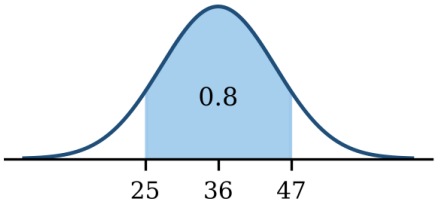
Day 202 **A Level Maths: S Tier 10-a-day**

1 The pdf of $X \sim N(36, \sigma^2)$ is shown; the shaded area is symmetrical.
(a) Find σ. (b) Find $P(X > 57)$.



2 Solve the simultaneous equations
$\log_5 x - \log_5 y = 1$
$x + y = 42$

3 A rare allele is present in 0.5% of a population. A test is positive for 98% of those with it and for 8% of those without it.
Find P(positive) and P(has it | positive).

4 Express $\frac{-6 - 5\sqrt{3}}{6 + 3\sqrt{3}}$ in the form $p + q\sqrt{3}$, where p and q are rational numbers.

5 A particle starts from rest at the top of a rough slope of length 20 m ($\sin\alpha = \frac{4}{5}$, $\mu = 0.4$), then slides along rough horizontal ground with the same μ.
Use energy to find (a) its speed at the foot of the slope (3 s.f.), (b) the distance it slides on the ground. Take $g = 9.8$ m s^{-2}.

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6 A curve is given by $x = y^3 + 3y^2 - 2y$.
Find dy/dx and d^2y/dx^2 when $y = 2$.

7 $g(x) = \sqrt{-x^2 + 2x + 24}$.
Find the largest possible domain of g, and the corresponding range.

8 A sequence is defined by $u_1 = -1$ and
$u_{n+1} = \frac{1}{1 - u_n}$.
Show that the sequence is periodic and find $\sum_{r=1}^{80} u_r$.

9 $f(\theta) = \frac{4}{16 + 12 \sin \theta + 5 \cos \theta}$
(a) Write $12 \sin \theta + 5 \cos \theta$ 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.

10 A uniform rod AB (3 m, 60 N) is hinged at A to a vertical wall and held horizontal by a string BC, C on the wall above A, with $\tan \alpha = \frac{5}{12}$, where α is the angle between string and rod. A 50 N particle hangs at P, AP = 1.5 m.
Find (a) the tension, (b) the magnitude and direction of the hinge force (3 s.f. and 1 d.p.).

