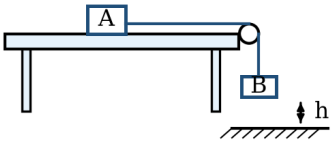
Day 276	A Level Maths: S Tier 10-a-day
1 A van costs £24000 and loses 8% of its value each year. Find the least whole number of years after which its value is below £5000.	
2 Describe a sequence of two transformations that maps the curve $y = x^2$ onto the curve $y = 3x^2 - 12x + 17$.	
3 A particle P moves in a plane. At time t seconds its position vector relative to a fixed origin O is r metres, where $\mathbf{r} = (2.5t^2 + 2t)\mathbf{i} + (3t^2 - 4t)\mathbf{j}$. Find (a) the value of t at which P is moving parallel to $(\mathbf{i} + \mathbf{j})$, (b) the speed of P at this time (3 s.f. if not exact).	
4 $X \sim B(26, \frac{1}{4})$. (a) Show that $P(X = r + 1) \div P(X = r) = \frac{26 - r}{r + 1} \times \frac{1}{3}$. (b) Find the most likely value of X and its probability (3 s.f.).	
5 A drink cools according to $\theta = 20 + Ae^{-kt}$, where θ °C is the temperature after t minutes. Initially $\theta = 80$, and after 4 minutes $\theta = 62$. Find A and k, then find when $\theta = 27$ (3 s.f.).	

Day 276 **A Level Maths: S Tier 10-a-day**

6 For 25 observations x, $\Sigma(x - 20) = 20$ and $\Sigma(x - 20)^2 = 616$.
(a) Find the mean of x.
(b) Find the standard deviation of x.
(c) Find the value of Σx^2.

7 Express $\sqrt{39 + 12\sqrt{3}}$ in the form $a + b\sqrt{3}$, where a and b are positive integers.

8 Particles A (3 kg) and B (1 kg) are joined by a light string over a smooth pulley (see diagram). A lies on a rough table with $\mu = 0.25$, 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).



9 A is acute and B is acute. $\cos A = \frac{21}{29}$ and $\cos B = \frac{15}{17}$.
Find the exact values of $\cos(A + B)$ and $\sin(A - B)$.

10 (a) Expand $(9 - x)^{-\frac{1}{2}}$ up to and including the term in x^2.
(b) Use $x = 0.03$ to estimate $\frac{1}{\sqrt{8.97}}$ to 5 decimal places.