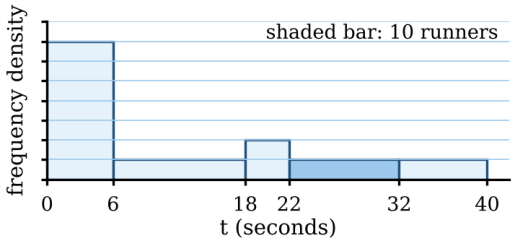
Day 171 **A Level Maths: S Tier 10-a-day**

1 Solve simultaneously:
$x + y = 2$
$x^2 + 2xy + 2y^2 = 13$

2 A radioactive sample has mass $m = m_0e^{-kt}$ grams, t in days.
Initially m = 160 and after 5 days $m = \frac{320}{3}$.
Find k, and the time for the mass to fall to 40 grams, to 3 s.f.

3 $u_{n+1} = \frac{4}{5}u_n + 2$, $u_1 = -14$.
(a) Find the limit L of the sequence.
(b) Find the least n such that $|u_n - L| < 0.001$.

4 The histogram shows the times, t seconds, of some runners.
Find (a) the total number of runners, (b) an estimate of the number with $9 \leq t < 33$.



5 Use a suitable trigonometric identity to find the exact value of

$\int_0^{\pi/3} \sin 3x \cos x \, dx$

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6 A car of mass 1500 kg tows a trailer of mass 500 kg along a horizontal road, with driving force 1800 N. Resistances are 600 N on the car and 400 N on the trailer. (a) Find the tension in the tow bar. At 6.4 m s^{-1} the tow bar breaks. (b) Find the distance between car and trailer when the trailer stops.	
7 (a) Express $20 \sin\theta + 21 \cos\theta$ in the form $R \sin(\theta + \alpha)$, where $R > 0$ and $0 < \alpha < 90°$. Give α to 1 d.p. (b) Hence solve $20 \sin\theta + 21 \cos\theta = 7$ for $0 \leq \theta < 360°$, giving answers to 1 d.p.	
8 The first term of an arithmetic sequence is 4 and its common difference d is non-zero. The 1st, 3rd and 7th terms are the first three terms of a geometric sequence. Find d and the common ratio.	
9 For n = 10 pairs of values: $\Sigma x = 150$, $\Sigma y = 400$, $\Sigma x^2 = 2308$, $\Sigma xy = 5884$. (a) Find the equation of the regression line of y on x. (b) The x values lie between 11 and 20. Estimate y when x = 19 and comment on its reliability.	
10 Particles of mass 11 kg and 9 kg hang on a light string over a smooth fixed pulley. The 11 kg particle is 0.5 m above the ground; the 9 kg one is on the ground. Released from rest, find (a) the tension, (b) the greatest height reached by the 9 kg particle. Take g = 9.8 m s^{-2}.	