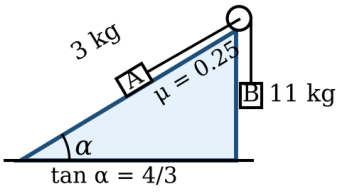
Day 109	A Level Maths: A Tier 10-a-day

1 The radius of a sphere increases at 1 cm s^{-1}. Find the rate of increase of its volume when r = 4 cm, in terms of π.

2 A systematic sample is taken from a numbered list of 100 items.
The 3th item chosen is number 11 and the 6th item chosen is number 26.
Find the sampling interval, the number of the first item chosen and the size of the sample.

3 Find the value of $\sum_{r=1}^{5} 2 \times \frac{2}{3}^{r}$.

4 The system is released from rest and A moves up the rough plane. Find (a) the acceleration, (b) the tension in the light string. Take g = 9.8. Give answers to 3 s.f. if not exact.



5 Given that $\log_a 2 = p$ and $\log_a 3 = q$, express $\log_a(\sqrt{54})$ in terms of p and q.

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6 A 2000 kg car has engine power 30 kW and constant resistance 600 N. Find (a) its greatest steady speed on a horizontal road, (b) its acceleration at 12 m s^{-1} up a hill where $\sin\alpha = \frac{1}{20}$. Take g = 10.	
7 The circle $x^2 + y^2 - 4x + 2y - 95 = 0$ passes through P(−6, −7). (a) Find the equation of the tangent at P, in the form ax + by = c. (b) Find the coordinates of the point where this tangent crosses the x-axis.	
8 A and B have position vectors $\begin{pmatrix}6\\5\end{pmatrix}$ and $\begin{pmatrix}3\\5\end{pmatrix}$. The point P lies on AB with AP : PB = 1 : 2. Find the position vector of P and the exact distance OP.	
9 X ~ B(10, 0.2). Find $P(X = 7 \mid X \geq 4)$ to 3 significant figures.	
10 Express $\frac{3x^2 + 9}{(x + 3)(x - 3)^2}$ in the form $\frac{A}{(x + 3)} + \frac{B}{(x - 3)} + \frac{C}{(x - 3)^2}$, and find A, B and C.	