Day 13	A Level Maths: S Tier 10-a-day
1 Solve $\cos 2\theta - 7\cos\theta + 4 = 0$ for $0 \leq \theta < 360°$.	
2 The circle $x^2 + y^2 + 2x - 6y - 159 = 0$ passes through $P(-13, 8)$. The tangent at P meets the axes at A and B. Find the area of triangle OAB.	
3 A ball is thrown vertically upwards from ground level with speed 58.8 m s^{-1}. Find the length of time for which the ball is more than 171.5 m above the ground, and the greatest height it reaches. Take g = 9.8 m s^{-2}.	
4 $f(x) = \frac{kx + 2}{x - 4}$ for $x \neq 4$. Given that f is self-inverse, find k, and hence solve $f(x) = x$.	
5 Ball A is projected vertically upwards from ground level with speed 11 m s^{-1}. At the same instant, ball B is released from rest 11 m directly above A. The balls collide. Find (a) the height above the ground at which they collide, (b) the velocity of A just before the collision. Take g = 9.8 m s^{-2}.	

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6 A curve is given by $x = y^3 - y^2 - 3y$. Find dy/dx and d^2y/dx^2 when $y = -1$.	
7 A game costs £2. Two fair dice are rolled: a total of at least 11 wins £8, a total of at most 2 wins £2, otherwise nothing. (a) Find the expected profit. (b) Find the standard deviation of the profit (3 s.f.). (c) Find the stake that makes the game fair.	
8 When a polynomial f(x) is divided by $(x - 2)$ the remainder is -6; when divided by $(x + 1)$ the remainder is 6. Find the remainder when f(x) is divided by $(x - 2)(x + 1)$.	
9 A is acute and B is obtuse. $\sin A = \frac{4}{5}$ and $\sin B = \frac{7}{25}$. Find the exact values of $\cos(A + B)$ and $\cos(A - B)$.	
10 A coin is said to show heads with probability 0.4. In 30 trials it does so 4 times. Test at the 10% level whether the probability is different from 0.4.	