Day 253	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 36 cm and its area is 65 cm^2. Find the two possible pairs of values of r and θ.	
2 A ball is thrown vertically upwards from ground level with speed 78.4 m s^{-1}. Find the length of time for which the ball is more than 137.2 m above the ground, and the greatest height it reaches. Take g = 9.8 m s^{-2}.	
3 (a) Expand $(25 + x)^{\frac{1}{2}}$ up to and including the term in x^2. (b) Use x = 0.04 to estimate $\sqrt{25.04}$ to 5 decimal places.	
4 A chord AB of a circle, centre O and radius 3 cm, subtends an angle of $\frac{2\pi}{3}$ at O. Find the exact area and the exact perimeter of the minor segment cut off by AB.	
5 The roots of $x^2 + kx + 32 = 0$ are in the ratio 2 : 1. Find the possible values of k.	

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6 A drug dose of 20 mg decays by 10% each hour. Find the first whole number of hours after which less than 2 mg remains.	
7 Faults in a cable occur at random at a mean rate of 3 per hour. After a modification, 0 faults are found in 1 hour. Test at the 10% level whether the rate of faults has decreased.	
8 A test of H_0: p = 0.25 against H_1: p > 0.25 uses a sample of 25 at the 5% level. (a) Find the critical region for X, the number of successes. (b) Find the actual significance level. (c) Find P(Type II error) when in fact p = 0.45.	
9 The function f is defined by $f(x) = 4x^2 - 8x - 1$ for $x \leq k$. Given that k is the greatest value for which f is one-one, find k, $f^{-1}(x)$, and the domain of f^{-1}.	
10 A river is 120 m wide and flows at 34 m s^{-1}. A boat has speed 16 m s^{-1} in still water and crosses the river heading so that it is carried as little distance downstream as possible. Find the least possible distance downstream between the starting point and the landing point.	