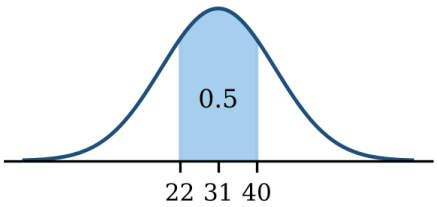
Day 363 **A Level Maths: S Tier 10-a-day**

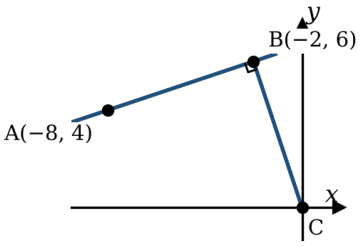
1 Ball A is projected vertically upwards from ground level with speed 37 m s^{-1}. At the same instant, ball B is released from rest 111 m directly above A.
The balls collide. Find (a) the height above the ground at which they collide, (b) the velocity of A just before the collision. Take g = 9.8 m s^{-2}.

2 Solve the simultaneous equations
$\log_2 x - \log_2 y = 1$
$x + y = 9$

3 The pdf of X ~ N(31, σ^2) is shown; the shaded area is symmetrical.
(a) Find σ. (b) Find P(X > 43).



4 In the diagram, line l_1 passes through A and B. Line l_2 is perpendicular to l_1 at B and meets the x-axis at C. Find the coordinates of C and the area of triangle ABC.



5 The curve C has equation $x e^y + 3y = 2$.
Find the equation of the normal to C at the point (2, 0),
in the form ax + by + c = 0 with integers a, b, c.

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6 A stone is projected from level ground with horizontal and vertical velocity components 9.8 and 24.5 m s^{-1}. Find (a) the two times at which it moves at 45° to the horizontal, (b) the horizontal distance between those two points. Take g = 9.8 m s^{-2}.	
7 X ~ B(11, $\frac{3}{10}$). (a) Show that P(X = r + 1) ÷ P(X = r) = $\frac{11 - r}{r + 1} \times \frac{3}{7}$. (b) Find the most likely value of X and its probability (3 s.f.).	
8 Solve $\frac{-3x + 4}{x + 3} \geq -2$.	
9 (a) Express $\frac{5x + 9}{(x + 3)(x + 1)}$ in partial fractions. (b) Hence find the exact value of $\int_0^1 \frac{5x + 9}{(x + 3)(x + 1)}\,dx$.	
10 Solve $x + 1\sqrt{x} - 2 = 0$.	