Day 303 **A Level Maths: B Tier 10-a-day**

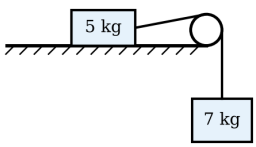
1 Bottle volumes are normal, s.d. 6 ml. Set mean 120 ml; 50 bottles have mean 121.7 ml.
Test at the 5% level whether the true mean is greater than 120.

2 Points A and B have position vectors $\begin{pmatrix}5\\5\\0\end{pmatrix}$ and $\begin{pmatrix}1\\1\\7\end{pmatrix}$.
Find AB and the distance AB.

3 A puck of mass 8 kg is moving on a smooth horizontal surface at 1 m s^{-1} when a constant horizontal force of 12 N, in the direction of motion, acts for 7 s.
Find the speed of the puck at the end of this time and the distance it moves.

4 Given that $y = (3x^2 + 2)^4$,
find $\frac{dy}{dx}$, and the gradient of the curve when $x = 0$.

5 A block of mass 5 kg lies on a rough horizontal table (coefficient of friction 0.2). It is joined by a light string over a smooth pulley to a particle of mass 7 kg hanging freely.
Take g = 9.8 m s^{-2}.
The system is released. Find the acceleration and the tension in the string.



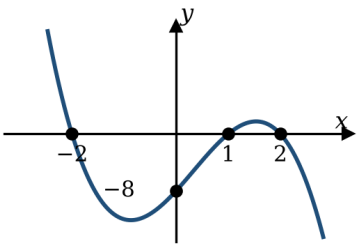
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6 A geometric series has first term 3 and sum to infinity 12.
Find the common ratio and the value of the 5th term.

7 A class of width 20, frequency 18, is a bar 4 cm wide, 1.125 cm tall.
(a) Find the bar height for width 20, frequency 20.
(b) Find the frequency of a 1.5 cm by 4 cm bar.

8 Line l_1: $\mathbf{r} = \begin{pmatrix} 5 \\ 5 \\ -9 \end{pmatrix} + \lambda \begin{pmatrix} -2 \\ -1 \\ 3 \end{pmatrix}$.
Line l_2: $\mathbf{r} = \begin{pmatrix} 3 \\ 7 \\ -1 \end{pmatrix} + \mu \begin{pmatrix} -1 \\ -2 \\ -1 \end{pmatrix}$.
Show that l_1 and l_2 intersect and find the point.

9 The diagram shows a sketch of the curve y = f(x), where f is a cubic. The curve meets the axes at the labelled points. Find f(x) in factorised form.



10 A salary starts at £20000 in year 1 and increases by 5% each year.
Find the total salary earned in the first 8 years, to the nearest pound.