Day 150	A Level Maths: S Tier 10-a-day
1 For 20 pairs of values, $S_{xx} = 144$, $S_{yy} = 256$ and $S_{xy} = 131$. (a) Calculate the product moment correlation coefficient r. (b) The critical value for a one-tailed test at the 5% level with n = 20 is 0.3783. Carry out the test of H_0: $\rho = 0$ against H_1: $\rho > 0$.	
2 Express $\frac{2 - 3\sqrt{7}}{6 - 2\sqrt{7}}$ in the form $p + q\sqrt{7}$, where p and q are rational numbers.	
3 Car A passes a point O travelling at a constant speed of 12.8 m s^{-1}. 9 s later, car B leaves O from rest with constant acceleration 2.5 m s^{-2}, travelling in the same direction. B overtakes A at the point X. Find (a) the time B takes to reach X, (b) the distance OX, (c) the speed of B at X.	
4 A circle has its centre in the first quadrant and touches both the x-axis and the y-axis. It passes through the point (8, 9). Find the two possible equations of the circle.	
5 A curve is given by $x = \ln y + 4y^2$. Find dy/dx and d^2y/dx^2 when y = 1.	

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6 A bag has 2 blue counters and some grey counters, n in total. Two are taken without replacement. P(at least one blue) = $\frac{3}{5}$. Find n.	
7 The region bounded by $y = \sin x + 3\cos x$, the x-axis and the lines $x = 0$ and $x = \pi/2$ is rotated through 2π about the x-axis. Find the exact volume of the solid formed.	
8 A box of weight 143 N is pulled at constant speed along rough horizontal ground ($\mu = \frac{5}{12}$) by a force P N at angle θ above the horizontal. (a) Find P when $\tan\theta = \frac{8}{15}$. (b) Find the least possible value of P as θ varies, and the corresponding θ to 1 d.p.	
9 When a polynomial f(x) is divided by $(x + 2)$ the remainder is -17; when divided by $(x - 2)$ the remainder is 3. Find the remainder when f(x) is divided by $(x + 2)(x - 2)$.	
10 The curve C has equation $x^2 + 2xy + 5y^2 = 144$. Find the coordinates of the points on C where the tangent is parallel to the x-axis.	