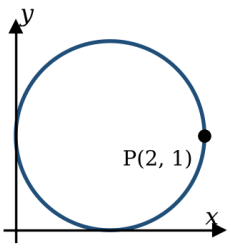
Day 43 **A Level Maths: S Tier 10-a-day**

1 Express $\frac{x^2 + 26x - 31}{(x + 3)(x - 2)^2}$ in the form $\frac{A}{(x + 3)} + \frac{B}{(x - 2)} + \frac{C}{(x - 2)^2}$.

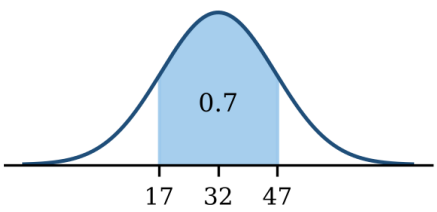
2 The curve $y = ax^n$ passes through (2, 12) and (5, 75).
Find the values of a and n.

3 The circle in the diagram touches both axes and passes through P. Find the equation of the circle, giving it in the form $x^2 + y^2 + ax + by + c = 0$.



4 $f(\theta) = \frac{1}{33 + 21 \sin \theta + 20 \cos \theta}$
(a) Write $21 \sin \theta + 20 \cos \theta$ as $R \sin(\theta + \alpha)$, $R > 0$, $0 < \alpha < 90°$.
(b) Find the greatest and least values of $f(\theta)$, and the smallest positive θ at which the greatest value occurs, to 1 d.p.

5 The pdf of $X \sim N(32, \sigma^2)$ is shown; the shaded area is symmetrical.
(a) Find σ. (b) Find $P(X > 56)$.



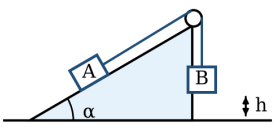
Day 43	A Level Maths: S Tier 10-a-day

6 A particle P moves in a plane. At time t seconds its position vector relative to a fixed origin O is r metres, where
$\mathbf{r} = (-2t^2 + 9t)\mathbf{i} + (-0.5t^2 - 4t)\mathbf{j}$.
Find (a) the value of t at which P is moving parallel to $(\mathbf{i} - \mathbf{j})$, (b) the speed of P at this time (3 s.f. if not exact).

7 A biased coin lands on 'win' with the same unknown probability p each time. It is used 10 times in round 1 and 7 times in round 2.
Given that exactly 7 wins occur altogether, find the probability that exactly 3 of them were in round 1.

8 The function f is defined by $f(x) = 4x^2 - 16x + 20$
for $x \leq k$. Given that k is the greatest value for which
f is one-one, find k, $f^{-1}(x)$, and the domain of f^{-1}.

9 Particles A (5 kg) and B (5 kg) are joined by a light string over a smooth pulley (see diagram). A lies on a smooth slope, $\alpha = 30°$, and B is 3 m above the ground.
Released from rest, find the further distance A moves up the slope after B lands (A does not reach the pulley).



10 The line l has equation $\mathbf{r} = \begin{pmatrix} 6 \\ 4 \\ 4 \end{pmatrix} + t\begin{pmatrix} 3 \\ 3 \\ 0 \end{pmatrix}$.
The point P has coordinates (2, 2, 0).
Find the coordinates of the foot F of the perpendicular from P to l, and the exact distance PF.