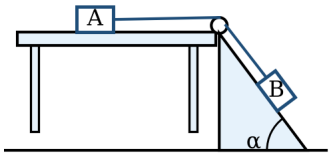
Day 214	A Level Maths: S Tier 10-a-day

1 Solve $2x^3 - 12x^2 + 18x - 8 < 0$.

2 Particle A (5 kg) lies on a rough table with $\mu = 0.4$, and is joined by a light string over a smooth pulley (see diagram) to particle B (10 kg) on a smooth slope, $\sin\alpha = \frac{4}{5}$.

Released from rest, the string is cut when B has moved 1.75 m. Find the further distance A slides before stopping.



3 Find the exact value of $\tan(\tan^{-1}(\frac{3}{8}) + \tan^{-1}(\frac{1}{4}))$.

4 12 recorded masses (grams) have mean 50 and standard deviation 4.
One value was recorded as 51 but should have been 63.
Find the correct mean and the correct standard deviation.

5 The circle $x^2 + y^2 + 4x - 8y - 149 = 0$ passes through $P(-14, 9)$. The tangent at P meets the axes at A and B. Find the area of triangle OAB.

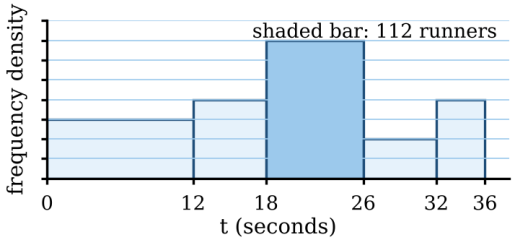
Day 214 **A Level Maths: S Tier 10-a-day**

6 A drink cools according to $\theta = 15 + Ae^{-kt}$, where θ °C is the temperature after t minutes. Initially $\theta = 90$, and after 5 minutes $\theta = 60$.
Find A and k, then find when $\theta = 47$ (3 s.f.).

7 A golf ball is hit from a point O on horizontal ground. It lands 48 m from O, and reaches a maximum height of 16 m above the ground. Find the angle of projection and the speed of projection, to 3 s.f. Take $g = 9.8$ m s^{-2}.

8 Solve $\frac{4}{(x-1)} < \frac{5}{(x-4)}$.

9 The histogram shows the times, t seconds, of some runners.
Find (a) the total number of runners, (b) an estimate of the number with $15 \leq t < 34$.



10 Two drones P and Q move so that, t seconds after launch, their position vectors in metres are

$$\mathbf{r}_P = \begin{pmatrix} 4 \\ -1 \\ -4 \end{pmatrix} + t\begin{pmatrix} 0 \\ 0 \\ -2 \end{pmatrix} \text{ and } \mathbf{r}_Q = \begin{pmatrix} -7 \\ -12 \\ -3 \end{pmatrix} + t\begin{pmatrix} 2 \\ 3 \\ -3 \end{pmatrix}.$$

Find the time at which they are closest and the exact minimum distance between them.