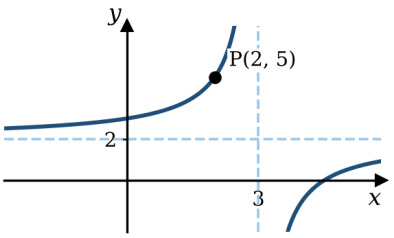
Day 91 **A Level Maths: S Tier 10-a-day**

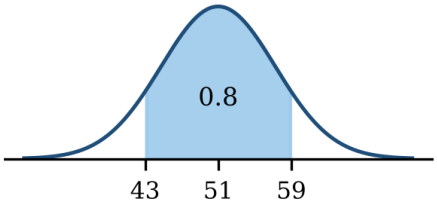
1 Solve the simultaneous equations
$\log_2 x - \log_2 y = 2$
$x + y = 40$

2 The diagram shows the curve C, its asymptotes (dashed) and a point P. C has equation $y = \frac{a}{x + p} + q$. Find a, p and q.



3 Three forces $(-\mathbf{i})$ N, $(3\mathbf{i} + k\mathbf{j})$ N and $(3\mathbf{i} + 3\mathbf{j})$ N act on a particle of mass 3 kg. The resultant is parallel to $(\mathbf{i})$.
Find (a) the value of k, (b) the magnitude of the acceleration of the particle, to 3 s.f.

4 The pdf of $X \sim N(51, \sigma^2)$ is shown; the shaded area is symmetrical.
(a) Find σ. (b) Find $P(X > 62)$.

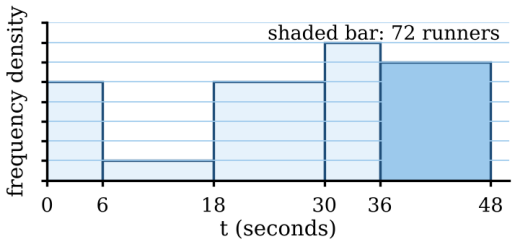


5 A drink cools according to $\theta = 10 + Ae^{-kt}$, where θ °C is the temperature after t minutes. Initially $\theta = 95$, and after 4 minutes $\theta = 61$.
Find A and k, then find when $\theta = 54$ (3 s.f.).

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6 Solve simultaneously:
$x - y = -2$
$3x^2 - 2xy + 3y^2 = 12$

7 The histogram shows the times, t seconds, of some runners.
Find (a) the total number of runners, (b) an estimate of the number with $15 \leq t < 45$.



8 At time t = 0 hours, ship A is at the point with position vector $(28\mathbf{i} + 28\mathbf{j})$ km relative to a port O, and moves with constant velocity $(-\mathbf{i} + \mathbf{j})$ km h^{-1}. Ship B leaves O at t = 0 with constant speed 10 km h^{-1} and intercepts A.
Find (a) the time at which B intercepts A, (b) the velocity of B as a vector.

9 The curve C has equation $x^3 + xy^2 = 80$.
Find the equation of the tangent to C at the point (4, 2),
in the form $ax + by + c = 0$ with integers a, b, c.

10 Find the sum of all the integers from 1 to 336 inclusive that are divisible by 4 or by 6, but not by both.