Day 103	A Level Maths: S Tier 10-a-day
1 Find the set of values of x for which both $x^2 - 5x + 4 < 0$ and $3x + 5 \leq 10$.	
2 The breaking strength of a cable is N(μ, 81) with known variance 81. The mean was claimed to be 26 kN. A random sample of 36 has mean 24.5. Test at the 10% level whether the mean is less than 26.	
3 Solve $2 \ln x = \ln(x + 90) + \ln 1$, stating clearly why one root is rejected.	
4 $f(x) = x^3 + ax^2 + bx - 12$, where a and b are constants. $(x + 4)$ is a factor of f(x), and f(x) leaves remainder -18 when divided by $(x - 2)$. Find a and b, and hence solve $f(x) = 0$.	
5 Solve $\text{cosec}(\theta - 30°) = \frac{2}{\sqrt{3}}$ for $-180° \leq \theta \leq 180°$.	

Day 103	A Level Maths: S Tier 10-a-day
6 Find the term independent of x in the expansion of $(x^2 - \frac{2}{x^3})^{10}$.	
7 A particle starts from rest at the top of a rough slope of length 15 m ($\sin\alpha = \frac{4}{5}$, $\mu = 0.4$), then slides along rough horizontal ground with the same μ. Use energy to find (a) its speed at the foot of the slope (3 s.f.), (b) the distance it slides on the ground. Take $g = 9.8$ m s^{-2}.	
8 The points A, B, C have coordinates (2, 5, 5), (0, 0, −2), (1, 4, −2). Find angle ABC to 1 d.p., and the exact area of triangle ABC.	
9 Data pairs (x, y) are coded by $u = x - 5$ and $v = \frac{y}{20}$. The regression line of v on u is $v = 10 + 1.5u$. (a) Find the regression line of y on x in the form $y = a + bx$. (b) Use it to estimate y when $x = 10$.	
10 A stone is projected from a point O on horizontal ground with speed 24.5 m s^{-1} at an angle θ above the horizontal, where $\tan\theta = \frac{4}{3}$. Find (a) the greatest height, (b) the speed when it is at half of this height (3 s.f.). Take $g = 9.8$ m s^{-2}.	