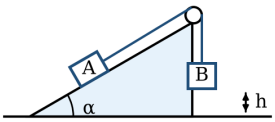
Day 144	A Level Maths: S Tier 10-a-day
1 $f(x) = \frac{8}{x^2 + 4x + 8}$ for all real x. Find the greatest value of f(x), the value of x at which it occurs, and the range of f.	
2 $X \sim B(22, \frac{2}{3})$. (a) Show that $P(X = r + 1) \div P(X = r) = \frac{22 - r}{r + 1} \times 2$. (b) Find the most likely value of X and its probability (3 s.f.).	
3 Prove that $7k = n^2 + 4$ has no integer solutions (k and n integers).	
4 A river is 100 m wide and flows at 3 m s^{-1}. A boatman can row at 5 m s^{-1} in still water and wants to reach the point directly opposite his starting point. Find (a) the angle to the bank at which he should head, to 1 d.p., (b) the time taken, to 3 s.f.	
5 A is acute and B is acute. $\cos A = \frac{5}{13}$ and $\sin B = \frac{12}{13}$. Find the exact values of tan(A + B) and tan(A − B).	

Day 144 **A Level Maths: S Tier 10-a-day**

6 (a) Expand $(8 + x)^{\frac{1}{3}}$ up to and including the term in x^2.
(b) Use $x = 0.04$ to estimate $\sqrt[3]{8.04}$ to 5 decimal places.

7 Solve $4\text{cosec}^2\theta + 7\cot\theta - 6 = 0$
for $0 \leq \theta < 360°$, giving answers to 1 d.p.

8 Particles A (2 kg) and B (10 kg) are joined by a light string over a smooth pulley (see diagram). A lies on a smooth slope, $\alpha = 30°$, and B is 4 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).



9 The mass of a parcel is $N(81, 3^2)$ kg. A parcel is 'heavy' if it exceeds 85.
(a) Find the probability that a parcel is heavy.
(b) 10 parcels are chosen at random. Find the probability that at least 2 are heavy.

10 (a) Write $\frac{2x + 13}{(x + 5)^2}$ in the form $\frac{A}{x + 5} + \frac{B}{(x + 5)^2}$.
(b) Find the exact value of $\int_0^3 \frac{2x + 13}{(x + 5)^2}\,dx$.