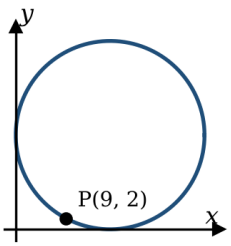
Day 96	A Level Maths: S Tier 10-a-day
1 θ is small and measured in radians. Use small angle approximations to find the value that $\frac{\sin 6\theta \tan 3\theta}{1 - \cos 5\theta}$ approaches as $\theta \to 0$.	
2 Evaluate $\sum_{r=3}^{13}(4 \times 2^r + 1r)$.	
3 The number of customers arriving at a shop in one hour is Po(45). Use a suitable approximation to find P($X \leq 38$), to 3 significant figures.	
4 The equation $x^3 = 3x + 12$ has a root α. (a) Show that the equation can be written as $x = \sqrt[3]{(3x + 12)}$. (b) Use $x_{n+1} = \sqrt[3]{(3x_n + 12)}$ with $x_0 = 2$ to find x_1, x_2, x_3 to 4 d.p., and hence state α to 3 d.p.	
5 A plank of mass 3 kg lies on a smooth horizontal table, with a block of mass 3 kg on it ($\mu = 0.25$ between them). A horizontal force P N acts on the plank. (a) Find the greatest P for which the block does not slip. (b) Find the accelerations of block and plank when P = 36.75. Take g = 9.8 m s^{-2}.	

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6 The circle in the diagram touches both axes and passes through P. Find the equation of the circle, giving it in the form $x^2 + y^2 + ax + by + c = 0$.



7 A particle P moves on a straight line. At time t seconds its velocity is v m s^{-1}, where $v = 10 \sin(\frac{\pi t}{2})$ for $t \geq 0$.

Find (a) the greatest magnitude of the acceleration of P, (b) the distance P travels between the first two times at which it is at rest. Give (b) to 3 s.f.

8 A curve has parametric equations $x = 3t^2$, $y = 3t(2 - t)$,
for $0 \leq t \leq 2$. The curve meets the x-axis at O and at A.
Find the area enclosed between the curve and the x-axis.

9 (a) Expand $(27 - x)^{\frac{1}{3}}$ up to and including the term in x^2.

(b) Use $x = 0.03$ to estimate $\sqrt[3]{26.97}$ to 5 decimal places.

10 X and Y are independent, X ~ Po(2) and Y ~ Po(3).
(a) State the distribution of X + Y.
(b) Given that X + Y = 5, find the probability that X = 4.