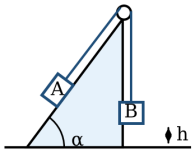
Day 215	A Level Maths: S Tier 10-a-day
1 A data set has lower quartile 10 and upper quartile 22. An outlier is a value more than 1.5 × IQR beyond the nearest quartile. (a) Find the range of values that are not outliers. (b) 15 observations have mean 12. The largest is 52, an outlier, and it is removed. Find the new mean.	
2 Solve the simultaneous equations $\log_3 x + \log_3 y = 4$ $x - y = 24$	
3 The roots of $x^2 + kx + 6 = 0$ differ by 1. Find the possible values of k.	
4 Use a suitable trigonometric identity to find the exact value of $\int_0^{\pi/6} \cos^4 3x \, dx$	
5 Sam claims that $n^2 + 3n + 43$ is prime for every positive integer n. Show that Sam is wrong by finding the smallest value of n that is a counter-example.	

Day 215 **A Level Maths: S Tier 10-a-day**

6 Particles A (2 kg) and B (7 kg) are joined by a light string over a smooth pulley (see diagram). A lies on a smooth slope, $\sin\alpha = \frac{4}{5}$, and B is 2 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).



7 The tangent to $y = \frac{2}{x^2 + 2}$ at the point where $x = 1$
meets the axes at A and B. Find the exact area of triangle OAB,
where O is the origin.

8 $f(x) = x^3 + ax^2 + bx - 15$, where a and b are constants.
$(x + 3)$ is a factor of f(x), and f(x) leaves remainder -35 when divided by $(x - 4)$.
Find a and b, and hence solve $f(x) = 0$.

9 A battery's life, in hours, is $N(77, 5^2)$.
Given that it exceeds 82, find the probability that it exceeds 91.

10 A uniform rod AB (4 m, 120 N) is hinged at A to a vertical wall and held horizontal by a string BC, C on the wall above A, with $\tan\alpha = \frac{5}{12}$, where α is the angle between string and rod. A 30 N particle hangs at P, AP = 1 m.
Find (a) the tension, (b) the magnitude and direction of the hinge force (3 s.f. and 1 d.p.).

