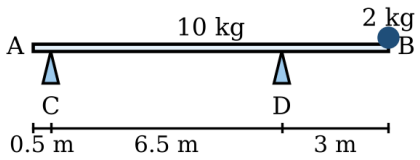
Day 271	A Level Maths: A Tier 10-a-day
1 A cyclist passes P with speed 7 m s^{-1} and accelerates uniformly. She travels 141.6 m in the next 12 s, reaching Q. Find (a) her acceleration, (b) her speed at Q, (c) her speed at the midpoint of PQ. Give answers to 3 s.f. if not exact.	
2 Summary statistics for the daily total rainfall (mm) in the same month are: Perth: mean 25, standard deviation 5.5; Jacksonville: mean 8.5, standard deviation 5.7. Make two comparisons.	
3 $f(x) = e^x - 5x - 9$. Show that the equation $f(x) = 0$ has a root α in the interval [3, 4].	
4 A curve has parametric equations $x = 1 + 2\cos\theta$, $y = -2 + 2\sin\theta$. Find its Cartesian equation and describe the curve.	
5 Solve $3\sec^2 x + 9\tan x + 3 = 0$ for $0° \leq x \leq 180°$. Give answers to 1 d.p.	

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6 A uniform beam AB rests on supports at C and D, with a particle attached at B. Find the reactions at C and D. Take g = 9.8. Give answers to 3 s.f. if not exact.



7 A drink at 75°C is left in a room at 15°C. Its temperature θ °C satisfies $\frac{d\theta}{dt} = -k(\theta - 15)$.
After 10 minutes the temperature is 55°C. Find k, then the time for it to reach 35°C, to 3 s.f.

8 Expand $(2 + 3x)^{-2}$ in ascending powers of x, up to and including x^2.
State the range of x for which the expansion is valid.

9 X ~ B(29, p). H_0: p = 0.4 is tested against H_1: p ≠ 0.4 at the 5% level.
(a) Find the critical region.
(b) Find the actual significance level of the test (3 s.f.).

10 $f(x) = \frac{-6x - 7}{(1 - 2x)(1 + 2x)}$.
(a) Express f(x) in partial fractions.
(b) Hence expand f(x) up to x^2.
(c) State the range of x for which the expansion is valid.