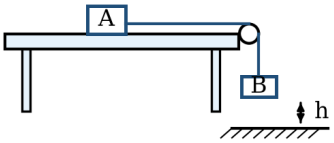
Day 134	A Level Maths: S Tier 10-a-day
1 A ball is dropped from a height of 8 m. After each bounce it rises to $\frac{1}{2}$ of its previous height. (a) Find the total distance it travels before it stops. (b) After how many bounces does it rise less than 0.01 m?	
2 A coin is said to land on blue with probability 0.5. In 40 trials it does so 29 times. Test at the 10% level whether the probability is different from 0.5.	
3 Use the trapezium rule with 8 strips to estimate $\int_1^2 \sqrt{4 - x^2}\, dx$, to 4 s.f. Is it an overestimate or an underestimate? Explain.	
4 Solve $\sqrt{3x - 2} = x - 2$.	
5 A ball is projected from level ground with horizontal and vertical velocity components 19.6 and 24.5 m s^{-1}. Find (a) the two times at which it moves at 45° to the horizontal, (b) the horizontal distance between those two points. Take g = 9.8 m s^{-2}.	

Day 134 **A Level Maths: S Tier 10-a-day**

6 The first row of a theatre has 9 seats. Each row has 5 more seats than the row in front. Find
(a) the number of seats in row 59,
(b) the least number of rows for at least 1078 seats.

7 Particles A (8 kg) and B (5 kg) are joined by a light string over a smooth pulley (see diagram). A lies on a rough table with $\mu = 0.5$, and B is 1.3 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).



8 $f(\theta) = \dfrac{2}{13 + 8\sin\theta + 6\cos\theta}$
(a) Write $8\sin\theta + 6\cos\theta$ 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.

9 The pdf of X is $f(x) = a + bx$ for $0 \le x \le 3$, and 0 otherwise, where a and b are constants. $E(X) = \dfrac{39}{20}$.
(a) Find a and b.
(b) Find $P(X < 1.5)$.

10 The line l has equation $\mathbf{r} = \begin{pmatrix}5\\0\\5\end{pmatrix} + t\begin{pmatrix}3\\2\\0\end{pmatrix}$.
The point P has coordinates (0, 1, 6).
Find the coordinates of the foot F of the perpendicular from P to l, and the exact distance PF.