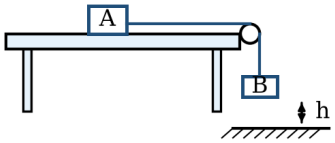
Day 60	A Level Maths: S Tier 10-a-day
1 The first term of an arithmetic sequence is 6 and its common difference d is non-zero. The 1st, 3rd and 11th terms are the first three terms of a geometric sequence. Find d and the common ratio.	
2 Solve the simultaneous equations $\log_3 x - \log_3 y = 3$ $x + y = 56$	
3 A(5, 3) and B(4, −4). The point C lies on the x-axis and CA = CB. Find the coordinates of C and the area of triangle ABC.	
4 A ball is projected from the top of a vertical cliff, 49 m high, at 24.5 m s^{-1} at angle α above the horizontal ($\tan\alpha = \frac{3}{4}$), and lands on horizontal ground. Find (a) the time of flight and the distance from the cliff, (b) the speed and direction on landing. Take g = 9.8 m s^{-2}.	
5 (a) Expand $(9 + x)^{-\frac{1}{2}}$ up to and including the term in x^2. (b) Use x = 0.01 to estimate $\frac{1}{\sqrt{9.01}}$ to 5 decimal places.	

Day 60 **A Level Maths: S Tier 10-a-day**

6 Particles A (5 kg) and B (3 kg) are joined by a light string over a smooth pulley (see diagram). A lies on a rough table with $\mu = 0.2$, and B is 1.6 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 For n = 12 pairs of values: $\Sigma x = 84$, $\Sigma y = 708$, $\Sigma x^2 = 734$, $\Sigma xy = 5175$.
(a) Find the equation of the regression line of y on x.
(b) The x values lie between 3 and 12. Estimate y when x = 11 and comment on its reliability.

8 The curves $y = e^x$ and $y = 25\,e^{-x}$ meet at the point P.
Find the exact area of the region bounded by the two curves
and the y-axis.

9 $X \sim N(\mu, 16)$. H_0: $\mu = 65$ is tested against H_1: $\mu > 65$ using the mean of a sample of size 25 at the 10% level.
(a) Find the critical region for the sample mean.
(b) Find the probability of a Type II error when $\mu = 66.5$.

10 Two boats P and Q move so that, t hours after noon, their position vectors in km are
$\mathbf{r}_P = \begin{pmatrix} -5 \\ -1 \end{pmatrix} + t\begin{pmatrix} -3 \\ 1 \end{pmatrix}$ and $\mathbf{r}_Q = \begin{pmatrix} -3 \\ -7 \end{pmatrix} + t\begin{pmatrix} -5 \\ 2 \end{pmatrix}$.
Find the time at which they are closest and the exact minimum distance between them.