Day 56	A Level Maths: A Tier 10-a-day
1 $y = \cos^3(2x)$. Find $\frac{dy}{dx}$ and its exact value at $x = \frac{\pi}{8}$.	
2 A ball is thrown vertically upwards at 24.5 m s^{-1} from a point h m above horizontal ground, and hits the ground 8 s later. Find (a) h, (b) the greatest height above the ground. Take g = 9.8.	
3 Solve $\cos 2\theta + 2\sin\theta = 1$ for $0 \leq \theta \leq 2\pi$.	
4 Solve $\frac{2}{x^2} - \frac{14}{x} + 12 = 0$.	
5 $X \sim B(27, 0.5)$. Find the smallest value of c such that $P(X \geq c) < 0.1$.	

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6 For small θ (in radians), use the small angle approximations to find the value that $\frac{1-\cos 5\theta}{\theta \sin \theta}$ approaches as $\theta \to 0$.	
7 A 900 kg car tows a 400 kg trailer by a light tow-bar on a horizontal road. Driving force 1240 N; resistances 600 N (car), 250 N (trailer). Find (a) the acceleration and the tow-bar tension. At 10 m s^{-1} the tow-bar breaks. (b) How far does the trailer then travel?	
8 The curve y = f(x), where f(x) = $\frac{1}{x-2} - 1$, is translated by $\begin{pmatrix} -3 \\ -3 \end{pmatrix}$. Write down the equations of the asymptotes of the new curve, and find where it crosses the x-axis.	
9 (a) Expand $(1-x)^{\frac{1}{2}}$ in ascending powers of x up to x^2. (b) Use x = 0.01 to estimate $\sqrt{99}$ to 4 decimal places.	
10 X ~ B(34, p). H_0: p = 0.5 is tested against H_1: p < 0.5 using a 5% significance level. (a) Find the critical region. (b) State the probability of a Type I error. (c) Find the probability of a Type II error when p = 0.4 (3 s.f.).	