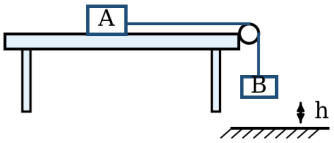
Day 329 **A Level Maths: S Tier 10-a-day**

1 Particles A (9 kg) and B (3 kg) are joined by a light string over a smooth pulley (see diagram). A lies on a rough table with $\mu = 0.25$, 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).



2 $X \sim B(23, \frac{3}{10})$.

(a) Show that $P(X = r + 1) \div P(X = r) = \frac{23 - r}{r + 1} \times \frac{3}{7}$.

(b) Find the most likely value of X and its probability (3 s.f.).

3 A ladder of length 15 m leans against a vertical wall. Its foot slides
away from the wall at 3 m s^{-1}. When the foot is 9 m from the wall,
find the rate at which the top is moving down.

4 $f(x) = \frac{kx - 8}{x - 6}$ for $x \neq 6$. Given that f is self-inverse, find k, and hence solve $f(x) = x$.

5 A stone is projected from level ground with horizontal and vertical velocity components 19.6 and 63.7 m s^{-1}.
Find (a) the two times at which it moves at 45° to the horizontal, (b) the horizontal distance between those two points. Take $g = 9.8$ m s^{-2}.

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6 $u_{n+1} = u_n + 3n$, $u_1 = 4$. (a) Show that $u_n = an^2 + bn + c$ and find a, b, c. (b) Find the least n for which $u_n > 1041$.	
7 The curve C has equation $x^2 - 3xy + 5y^2 = 44$. Find the coordinates of the points on C where the tangent is parallel to the x-axis.	
8 A curve has parametric equations $x = 2(t + \frac{1}{t})$, $y = (t - \frac{1}{t})$, $t \neq 0$. Find a Cartesian equation of the curve.	
9 The daily output of a machine is N(μ, 4) with known variance 4. The mean was claimed to be 82 units. A random sample of 16 has mean 83.5. Test at the 5% level whether the mean is less than 82.	
10 (a) Express $\frac{-x}{(x + 2)(x + 1)}$ in partial fractions. (b) Hence find the exact value of $\int_0^1 \frac{-x}{(x + 2)(x + 1)}\,dx$.	