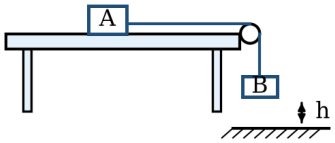
Day 189	A Level Maths: S Tier 10-a-day
1 The curve $y = 3^x - 5x$ has one stationary point. Find its coordinates to 3 s.f. and show that it is a minimum.	
2 A car of mass 1500 kg tows a trailer of mass 500 kg along a horizontal road, with driving force 2375 N. Resistances are 800 N on the car and 375 N on the trailer. (a) Find the tension in the tow bar. At 7.5 m s^{-1} the tow bar breaks. (b) Find the distance between car and trailer when the trailer stops.	
3 (a) Express $24\cos\theta + 7\sin\theta$ in the form $R\cos(\theta - \alpha)$, where $R > 0$ and $0 < \alpha < 90°$. Give α to 1 d.p. (b) Hence solve $24\cos\theta + 7\sin\theta = -8$ for $0 \leq \theta < 360°$, giving answers to 1 d.p.	
4 Given that $\sum_{r=1}^{n}(7r + 1) = 2300$, find n.	
5 A binomial random variable X has mean 24 and variance 6. (a) Find n and p. (b) Find P(X = 22), correct to 3 significant figures.	

Day 189 **A Level Maths: S Tier 10-a-day**

6 Particles A (3 kg) and B (3 kg) are joined by a light string over a smooth pulley (see diagram). A lies on a rough table with $\mu = 0.1$, and B is 0.5 m above the floor.
The system is released from rest. Find the total distance A moves before coming to rest (A does not reach the pulley).



7 The pdf of X is $f(x) = \frac{k}{x^2}$ for $1 \leq x \leq 3$, and 0 otherwise.
(a) Find k.
(b) Find the median of X.
(c) Find E(X), to 3 significant figures.

8 The curve C has parametric equations $x = t$, $y = 4t^2$. The line $y = -4x + 24$ meets C at A and B. Find the exact length AB.

9 $f(\theta) = \frac{3}{16 + 12 \sin \theta + 5 \cos \theta}$
(a) Write $12 \sin \theta + 5 \cos \theta$ as $R \sin(\theta + \alpha)$, $R > 0$, $0 < \alpha < 90°$.
(b) Find the greatest and least values of $f(\theta)$, and the smallest positive θ at which the greatest value occurs, to 1 d.p.

10 A(−7, 6) and B(1, −10). The point C lies on the x-axis and CA = CB. Find the coordinates of C and the area of triangle ABC.