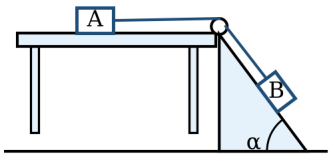
Day 317 **A Level Maths: S Tier 10-a-day**

1 Solve $\sec(3\theta + 25°) = -\frac{2}{\sqrt{3}}$ for $-90° \leq \theta \leq 270°$.

2 The pdf of X is $f(x) = kx(3 - x)$ for $0 \leq x \leq 3$, and 0 otherwise.
(a) Find k.
(b) Find E(X) and Var(X).
(c) Find P(X > 0.75).

3 A sequence is defined by $u_1 = 7$ and $u_{n+1} = \frac{u_n - 1}{3u_n - 1}$.
Show that the sequence is periodic and find $\sum_{r=1}^{100} u_r$.

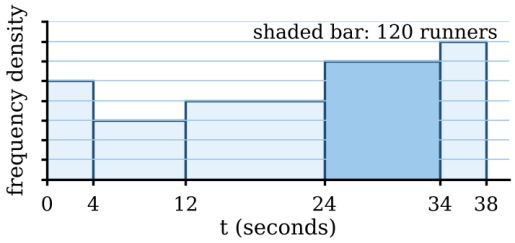
4 Particle A (2 kg) lies on a rough table with $\mu = 0.25$, and is joined by a light string over a smooth pulley (see diagram) to particle B (1 kg) on a smooth slope, $\sin\alpha = \frac{4}{5}$.
Released from rest, the string is cut when B has moved 2.5 m. Find the further distance A slides before stopping.



5 Describe a sequence of two transformations that maps the curve $y = x^2$ onto the curve $y = -3x^2 - 12x - 7$.

Day 317 **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 $5 \leq t < 35$.



7 A curve has parametric equations $x = t^2$, $y = 2t^3 + 12t$.
Find the coordinates of the points on the curve where
the gradient is -9.

8 A particle P moves on a straight line. At time t = 0, P passes through the fixed point O with velocity -60 m s^{-1}. At time t seconds, P has acceleration $(-3t + 23)$ m s^{-2}.
Find (a) the times at which P is at O again, (b) the greatest distance of P from O before it first returns to O.

9 The line l has equation $\mathbf{r} = \begin{pmatrix} 4 \\ -6 \\ 4 \end{pmatrix} + t\begin{pmatrix} -3 \\ 1 \\ -3 \end{pmatrix}$.
The point P has coordinates $(-1, -4, -3)$.
Find the coordinates of the foot F of the perpendicular from P to l, and the exact distance PF.

10 A circle passes through A$(-8, 13)$, B$(4, -3)$ and C$(-10, -1)$. Find its equation.