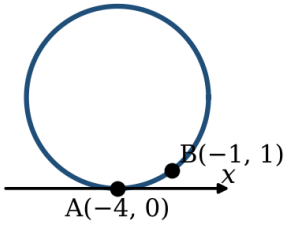
| Day 261 | A Level Maths: A Tier 10-a-day |
|---|---|
| **1** The 4th term of an arithmetic sequence is 32 and the 9th term is 72.<br>Find the first term and common difference, and the sum of the first 30 terms. | |
| **2** A college has 540 students: 200 Arts, 60 Science and 280 Humanities.<br>A stratified sample of size 27 is taken.<br>Find the number of students sampled from each group. | |
| **3** Find the exact value of<br>$\int_0^3 (2x)^2 \, dx$. | |
| **4** Particles A (6 kg) and B (2 kg) hang on a light string over a smooth pulley, A being 2 m above the ground. Released from rest; A lands without rebounding. Find (a) the tension while both move, (b) the greatest height of B above its start. Take g = 9.8. | |
| **5** The curve y = f(x), where $f(x) = \frac{4}{x+2} - 2$, is translated by $\begin{pmatrix} -3 \\ -3 \end{pmatrix}$.<br>Write down the equations of the asymptotes of the new curve, and find where it crosses the x-axis. | |

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**6** $y = e^{2x} - 12e^{x} + 10x$.
Show that the stationary points occur where $e^{x} = 1$ and $e^{x} = 5$, and find the exact y-coordinate of each, with its nature.

**7** The diagram shows a circle that touches the x-axis at A(−4, 0) and passes through B(−1, 1).
Find the equation of the circle.




**8** A curve has equation $x^2 + 2xy + 2y^2 = 9$.
Find the coordinates of the points where the tangent is parallel to the x-axis.

**9** A uniform ladder AB (15 m, 30 kg) rests with A on rough ground, $\mu = 0.3$, and B against a smooth wall, B being 12 m above the ground. A man of mass 50 kg climbs the ladder. How far along the ladder from A can he climb before it slips?

**10** Accidents occur as a Poisson process at a mean rate of 5 per week.
After a change, the number recorded in one week is 13.
Test at the 5% level whether the mean rate has increased.