of inflection of $y = \frac{4}{x^2 + 12}$.	
10 Data satisfy $y = ab^x$. The line of best fit for lg y against x is lg y = 0.25 + 0.15x. (a) Find a and b to 3 significant figures. (b) Estimate y when x = 13, to 3 significant figures. (c) Interpret the value of b.	