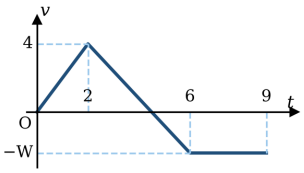
Day 101	A Level Maths: S Tier 10-a-day

1 A train accelerates uniformly from rest at 0.7 m s^{-2} to a speed of V m s^{-1}, travels at this speed, then decelerates uniformly at 1.4 m s^{-2} to rest. The journey takes 60 s and covers 630 m. Find V and the time spent at constant speed.

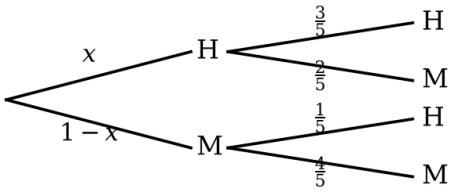
2 An arithmetic sequence has $u_5 = 19$ and $S_{12} = 318$.
(a) Find the first term and common difference.
(b) Find the least n for which $S_n > 636$.

3 The diagram shows the velocity-time graph of a particle P moving on a straight line (velocity in m s^{-1}, time in s). At time 9 s, P is back at its starting point.
Find (a) the value of W, (b) the greatest distance of P from its starting point.



4 $u_{n+1} = u_n + 4n - 1$, $u_1 = -4$.
(a) Show that $u_n = an^2 + bn + c$ and find a, b, c.
(b) Find the least n for which $u_n > 323$.

5 Given that $\cos 3\theta \equiv 4\cos^3\theta - 3\cos\theta$, solve $\cos 3\theta = 0$ for $0 < \theta < \pi$, in terms of π.

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6 A ball is dropped from a height of 4 m. After each bounce it rises to $\frac{4}{5}$ of its previous height. (a) Find the total distance it travels before it stops. (b) After how many bounces does it rise less than 0.1 m?	
7 The curve C has equation $x e^{y} + y = 1$. Find the equation of the tangent to C at the point (1, 0), in the form $ax + by + c = 0$ with integers a, b, c.	
8 The tree diagram shows two games played in turn. Given the second is a H, P(first was a H) = $\frac{1}{2}$. Find x. 	
9 The curve C has equation $x^2 - 3xy + 5y^2 = 220$. Find the coordinates of the points on C where the tangent is parallel to the y-axis.	
10 Faults in a cable occur at random at a mean rate of 4 per hour. After a modification, 12 faults are found in 1 hour. Test at the 5% level whether the rate of faults has increased.	