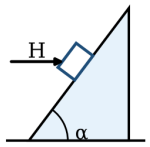
Day 232 **A Level Maths: S Tier 10-a-day**

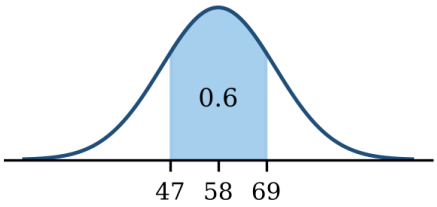
1 A particle of weight 175 N rests on a rough plane inclined at α to the horizontal, where tan $\alpha = \frac{4}{3}$ and $\mu = 0.5$.

A horizontal force H N, in the vertical plane through a line of greatest slope, holds it in equilibrium. Find the range of possible values of H.



2 Solve $e^{2x} - 6 \times e^{x} + 5 = 0$,
giving each answer exactly and, where not an integer, to 3 s.f.

3 The pdf of $X \sim N(58, \sigma^2)$ is shown; the shaded area is symmetrical.
(a) Find σ. (b) Find P(X > 74).



4 $f(x) = x^3 + x^2 - 3x - 14$.
(a) Show that f(x) = 0 has a root α with $2 < \alpha < 3$.
(b) Use Newton-Raphson with $x_0 = 2$ to find x_1 and x_2
to 4 decimal places.

5 The first term of an arithmetic sequence is 2 and its common difference d is non-zero. The 2nd, 4th and 8th terms are the first three terms of a geometric sequence. Find d and the common ratio.

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6 A golf ball is hit from a point O on horizontal ground. It lands 24 m from O, and reaches a maximum height of 6 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}.	
7 (a) Expand $(8 - x)^{\frac{1}{3}}$ up to and including the term in x^2. (b) Use x = 0.02 to estimate $\sqrt[3]{7.98}$ to 5 decimal places.	
8 The circle with equation $(x - 1)^2 + (y + 3)^2 = 169$ passes through P(13, 2). The tangent at P meets the axes at A and B. Find the area of triangle OAB.	
9 X ~ B(120, 0.45). (a) State why a normal approximation is suitable for X. (b) Use a normal approximation to estimate $P(49 \leq X \leq 59)$, to 3 significant figures.	
10 (a) Write $\frac{-x - 2}{(x + 3)^2}$ in the form $\frac{A}{x + 3} + \frac{B}{(x + 3)^2}$. (b) Find the exact value of $\int_0^3 \frac{-x - 2}{(x + 3)^2}\,dx$.	