Day 319 **A Level Maths: S Tier 10-a-day**

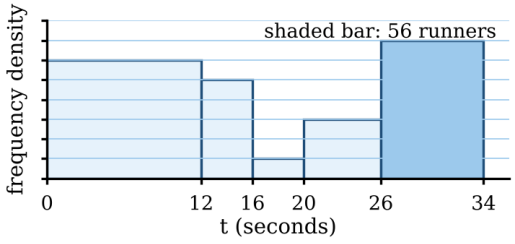
1 The size of a rod is N(78, 10^2) mm. A rod is 'large' if it exceeds 90.
(a) Find the probability that a rod is large.
(b) 15 rods are chosen at random. Find the probability that at least 4 are large.

2 A lift of mass 500 kg, carrying a passenger of mass 70 kg, is supported by a vertical cable. The lift is moving upwards and accelerating at 0.4 m s^{-2}.
Find (a) the force the floor exerts on the passenger, (b) the tension in the cable. Take g = 9.8 m s^{-2}.

3 Solve $x + 2\sqrt{x} - 3 = 0$.

4 A drink cools according to $\theta = 20 + Ae^{-kt}$, where θ °C is the temperature after t minutes. Initially $\theta = 80$, and after 5 minutes $\theta = 62$.
Find A and k, then find when $\theta = 48$ (3 s.f.).

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 $13 \leq t < 30$.



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6 The curve $y = 2x^3\sqrt{28 - x}$, for $0 < x < 28$, has one stationary point. Find its exact coordinates and determine its nature.	
7 (a) Expand $(9 - x)^{-\frac{1}{2}}$ up to and including the term in x^2. (b) Use $x = 0.01$ to estimate $\frac{1}{\sqrt{8.99}}$ to 5 decimal places.	
8 $f(\theta) = \frac{1}{32 + 24\sin\theta + 7\cos\theta}$ (a) Write $24\sin\theta + 7\cos\theta$ 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 A car of mass 800 kg, with engine power 13.84 kW, climbs a straight road with $\sin\alpha = \frac{1}{20}$ against a constant resistance of 300 N. Find (a) the greatest steady speed up the hill, (b) the acceleration at 10 m s^{-1}. Take $g = 9.8$ m s^{-2}.	
10 Find the remainder when x^5 is divided by $(x - 1)(x - 2)$.	