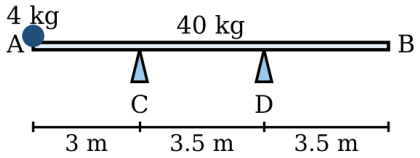
Day 201 **A Level Maths: A Tier 10-a-day**

1 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.



2 A systematic sample is taken from a numbered list of 375 items.
The 6th item chosen is number 86 and the 8th item chosen is number 116.
Find the sampling interval, the number of the first item chosen and the size of the sample.

3 $|a| = 2$, $|b| = 6$ and the angle between a and b is 120°.
Find the exact values of $a \cdot b$ and $|a + b|$.

4 $f(x) = 3x^2 + 18x + 21$.
(a) Write f(x) in the form $a(x + p)^2 + q$.
(b) State the minimum value of f(x) and the value of x at which it occurs.
(c) Solve $f(x) = 0$, giving surds in simplest form.

5 A is acute and B is obtuse, with $\sin A = \frac{5}{13}$ and $\cos B = -\frac{12}{13}$.
Find the exact values of $\sin(A+B)$ and $\tan(A-B)$.

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6 $f(x) = x^2 - 8x + 19$, $x \geq 4$. Find $f^{-1}(x)$ and state its domain.	
7 A bag has 6 green and 7 yellow counters. Two are taken at random without replacement. Given that the counters are different colours, find the probability that the first is green.	
8 A drink at 82°C is left in a room at 22°C. Its temperature θ °C satisfies $\frac{d\theta}{dt} = -k(\theta - 22)$. After 15 minutes the temperature is 72°C. Find k, then the time for it to reach 37°C, to 3 s.f.	
9 A 3 kg particle is in equilibrium on a rough plane inclined at α, $\tan\alpha = \frac{12}{5}$, $\mu = 0.4$. A horizontal force of P N, in the vertical plane through a line of greatest slope, pushes it towards the plane. Find the least and greatest values of P. Take g = 9.8.	
10 The equation $3x^2 + (k - 5)x + (2k + 5) = 0$ has real roots. Find the set of possible values of k.	