Day 314	A Level Maths: A Tier 10-a-day
1 Solve $5^{2x} - 425^{x} + 425 = 0$. Give exact roots, or 3 s.f. where the answer is not exact.	
2 A circle has equation $x^2 + y^2 - 6x - 12y + 41 = 0$. (a) Find the centre and radius of the circle. (b) Determine whether P(1, 2) lies inside or outside the circle.	
3 A ball is projected from the ground at 22 m s^{-1} at angle α above the horizontal, $\tan\alpha = \frac{12}{5}$. At time T s, while in flight, it is moving perpendicular to its initial direction. Find (a) T, (b) the height of the ball then. Take g = 9.8. Give answers to 3 s.f. if not exact.	
4 For a sample of 10 pairs of values of time spent on social media and exam score, $r = -0.751$. The critical value for a two-tailed test at the 5% level is 0.6319. Test, at this level, whether there is any correlation between the two variables.	
5 Solve $\cos 2x - 4\sin x = -5$ for $0° \leq x \leq 360°$.	

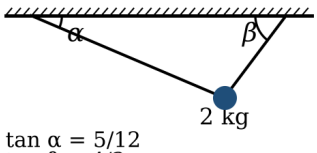
Day 314	A Level Maths: A Tier 10-a-day

6 Of 44 students, 21 study Maths (M), 20 Physics (P) and 21 Chemistry (C).
7 study M and P, 11 study M and C, 8 study P and C, and 5 study all three.
One student is chosen at random. Given that a student studies exactly two subjects, find the probability that they study Physics.

7 A sequence is defined by $u_1 = k$ and $u_{n+1} = 2u_n + 2$.
Given that $u_3 = -6$, find (a) the value of k, (b) $\sum_{r=1}^{4} u_r$.

8 A curve has equation $3x^2 + 2xy + 3y^2 = 24$.
Find the coordinates of the points where the tangent is parallel to the x-axis.

9 A 2 kg particle hangs in equilibrium from two light strings, as shown. Find the tension in each string (T_1 in the string at angle α). Take g = 9.8. Give answers to 3 s.f. if not exact.



tan α = 5/12
tan β = 4/3

10 $f(x) = \frac{x + 1}{(1 + 3x)(1 + 2x)}$.
(a) Express f(x) in partial fractions.
(b) Hence expand f(x) up to x^2.
(c) State the range of x for which the expansion is valid.