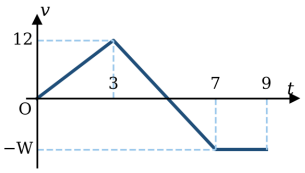
Day 220 **A Level Maths: S Tier 10-a-day**

1 Express $\frac{-3x^2 - 14x + 22}{(x - 2)(3x - 3)^2}$ in the form $\frac{A}{(x - 2)} + \frac{B}{(3x - 3)} + \frac{C}{(3x - 3)^2}$.

2 Large Data Set, daily mean air temperature (°C), Heathrow, October 2015 (n = 184): mean 14.4, sd 3.1. (F = 1.8C + 32)
(a) Find the mean and sd in °F.
(b) Is a reading of 20 more than 2 sd above the mean?

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 The line $5y = 12x + k$ is a tangent to the circle $(x + 3)^2 + (y - 3)^2 = 1$.
Find the two possible values of k.

5 The tangent to $y = x\sqrt{2x + 12}$ at the point where $x = 2$
meets the axes at A and B. Find the exact area of triangle OAB,
where O is the origin.

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6 Given that $\sqrt{10}$ is irrational, prove by contradiction that $\sqrt{5} + \sqrt{2}$ is irrational.	
7 The mass of a parcel is N(64, 5^2) kg. A parcel is 'heavy' if it exceeds 69. (a) Find the probability that a parcel is heavy. (b) 17 parcels are chosen at random. Find the probability that at least 3 are heavy.	
8 The curves $y = 5\cos x$ and $y = 5\cos 2x$ meet at $x = 0$ and at $x = \frac{2\pi}{3}$. Find the exact area enclosed between them for $0 \leq x \leq \frac{2\pi}{3}$.	
9 A particle is projected at 4 m s^{-1} up a line of greatest slope of a rough plane inclined at α to the horizontal, where $\sin\alpha = \frac{3}{5}$ and $\mu = 0.35$. Find (a) the distance it travels up the plane, to 3 s.f., (b) its speed on returning to its starting point. Take g = 9.8 m s^{-2}.	
10 Two boats P and Q move so that, t hours after noon, their position vectors in km are $\mathbf{r}_P = \begin{pmatrix}-3\\3\end{pmatrix} + t\begin{pmatrix}0\\3\end{pmatrix}$ and $\mathbf{r}_Q = \begin{pmatrix}-12\\9\end{pmatrix} + t\begin{pmatrix}3\\3\end{pmatrix}$. Find the time at which they are closest and the exact minimum distance between them.	