Day 270 **A Level Maths: A Tier 10-a-day**

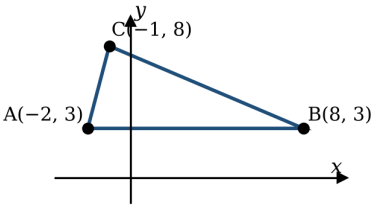
1 A particle slides from rest down a rough plane inclined at α to the horizontal, where $\tan \alpha = \frac{3}{4}$. It moves 17.64 m in 3 s. Find (a) the coefficient of friction, (b) the speed after 3 s. Take g = 9.8.

2 Find the exact value of

$$\int_0^{\ln 3} (2e^{2x} + 5e^{x})\, dx.$$

3 X, the height (cm), is normally distributed with mean 175 and standard deviation 7.
Find (a) P(X > 192.5) (b) P(192.5 < X < 199.5), each to 3 s.f.

4 The diagram shows triangle ABC.
(a) Find the equation of the line through C perpendicular to AB.
(b) Hence find the coordinates of D, the foot of the perpendicular from C to AB, and the area of triangle ABC.



5 Particles A (7 kg) and B (3 kg) hang on a light string over a smooth pulley, A being 1 m above the ground. Released from rest; A lands without rebounding. Find (a) the tension while both move, (b) the greatest height of B above its start. Take g = 9.8.

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6 A sequence is defined by $u_1 = k$ and $u_{n+1} = 3u_n + 3$. Given that $u_3 = 57$, find (a) the value of k, (b) $\sum_{r=1}^{4} u_r$.	
7 A drink at 102°C is left in a room at 22°C. Its temperature θ °C satisfies $\frac{d\theta}{dt} = -k(\theta - 22)$. After 15 minutes the temperature is 72°C. Find k, then the time for it to reach 37°C, to 3 s.f.	
8 X is normally distributed with mean μ and standard deviation 8. Given that P(X > 33) = 0.0668, find μ to 3 significant figures.	
9 $u_1 = 22$ and $u_{n+1} = -\frac{1}{2} u_n + 18$. (a) Find the limit L of the sequence as $n \to \infty$. (b) Find the least n for which $\lvert u_n - L \rvert < 0.1$.	
10 Solve $\cos 2x - 2\sin x = 1$ for $-180° \leq x \leq 180°$.	