Day 143	A Level Maths: S Tier 10-a-day

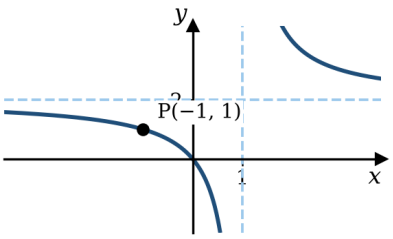
1 A sector of a circle has radius r cm and angle θ radians, where $\theta < 2\pi$.
Its perimeter is 26 cm and its area is 42 cm^2.
Find the two possible pairs of values of r and θ.

2 A stone is projected from level ground with horizontal and vertical velocity components 14.7 and 39.2 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}.

3 Use the trapezium rule with 4 strips to estimate $\int_0^2 \frac{1}{\sqrt{1+x}}\,dx$, to 4 s.f.
Is it an overestimate or an underestimate? Explain.

4 The size of a rod is N(62, 7^2) mm. A rod is 'large' if it exceeds 67.
(a) Find the probability that a rod is large.
(b) 12 rods are chosen at random. Find the probability that at least 3 are large.

5 The diagram shows the curve C, its asymptotes (dashed) and a point P. C has equation $y = \frac{a}{x+p} + q$. Find a, p and q.



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6 A particle P of mass 4 kg moves under a single force F N, where $F = (24t + 20)\mathbf{i} + (36t^2 - 8)\mathbf{j}$ and t is the time in seconds. At t = 0, P is at the origin with velocity $(3\mathbf{i})$ m s^{-1}. Find (a) the velocity of P at t = 2, (b) the position vector of P at t = 2.	
7 Find the set of values of x for which both $x^2 + 2x - 8 \leq 0$ and $3x + 7 \geq 10$.	
8 A(−4, −5) and B(−1, −4). The point C lies on the x-axis and CA = CB. Find the coordinates of C and the area of triangle ABC.	
9 Use the substitution u = 1 − x to find the exact value of $\int_0^1 x(1 - x)^2 \, dx$	
10 X and Y are independent, X ~ Po(4) and Y ~ Po(2). (a) State the distribution of X + Y. (b) Given that X + Y = 7, find the probability that X = 1.	