Day 125	A Level Maths: S Tier 10-a-day

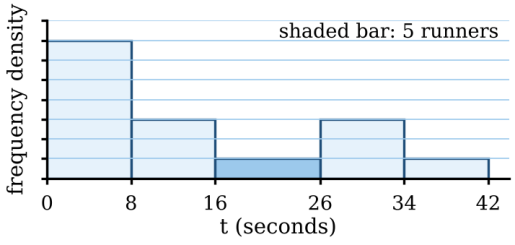
1 A tennis ball is projected from a point O on horizontal ground with speed 24.5 m s^{-1} at an angle θ above the horizontal, where $\tan\theta = \frac{3}{4}$.
Find the horizontal distance between the two points at which the tennis ball is 6.125 m above the ground. Take g = 9.8 m s^{-2}.

2 Solve $5^{2x} - 30 \times 5^{x} + 125 = 0$,
giving each answer exactly and, where not an integer, to 3 s.f.

3 A stone is thrown vertically upwards with speed 7 m s^{-1} from the top of a cliff. The top of the cliff is 87.5 m above the sea.
Find (a) the time taken for the stone to reach the sea, (b) the total distance travelled by the stone, to 3 s.f. Take g = 9.8 m s^{-2}.

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

5 The histogram shows the times, t seconds, of some runners.
Find (a) the total number of runners, (b) an estimate of the number with $9 \leq t < 36$.



Day 125	A Level Maths: S Tier 10-a-day
6 Given that $\cos 3\theta \equiv 4\cos^3\theta - 3\cos\theta$, solve $\cos 3\theta = -2\cos\theta$ for $0 < \theta < 180°$.	
7 $f(x) = 2x^3 + ax^2 + bx + 20$, where a and b are constants. $(x - 2)$ is a factor of f(x), and f(x) leaves remainder -16 when divided by $(x - 3)$. Find a and b, and hence solve $f(x) = 0$.	
8 A sequence is defined by $u_1 = 4$ and $u_{n+1} = \frac{1}{1 - u_n}$. Show that the sequence is periodic and find $\sum_{r=1}^{100} u_r$.	
9 X and Y are independent, X ~ Po(2) and Y ~ Po(3). (a) State the distribution of X + Y. (b) Given that X + Y = 5, find the probability that X = 3.	
10 Line l_1: $\mathbf{r} = \begin{pmatrix} 8 \\ -1 \\ 8 \end{pmatrix} + s\begin{pmatrix} 2 \\ -2 \\ 3 \end{pmatrix}$, line l_2: $\mathbf{r} = \begin{pmatrix} 0 \\ 1 \\ 6 \end{pmatrix} + t\begin{pmatrix} 2 \\ 1 \\ -1 \end{pmatrix}$. Show whether the lines meet, giving the point of intersection if they do, and find the acute angle between them to 1 d.p.	