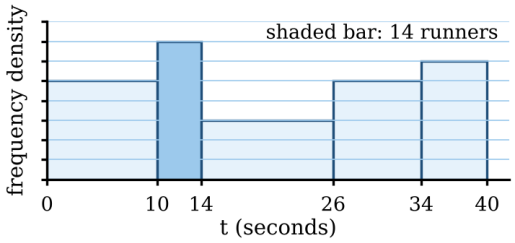
Day 178	A Level Maths: S Tier 10-a-day
1 Three forces $(-7\mathbf{i} - 5\mathbf{j})$ N, $(0\mathbf{i} + k\mathbf{j})$ N and $(8\mathbf{i} - 5\mathbf{j})$ N act on a particle of mass 5 kg. The resultant is parallel to $(\mathbf{i} - 2\mathbf{j})$. Find (a) the value of k, (b) the magnitude of the acceleration of the particle, to 3 s.f.	
2 $X \sim B(10, \frac{1}{4})$. (a) Show that $P(X = r + 1) \div P(X = r) = \frac{10 - r}{r + 1} \times \frac{1}{3}$. (b) Find the most likely value of X and its probability (3 s.f.).	
3 A curve has parametric equations $x = t^2$, $y = 3t^3$. Show that $y^2 = kx^3$ and find k.	
4 A particle P moves with constant acceleration. At t = 0 seconds P is at $(4\mathbf{i} - 5\mathbf{j})$ m with velocity $(6\mathbf{i} - 8\mathbf{j})$ m s^{-1}. At t = 8, P has velocity $(-10\mathbf{i} + 16\mathbf{j})$ m s^{-1}. Find (a) the acceleration of P, (b) the time at which P moves parallel to $(\mathbf{i} - \mathbf{j})$, (c) the position vector of P at that time.	
5 Find the exact value of $\tan(2\cos^{-1}(\frac{3}{5}))$.	

Day 178 **A Level Maths: S Tier 10-a-day**

6 The histogram shows the times, t seconds, of some runners.
Find (a) the total number of runners, (b) an estimate of the number with $11 \leq t < 37$.



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

8 P is a point on the curve $y^2 = x$. Find the exact minimum
distance from P to the point (3, 0), and the x coordinate of P
at which it occurs.

9 $f(x) = \dfrac{-24x + 2}{(1 - 3x)(1 + 3x)}$.
(a) Express f(x) in partial fractions.
(b) Hence expand f(x) in ascending powers of x up to x^3, stating the range of validity.

10 For $0 \leq x \leq \pi$, the curves $y = \sin x$ and $y = \sin 2x$
meet at the origin and at $x = \frac{\pi}{3}$. Find the exact area
enclosed between them for $0 \leq x \leq \frac{\pi}{3}$.