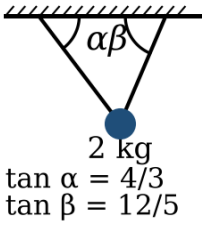
Day 115	A Level Maths: A Tier 10-a-day

1 $f(x) = x^3 - 2x - 1$.
Show that the equation $f(x) = 0$ has a root α in the interval $[1, 2]$.

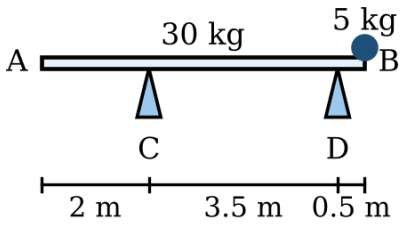
2 A 2 kg particle hangs in equilibrium from two light strings, as shown. Find the tension in each string (T_1 in the string at angle α). Take $g = 9.8$.



$\tan \alpha = 4/3$
$\tan \beta = 12/5$

3 $y = \cot(x)$.
Find $\frac{dy}{dx}$ and its exact value at $x = \frac{\pi}{3}$.

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



5 Given that $(x + 5)$ is a factor of $f(x) = x^3 + 5x^2 - 16x - 80$, solve $f(x) > 0$.

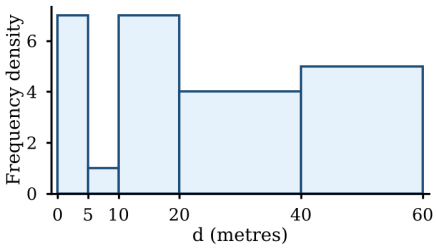
Day 115 **A Level Maths: A Tier 10-a-day**

6 Use the substitution $u = x^2$ to find the exact value of

$\int_0^1 x\, e^{2x^2}\, dx$.

7 $f(x) = x^3 + ax^2 + bx - 9$, where a and b are constants.
$(x - 3)$ is a factor of f(x). The remainder when f(x) is divided by $(x + 2)$ is 5.
(a) Find a and b. (b) Solve $f(x) = 0$.

8 The histogram shows the distances thrown, d (in metres), of a sample.
(a) How many were in the class $0 \leq d < 5$?
(b) Estimate how many had $30 < d < 55$.



9 For 25 values of x, $\Sigma(x - 40) = 125$ and $\Sigma(x - 40)^2 = 850$.
Find the mean and standard deviation of x.

10 $u_1 = 0$ and $u_{n+1} = -\frac{1}{2} u_n + 30$.
(a) Find the limit L of the sequence as $n \to \infty$.
(b) Find the least n for which $|u_n - L| < 0.1$.