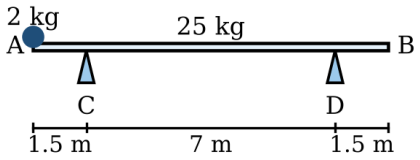
Day 123 **A Level Maths: A Tier 10-a-day**

1 Given that $\log_a 2 = p$ and $\log_a 3 = q$,

express $\log_a\left(\frac{\sqrt{8}}{\sqrt{27}}\right)$ in terms of p and q.

2 The curve y = f(x) has a minimum point at (5, −6).
Find the coordinates of the corresponding point on:
(a) y = 4f(x)
(b) y = f(x) + 1
(c) y = f(2x)

3 A uniform beam AB rests on supports at C and D, with a particle attached at A. Find the reactions at C and D. Take g = 9.8.



4 Evaluate $\sum_{r=9}^{31}(2r - 1)$.

5 Solve $\cos 2x - 3\sin x = -1$
for $0° \leq x \leq 360°$.

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6 X ~ B(80, 0.4). Use a normal approximation to estimate P(X ≥ 34) to 3 significant figures.	
7 For small x (in radians), use the small angle approximations to find the value that $\frac{1 - \cos 2x}{x \sin x}$ approaches as $x \to 0$.	
8 $f(x) = x^2 - 4x + 8$, $x \in \mathbb{R}$, and $g(x) = \frac{6}{x + 1}$, $x > -1$. (a) Find the range of f. (b) Show that gf is defined and find its range.	
9 5% of people have a disease. The screening test is positive for 90% of those who have it and for 5% of those who do not. (a) Find the probability that a person tests positive. (b) Given a positive test, find the probability that the person has the disease (3 s.f.).	
10 A ball is projected from a point O on horizontal ground at angle α above the horizontal, $\tan \alpha = \frac{3}{4}$, and passes through A, 48 m horizontally from O and 13.5 m above the ground. Find the speed of projection. Take g = 9.8.	