Day 346 **A Level Maths: S Tier 10-a-day**

1 $u_{n+1} = u_n + n + 5$, $u_1 = -1$.

(a) Show that $u_n = an^2 + bn + c$ and find a, b, c.

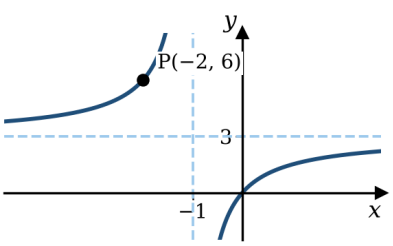
(b) Find the least n for which $u_n > 1217$.

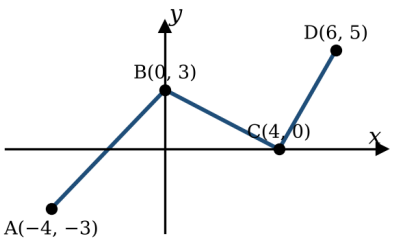
2 12 recorded times (seconds) have mean 54 and standard deviation 4.
One value was recorded as 49 but should have been 41.
Find the correct mean and the correct standard deviation.

3 Car A passes a point O travelling at a constant speed of 12 m s^{-1}. 5 s later, car B leaves O from rest with constant acceleration 1.5 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 Solve $3^{2x} - 11 \times 3^x + 10 = 0$,
giving each answer exactly and, where not an integer, to 3 s.f.

5 The diagram shows the curve C, its asymptotes (dashed) and a point P. C has equation $y = \frac{a}{x + p} + q$. Find a, p and q.



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6 Find the exact value of $\tan(2\cos^{-1}(\frac{15}{17}))$.	
7 A rare allele is present in 1% of a population. A test is positive for 95% of those with it and for 1% of those without it. Find P(positive) and P(has it | positive).	
8 The diagram shows y = f(x), made of three straight line segments. Find the coordinates of the images of A, B, C and D on the graph of $y = 2f(x - 1) + 2$. 	
9 A ball is projected from a point O on horizontal ground at 35 m s^{-1}, at angle θ above the horizontal. It passes through the point P, 72 m horizontally and 40 m vertically from O. Find the two possible values of tan θ, and the two possible values of θ to 1 d.p. Take g = 9.8 m s^{-2}.	
10 $y = e^{3x}\cos x$. Show that $dy/dx = e^{3x}(3\cos x - \sin x)$. Find the x coordinate of the stationary point with the smallest positive x (3 s.f.), and its nature.	