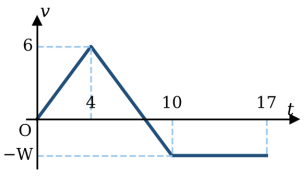
Day 31	A Level Maths: S Tier 10-a-day
1 Large Data Set, daily mean air temperature (°C), Hurn, June 2015 (n = 31): mean 12.6, sd 4. (F = 1.8C + 32) (a) Find the mean and sd in °F. (b) Is a reading of 17.4 more than 2 sd above the mean?	
2 The curve C has parametric equations $x = t$, $y = 4t^2$. The line $y = 8x + 12$ meets C at A and B. Find the exact length AB.	
3 The scores in an aptitude test are modelled by $N(78, \sigma^2)$. The probability of a value below 62 is 0.10. (a) Find σ. (b) Find the probability of a value above 69.	
4 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 17 s, P is back at its starting point. Find (a) the value of W, (b) the greatest distance of P from its starting point. 	
5 Given that $\sin 3\theta \equiv 3\sin\theta - 4\sin^3\theta$, solve $\sin 3\theta = 0$ for $0 < \theta < 180°$.	

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6 A shell is projected from level ground with horizontal and vertical velocity components 49 and 63.7 m s^{-1}.
Find (a) the two times at which it moves at 45° to the horizontal, (b) the horizontal distance between those two points. Take g = 9.8 m s^{-2}.

7 $u_{n+1} = u_n + 3n - 1$, $u_1 = -4$.
(a) Show that $u_n = an^2 + bn + c$ and find a, b, c.
(b) Find the least n for which $u_n > 256$.

8 $f(\theta) = \dfrac{2}{10 + 4\sin\theta + 3\cos\theta}$
(a) Write $4\sin\theta + 3\cos\theta$ as $R\sin(\theta + \alpha)$, $R > 0$, $0 < \alpha < 90°$.
(b) Find the greatest and least values of $f(\theta)$, and the smallest positive θ at which the greatest value occurs, to 1 d.p.

9 Find the binomial expansion of $(8 - 6x)^{-\frac{1}{3}}$ in ascending powers of x up to and including the term in x^3.
State the values of x for which it is valid.

10 Line l_1: $\mathbf{r} = \begin{pmatrix}10\\1\\3\end{pmatrix} + s\begin{pmatrix}3\\2\\3\end{pmatrix}$,
line l_2: $\mathbf{r} = \begin{pmatrix}-2\\-9\\-7\end{pmatrix} + t\begin{pmatrix}-3\\-3\\-2\end{pmatrix}$.
Show whether the lines meet, giving the point of intersection if they do, and find the acute angle between them to 1 d.p.