Day 110	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 42 cm and its area is 110 cm^2. Find the two possible pairs of values of r and θ.	
2 Class S has 20 students with mean mark 39 and standard deviation 6. Class P has 25 students with mean mark 53 and standard deviation 3. (a) Find the mean mark of all 45 students. (b) Find the standard deviation of all 45 students.	
3 Describe a sequence of two transformations that maps the curve $y = x^2$ onto the curve $y = -2x^2 - 4x$.	
4 Solve $2\text{cosec}^2\theta + 5\cot\theta + 1 = 0$ for $0 \leq \theta < 360°$, giving answers to 1 d.p.	
5 A golf ball is hit from a point O on horizontal ground. It lands 40 m from O, and reaches a maximum height of 20 m above the ground. Find the angle of projection and the speed of projection, to 3 s.f. Take g = 9.8 m s^{-2}.	

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6 Use integration by parts to find the exact value of $\int_0^{\pi/2} e^x \sin x \, dx$	
7 $g(x) = \sqrt{-x^2 + 16}$. Find the largest possible domain of g, and the corresponding range.	
8 Solve simultaneously: $x - y = 5$ $3x^2 - 2xy + y^2 = 33$	
9 A particle P moves on a straight line. The velocity of P is v m s^{-1} and its acceleration is $-0.2v^2$ m s^{-2}. At t = 0, v = 10. Find (a) the time taken for the speed of P to halve, (b) the distance P travels in this time, to 3 s.f.	
10 Two fair 8-sided dice, numbered 1 to 8, are rolled. M is the smaller of the two scores. (a) Show that $P(M = m) = \frac{(17 - 2m)}{64}$ for m = 1, 2, ..., 8. (b) Find P(M = 4) and E(M).	