Day 149 **A Level Maths: B Tier 10-a-day**

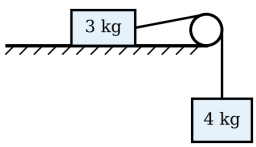
1 A block of mass 8 kg is projected along a rough horizontal surface with speed 7 m s^{-1} and comes to rest after sliding 10 m.
Take g = 9.8 m s^{-2}.
Use work and energy to find the coefficient of friction.

2 Statement: "8n + 5 is prime for every positive integer n."
Show that this statement is false by finding a counter-example.

3 Points A and B have position vectors $\begin{pmatrix} -1 \\ 2 \\ 0 \end{pmatrix}$ and $\begin{pmatrix} -5 \\ 10 \\ 1 \end{pmatrix}$.
Find AB and the distance AB.

4 12 pairs of height and arm span give r = 0.559.
One-tailed critical value (1%): 0.6581.
Test for positive correlation.

5 A block of mass 3 kg lies on a rough horizontal table (coefficient of friction 0.4). It is joined by a light string over a smooth pulley to a particle of mass 4 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 curve has equation $x^2 + 3x + y^2 + y - 2xy = 30$. Find $\frac{dy}{dx}$ in terms of x and y, and the gradient at $(-3, 3)$.	
7 A circle passes through A(1, −3) and B(4, 12), and its centre lies on the y-axis. Find the centre and the equation of the circle.	
8 Solve $12\sin^2 x - 5\sin x - 2 = 0$ for $0 \leq x \leq 360°$, giving answers to 1 d.p. where necessary.	
9 The random variable X is normally distributed. $P(X < 48) = 0.1587$ and $P(X > 72) = 0.1587$. Find the mean and standard deviation (3 s.f.).	
10 (a) Expand $(8 + 4x)^{\frac{1}{3}}$ in ascending powers of x up to and including the term in x^3. (b) State the range of values of x for which the expansion is valid.	