Day 135	A Level Maths: S Tier 10-a-day
1 Class P has 30 students with mean mark 59 and standard deviation 6. Class Q has 20 students with mean mark 80 and standard deviation 4. (a) Find the mean mark of all 50 students. (b) Find the standard deviation of all 50 students.	
2 A box of mass 15 kg is at rest on rough horizontal ground ($\mu = 0.1$). A horizontal force of 35.7 N acts on it for 7 s and is then removed. Find (a) the speed when the force is removed, (b) the total distance travelled before the box stops. Take $g = 9.8$ m s^{-2}.	
3 Solve $2 \ln x = \ln(x + 60) + \ln 2$, stating clearly why one root is rejected.	
4 When a polynomial f(x) is divided by $(x - 3)$ the remainder is -19; when divided by $(x + 2)$ the remainder is 1. Find the remainder when f(x) is divided by $(x - 3)(x + 2)$.	
5 A box holds 9 components, each faulty with probability 0.1, independently. A box is rejected if it has at least 2 faulty components. (a) Find the probability that a box is rejected. (b) 14 boxes are inspected. Find the probability that at least 2 are rejected.	

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6 Show that $\frac{3+\sqrt{7}}{3-\sqrt{7}} - \frac{3-\sqrt{7}}{3+\sqrt{7}}$ can be written in the form $k\sqrt{7}$, and find k.	
7 A curve has parametric equations $x = 2t^2$, $y = t^3 + 9t$. Find the coordinates of the points on the curve where the gradient is -3.	
8 Prove by contradiction that $\log_5 15$ is irrational.	
9 $\frac{dy}{dx} = 6xy$, and $y = 5$ when $x = 0$. Solve the differential equation and find y when $x = 2$.	
10 Particle A (1 kg) lies on a rough table with $\mu = 0.3$, and is joined by a light string over a smooth pulley (see diagram) to particle B (1 kg) on a smooth slope, $\alpha = 30°$. Released from rest, the string is cut when B has moved 3 m. Find the further distance A slides before stopping. 	