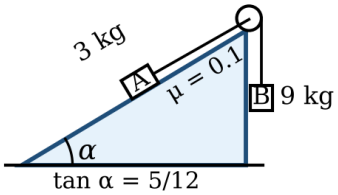
Day 230	A Level Maths: A Tier 10-a-day
1 A curve has parametric equations $x = 3(t - \sin t)$, $y = 3(1 - \cos t)$. Find $\frac{dy}{dx}$ in terms of t and the exact equation of the tangent at the point where $t = \frac{\pi}{3}$, in the form $y = mx + c$.	
2 Find the coefficient of x^4 in the expansion of $(4 + 2x)^7$.	
3 $y = \cot(3x)$. Find $\frac{dy}{dx}$ and its exact value at $x = \frac{\pi}{18}$.	
4 Prove that the square of any integer is of the form $5k$, $5k + 1$ or $5k - 1$.	
5 Solve $3\sec^2 x + 9\tan x + 3 = 0$ for $-180° \leq x \leq 180°$. Give answers to 1 d.p.	

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6 Express $\frac{-1-4\sqrt{6}}{4+2\sqrt{6}}$ in the form $p + q\sqrt{6}$, where p and q are rational numbers.

7 For 50 values of x, the coded variable $y = \frac{x-40}{2}$ gives
$\Sigma y = 175$ and $\Sigma y^2 = 925$.
Find the mean and standard deviation of x.

8 The system is released from rest and A moves up the rough plane. Find (a) the acceleration, (b) the tension in the light string. Take g = 9.8. Give answers to 3 s.f. if not exact.



9 A particle is projected at 7.7 m s^{-1} up a line of greatest slope of a rough plane inclined at α, where $\tan\alpha = \frac{4}{3}$. The coefficient of friction is 0.5. Find (a) the greatest distance it moves up the plane, (b) its speed on returning to the start. Take g = 9.8. Give answers to 3 s.f. if not exact.

10 At one location, the daily mean wind speed is modelled by $N(7.4, 2.9^2)$.
(a) Find the probability that on a randomly chosen day the value exceeds 12 knots.
(b) Estimate the number of such days in a period of 62 days.