Day 203	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 16 cm and its area is 15 cm^2. Find the two possible pairs of values of r and θ.	
2 A stone is thrown vertically upwards with speed 6 m s^{-1} from the top of a cliff. The top of the cliff is 26.1 m above the sea. Find (a) the time taken for the stone to reach the sea, (b) the total distance travelled by the stone, to 3 s.f. Take g = 9.8 m s^{-2}.	
3 A binomial random variable X has mean 4 and variance 3.2. (a) Find n and p. (b) Find P(X = 6), correct to 3 significant figures.	
4 Solve $2\text{cosec}^2\theta - \cot\theta - 8 = 0$ for $0 \leq \theta < 360°$, giving answers to 1 d.p.	
5 Prove that n(n + 8)(n + 16)(n + 24) + 4096 is a perfect square for every integer n.	

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6 Faults in a cable occur at random at a mean rate of 4 per day. After a modification, 0 faults are found in 1 day. Test at the 5% level whether the rate of faults has decreased.	
7 (a) Expand $(9 + x)^{\frac{1}{2}}$ up to and including the term in x^2. (b) Use $x = 0.05$ to estimate $\sqrt{9.05}$ to 5 decimal places.	
8 Solve $\frac{1}{(x-3)} > \frac{3}{(x-1)}$.	
9 The line l has equation $\mathbf{r} = \begin{pmatrix} 12 \\ 9 \\ -5 \end{pmatrix} + t\begin{pmatrix} -3 \\ -2 \\ 2 \end{pmatrix}$. The point P has coordinates $(1, 3, -2)$. Find the coordinates of the foot F of the perpendicular from P to l, and the exact distance PF.	
10 At time $t = 0$ hours, ship A is at the point with position vector $(14\mathbf{i} + 26\mathbf{j})$ km relative to a port O, and moves with constant velocity $(\mathbf{i} + 2\mathbf{j})$ km h^{-1}. Ship B leaves O at $t = 0$ with constant speed 17 km h^{-1} and intercepts A. Find (a) the time at which B intercepts A, (b) the velocity of B as a vector.	