| Day 319 | A Level Maths: A Tier 10-a-day |
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| **1** The 2nd term of an arithmetic sequence is $-10$ and the 9th term is $-31$.<br>Find the first term and common difference, and the sum of the first 15 terms. | |
| **2** Summary statistics for the daily total rainfall (mm) in the same month are:<br>Heathrow: mean 14.5, standard deviation 1.2;<br>Leuchars: mean 28.5, standard deviation 1.9.<br>Make two comparisons. | |
| **3** A cyclist passes P with speed 2 m $s^{-1}$ and accelerates uniformly. She travels 45 m in the next 10 s, reaching Q. Find (a) her acceleration, (b) her speed at Q, (c) her speed at the midpoint of PQ. Give answers to 3 s.f. if not exact. | |
| **4** A sequence is defined by $u_1 = 5$ and $u_{n+1} = \frac{u_n + 1}{u_n - 1}$.<br>(a) Find $u_2$ and $u_3$.<br>(b) Find $u_{101}$ and $\sum_{r=1}^{101} u_r$. | |
| **5** A curve has equation $x^2 - 4xy + 2x - y = 14$. Show that P$(-3, 1)$ lies on the curve and find the equation of the tangent at P in the form $ax + by + c = 0$ with integer a, b, c. | |

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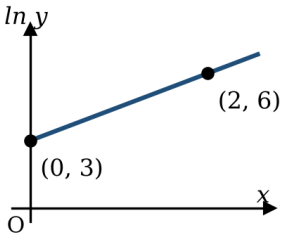
**6** For 40 values of x, the coded variable $y = \frac{x - 30}{4}$ gives

$\Sigma y = 80$ and $\Sigma y^2 = 320$.

Find the mean and standard deviation of x.

**7** The diagram shows the graph of ln y against x for $y = A\,b^x$.

Find the exact values of A and b.




**8** A circle touches both coordinate axes and passes through the point (4, −2). Its centre lies in the fourth quadrant.

Find the equations of the two possible circles.

**9** Use integration by parts to find the exact value of

$\int_1^e x^2 \ln x \, dx$.

**10** Particle A (4 kg) lies on a rough table, $\mu = 0.25$, joined by a light string over a smooth pulley to particle B (6 kg), 0.8 m above the floor. Released from rest; B lands without rebounding. Find (a) the acceleration of A before B lands, (b) the further distance A moves. Take g = 9.8.