Day 57 **A Level Maths: S Tier 10-a-day**

1 A geometric series has sum to infinity 50 and second term 8. Find the possible values of the common ratio r and the first term a in each case.

2 For 40 observations x, $\Sigma(x - 30) = 20$ and $\Sigma(x - 30)^2 = 1090$.
(a) Find the mean of x.
(b) Find the standard deviation of x.
(c) Find the value of Σx^2.

3 The first row of a theatre has 20 seats. Each row has 3 more seats than the row in front. Find
(a) the number of seats in row 41,
(b) the least number of rows for at least 1200 seats.

4 (a) Express $6\cos\theta - 8\sin\theta$ in the form $R\cos(\theta + \alpha)$, where $R > 0$ and $0 < \alpha < 90°$. Give α to 1 d.p.
(b) Hence solve $6\cos\theta - 8\sin\theta = -3$ for $0 \leq \theta < 360°$, giving answers to 1 d.p.

5 The table shows the times, t minutes, taken by some runners.
Using linear interpolation, the median is estimated as 24 minutes. Find the value of k.

t (min)	0-10	10-20	20-30	30-40	40-60
Frequency	k	7	5	4	14

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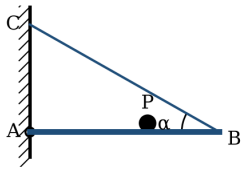
6 Find the exact coordinates of the stationary point of

$y = \frac{\ln x}{x^2}$ for $x > 0$,

and determine its nature.

7 Given that $\sum_{r=1}^{n}(2r - 4) = 868$, find n.

8 A uniform rod AB (3 m, 100 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 40 N particle hangs at P, AP = 0.75 m.
Find (a) the tension, (b) the magnitude and direction of the hinge force (3 s.f. and 1 d.p.).



9 The region bounded by $y = \frac{1}{\sqrt{x + 2}}$, the x-axis and the lines
$x = 0$ and $x = 4$ is rotated through 2π about the x-axis.
Find the exact volume of the solid formed.

10 A particle of weight 105 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.

