Day 94	A Level Maths: B Tier 10-a-day

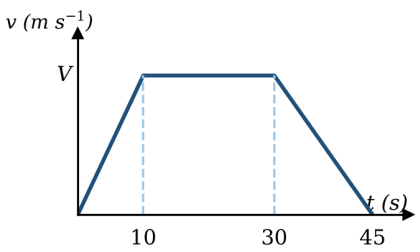
1 Find the set of values of x for which $4x - 4 \leq -7$ and $x^2 + 2x - 8 \leq 0$.

2 Solve $\cos x = -\frac{\sqrt{2}}{2}$ for $0 \leq x \leq 360°$.

3 Prove that $n^2 + 3n + 10$ is even for all integers n.

4 The height of the tide in a harbour is modelled by $H = 9 + 2\sin(\frac{\pi t}{6})$, where t is in hours after midnight.
Find (a) the greatest and least values, (b) the values of t with $0 \leq t \leq 12$ when it equals 8 m.

5 A lift travels between floors in 45 s. The speed-time graph is a trapezium, with the maximum speed V m s^{-1} held from t = 10 to t = 30.
The floors are 195 m apart. Find V, and the deceleration in the final stage.



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6 Data are modelled by $y = ab^x$, where a and b are constants. A plot of $\log_{10} y$ against x is a straight line with intercept 0.602 and gradient 0.477. Find a and b to 2 significant figures.	
7 (a) Expand $(1 + 2x)^{-2}$ up to the x^2 term. (b) Use x = 0.03 to estimate $\frac{1}{1.06^2}$ to 5 decimal places.	
8 $f(x) = e^x - 5x$. Use the Newton-Raphson method with $x_0 = 0.3$ to find x_1 and x_2, to 4 d.p.	
9 A factory says a proportion 0.25 of its parts are defective. In a sample of 30 parts, 15 are defective. Test, at the 5% significance level, whether the proportion is different from 0.25.	
10 A model boat moves so that its position vector relative to O at time t s is $\mathbf{r} = (3t^2 + 3t)\mathbf{i} + (2t^3 - 4t)\mathbf{j}$ metres. Find the velocity when t = 2, and the speed at that time.	