Day 343	A Level Maths: A Tier 10-a-day
1 Find the exact value of $\int_1^3 (\frac{4}{x} + \frac{5}{x^2})\,dx$.	
2 A stratified sample of 80 people is taken from three groups. 9 of the sample are from Sales, which has 135 people. (a) Find the total number of people. (b) Admin has 165 people. How many are sampled?	
3 A sector of a circle has arc length 3.2 cm and area 6.4 cm^2. Find the radius of the circle and the angle of the sector, in radians.	
4 Solve $25^{3x-3} = 5^{3x+2}$.	
5 A lift of mass 200 kg carries a person of mass 70 kg. The cable tension is 2808 N and the lift is accelerating. Find (a) the magnitude and direction of the acceleration, (b) the force of the floor on the person. Take g = 9.8.	

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6 Prove the identity $\frac{1}{1-\sin 2\theta} + \frac{1}{1+\sin 2\theta} \equiv 2\sec^2 2\theta$	
7 Of 41 students, 20 study Maths (M), 15 Physics (P) and 18 Chemistry (C). 9 study M and P, 8 study M and C, 7 study P and C, and 4 study all three. One student is chosen at random. Given that a student studies exactly two subjects, find the probability that they study Physics.	
8 A circle passes through A$(-4, -16)$ and B$(-4, 10)$. Its centre lies on the line $y = \frac{1}{2}x - 1$. Find the equation of the circle.	
9 (a) Expand $(1 + 2x)^{\frac{1}{2}}$ in ascending powers of x up to x^2. (b) Use $x = 0.005$ to estimate $\sqrt{101}$ to 3 decimal places.	
10 A ball is projected from the ground at 38 m s^{-1} at angle α above the horizontal, $\tan\alpha = \frac{12}{5}$. At time T s, while in flight, it is moving perpendicular to its initial direction. Find (a) T, (b) the height of the ball then. Take g = 9.8. Give answers to 3 s.f. if not exact.	