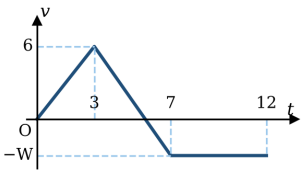
Day 146 **A Level Maths: S Tier 10-a-day**

1 The first term of an arithmetic sequence is 3 and its common difference d is non-zero. The 2nd, 6th and 14th terms are the first three terms of a geometric sequence. Find d and the common ratio.

2 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 12 s, P is back at its starting point.
Find (a) the value of W, (b) the greatest distance of P from its starting point.



3 For 50 observations x, $\Sigma(x - 40) = 30$ and $\Sigma(x - 40)^2 = 768$.
(a) Find the mean of x.
(b) Find the standard deviation of x.
(c) Find the value of Σx^2.

4 Express $\frac{x^3 + 3x^2 - 4x + 6}{(x + 2)(x - 1)}$ in the form $ax + b + \frac{C}{(x + 2)} + \frac{D}{(x - 1)}$.

5 The curve C has equation $x e^y + y = 2$.
Find the equation of the tangent to C at the point (2, 0),
in the form $ax + by + c = 0$ with integers a, b, c.

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6 For n = 10 pairs of values: $\Sigma x = 110$, $\Sigma y = 350$, $\Sigma x^2 = 1406$, $\Sigma xy = 3948$. (a) Find the equation of the regression line of y on x. (b) The x values lie between 7 and 16. Estimate y when x = 15 and comment on its reliability.	
7 The curves $y = 3\cos x$ and $y = 3\cos 2x$ meet at x = 0 and at $x = \frac{2\pi}{3}$. Find the exact area enclosed between them for $0 \leq x \leq \frac{2\pi}{3}$.	
8 $f(x) = x^3 + ax^2 + bx + 12$, where a and b are constants. $(x - 3)$ is a factor of f(x), and f(x) leaves remainder 6 when divided by $(x - 1)$. Find a and b, and hence solve f(x) = 0.	
9 A plank of mass 5 kg lies on a smooth horizontal table, with a block of mass 5 kg on it ($\mu = 0.25$ between them). A horizontal force P N acts on the block. (a) Find the greatest P for which the block does not slip. (b) Find the accelerations of block and plank when P = 36.75. Take $g = 9.8$ m s^{-2}.	
10 Two drones P and Q move so that, t seconds after launch, their position vectors in metres are $\mathbf{r}_P = \begin{pmatrix} -5 \\ 0 \\ 4 \end{pmatrix} + t\begin{pmatrix} 2 \\ -1 \\ 2 \end{pmatrix}$ and $\mathbf{r}_Q = \begin{pmatrix} -9 \\ 7 \\ 7 \end{pmatrix} + t\begin{pmatrix} 4 \\ -2 \\ 2 \end{pmatrix}$. Find the time at which they are closest and the exact minimum distance between them.	