Day 121	A Level Maths: S Tier 10-a-day
1 A bag has 4 red counters and some white counters, n in total. Two are taken without replacement. P(at least one red) = $\frac{14}{15}$. Find n.	
2 $\frac{dy}{dx} = 6xy$, and y = 3 when x = 0. Solve the differential equation and find y when x = 1.	
3 A ball is thrown vertically upwards from ground level. It is more than 308.7 m above the ground for 2 s. Find the speed of projection and the greatest height reached. Take g = 9.8 m s^{-2}.	
4 The scores in an aptitude test are modelled by N(48, σ^2). The probability of a value below 44 is 0.30. (a) Find σ. (b) Find the probability of a value above 61.	
5 Prove that $(n + 5)^3 - n^3 - 125$ is a multiple of 15 for every integer n.	

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6 A particle of weight W N is on a rough plane inclined at α to the horizontal, where $\sin\alpha = \frac{4}{5}$. A force P N acts up a line of greatest slope; the particle stays at rest for $70.3 \leq P \leq 81.7$. Find (a) W, (b) the coefficient of friction, (c) the acceleration when P = 163.4. Take g = 9.8 m s^{-2}.	
7 Use integration by parts to find the exact value of $\int_0^{\pi/2} x \cos x \, dx$	
8 $f(x) = \frac{-16x + 6}{(1 - 3x)(1 - 2x)}$. (a) Express f(x) in partial fractions. (b) Hence expand f(x) in ascending powers of x up to x^3, stating the range of validity.	
9 The curve C has equation $x^2 - 2xy + 3y^2 = 24$. Find the coordinates of the points on C where the tangent is parallel to the y-axis.	
10 $g(x) = \sqrt{-x^2 - 2x}$. Find the largest possible domain of g, and the corresponding range.	