Day 288	A Level Maths: A Tier 10-a-day
1 A group of 7 men and 8 women. A team of 4 is chosen at random. Find the probability that all the team are of the same sex.	
2 A ball is projected horizontally at 24 m s^{-1} from a point 44.1 m above horizontal ground. Find (a) the horizontal distance to the landing point, (b) the speed and direction (angle below the horizontal, 1 d.p.) on landing. Take g = 9.8. Give answers to 3 s.f. if not exact.	
3 θ is small and measured in radians. Use small angle approximations to show that $3\sin 3\theta + \cos\theta = 5.5$ can be written as $a\theta^2 + b\theta + c = 0$ with integers a, b, c. Hence find the approximate solution with $0 < \theta < 0.8$, to 3 s.f.	
4 Evaluate $\sum_{r=8}^{24}(5r - 5)$.	
5 Water pours into a cone, vertex down, at 20 cm^3s^{-1}. The surface radius is always $\frac{h}{2}$. Find the rate at which the depth is rising when h = 4 cm.	

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6 Of 35 students, 15 study Maths (M), 17 Physics (P) and 12 Chemistry (C). 8 study M and P, 5 study M and C, 5 study P and C, and 3 study all three. One student is chosen at random. Given that a student does not study Maths, find the probability that they study Physics.	
7 Car A passes P at constant speed 7 m s^{-1}. 14 s later car B leaves P from rest, in the same direction, with acceleration 2 m s^{-2}. B overtakes A at Q. Find (a) the time B takes to reach Q, (b) PQ, (c) the speed of B at Q.	
8 A sequence is defined by $u_1 = k$ and $u_{n+1} = -2u_n + 5$. Given that $u_3 = 11$, find (a) the value of k, (b) $\sum_{r=1}^{4} u_r$.	
9 Water drains from a tank so that the depth h metres falls at a rate proportional to $\sqrt{h}$. Initially h = 25, and after 5 hours h = 1. Form and solve a differential equation to find how long, in total, the tank takes to empty.	
10 The line $y = kx + 2$ is a tangent to the curve $y = x^2 - 2x + 11$. (a) Find the possible values of k. (b) For the larger value of k, find the coordinates of the point of contact.	