Day 170	A Level Maths: S Tier 10-a-day
1 A manufacturer says that 50% of its screens have no flaws. A sample of 25 screens is checked, and 18 have no flaws. Test, at the 5% significance level, the claim that the proportion is higher. Give your conclusion in context.	
2 Solve simultaneously, giving integer x and y: $8^x \times 2^y = 128$ $9^x \div 3^y = 27$	
3 Solve the simultaneous equations $\lg x + \lg y = 2$ $x - y = 99$	
4 Express $\frac{-7x^2 + 29x + 6}{(x + 3)(x - 3)^2}$ in the form $\frac{A}{(x + 3)} + \frac{B}{(x - 3)} + \frac{C}{(x - 3)^2}$.	
5 A bag has 3 red counters and some black counters, n in total. Two are taken without replacement. P(at least one red) = $\frac{36}{91}$. Find n.	

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6 A particle P moves on a straight line. At time t seconds, where $t \geq 0$, its velocity is v m s^{-1}, where

$v = 6\sqrt{t} - 1t$.

Find (a) the greatest speed of P, (b) the greatest displacement of P from its starting point.

7 A and B are acute angles with $\tan A = \frac{1}{13}$ and $\tan B = \frac{6}{7}$.

Find $\tan(A + B)$ and hence show that $A + B = \frac{\pi}{4}$.

8 The volume of a sphere increases at a constant rate of 72π cm^3s^{-1}.

When the radius is 6 cm, find the rate of increase of (a) the radius,

(b) the surface area. Volume = $\frac{4}{3}\pi r^3$.

9 Solve $|-x - 5| > 2x - 1$.

10 A uniform rod AB (4 m, 120 N) is hinged at A to a vertical wall and held horizontal by a string BC, C on the wall above A, with $\tan \alpha = \frac{4}{3}$, where α is the angle between string and rod. A 40 N particle hangs at P, AP = 3 m.

Find (a) the tension, (b) the magnitude and direction of the hinge force (3 s.f. and 1 d.p.).

