Day 137	A Level Maths: S Tier 10-a-day
1 Solve the simultaneous equations $\log_2 x + \log_2 y = 7$ $x - y = 28$	
2 Solve $\frac{5}{(x-4)} < \frac{4}{(x+2)}$.	
3 The curve C has equation $x e^y + 3y = 4$. Find the equation of the tangent to C at the point (4, 0), in the form $ax + by + c = 0$ with integers a, b, c.	
4 Find the binomial expansion of $(4 - 2x)^{-\frac{1}{2}}$ in ascending powers of x up to and including the term in x^3. State the values of x for which it is valid.	
5 X ~ B(11, p). It is given that $P(X = 2) = \frac{10}{3} \times P(X = 1)$. (a) Find the value of p. (b) Find P(X = 0), correct to 3 significant figures.	

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6 A particle of weight W N is on a rough plane inclined at α to the horizontal, where $\sin\alpha = \frac{12}{13}$. A force P N acts up a line of greatest slope; the particle stays at rest for $34 \leq P \leq 62$.
Find (a) W, (b) the coefficient of friction, (c) the acceleration when P = 124. Take g = 9.8 m s^{-2}.

7 The cdf of X is $F(x) = 0$ for $x < 0$, $F(x) = 1 - (1 - \frac{x}{4})^2$ for $0 \leq x \leq 4$, and $F(x) = 1$ for $x > 4$.
(a) Find the pdf of X.
(b) Find E(X).
(c) Find $P(1 < X < 2)$ and the median, to 3 significant figures.

8 A curve has parametric equations
$x = t^2$, $y = 2t^3$.
Show that $y^2 = kx^3$ and find k.

9 A curve has parametric equations $x = 3(\theta - \sin\theta)$, $y = 3(1 - \cos\theta)$.
Find the exact area under one arch, for $0 \leq \theta \leq 2\pi$,
between the curve and the x-axis.

10 Particle A (3 kg) lies on a rough table with $\mu = 0.2$, and is joined by a light string over a smooth pulley (see diagram) to particle B (3 kg) on a smooth slope, $\sin\alpha = \frac{3}{5}$.
Released from rest, the string is cut when B has moved 3.5 m. Find the further distance A slides before stopping.

