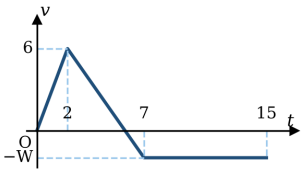
Day 322 **A Level Maths: S Tier 10-a-day**

1 Solve $x - 5\sqrt{x} + 6 = 0$.

2 A curve has parametric equations $x = \ln t$, $y = 2t^2 + 3t$, $t > 0$.
Find the equation of the tangent where $t = 1$, in the form $y = mx + c$.

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 15 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 Each component is faulty with probability 0.12, independently.
Find the least number n of components that must be tested so that the probability of finding at least two faulty is greater than 0.9.

5 Use the substitution $u = e^x + 3$ to find the exact value of

$$\int_0^{\ln 7} \frac{e^x}{e^x + 3}\,dx$$

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6 Prove that $3k = n^2 + 1$ has no integer solutions (k and n integers).	
7 A car of mass 1200 kg, with engine power 31 kW, climbs a straight road with $\sin\alpha = \frac{1}{14}$ against a constant resistance of 400 N. Find (a) the greatest steady speed up the hill, (b) the acceleration at 6.25 m s^{-1}. Take g = 9.8 m s^{-2}.	
8 The curve C has equation $3x^2 - 4xy + 3y^2 = 10$. Find the equation of the tangent to C at the point $(-1, 1)$, in the form $ax + by + c = 0$ with integers a, b, c.	
9 The line $5y = 12x + k$ is a tangent to the circle $(x - 2)^2 + (y - 4)^2 = 16$. Find the two possible values of k.	
10 $X \sim B(18, \frac{1}{4})$. (a) Show that $P(X = r + 1) \div P(X = r) = \frac{18 - r}{r + 1} \times \frac{1}{3}$. (b) Find the most likely value of X and its probability (3 s.f.).	