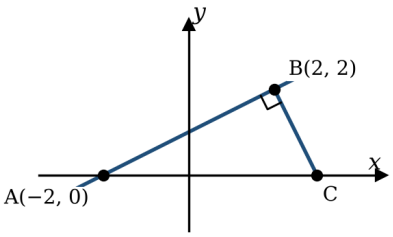
| Day 195 | A Level Maths: S Tier 10-a-day |
|---|---|
| **1** $f(x) = x^3 + ax^2 + bx - 12$, where a and b are constants.<br>$(x + 4)$ is a factor of $f(x)$, and $f(x)$ leaves remainder $-20$ when divided by $(x - 1)$.<br>Find a and b, and hence solve $f(x) = 0$. | |
| **2** The scores in an aptitude test are modelled by $N(27, \sigma^2)$. The probability of a value below 23 is 0.15.<br>(a) Find $\sigma$.<br>(b) Find the probability of a value above 32. | |
| **3** Solve $e^x + 40\,e^{-x} = 13$,<br>giving your answers exactly in terms of natural logarithms. | |
| **4** A bag has 2 green counters and some black counters, n in total.<br>Two are taken without replacement. P(at least one green) $= \frac{13}{28}$. Find n. | |
| **5** $f(\theta) = \frac{2}{19 + 12\sin\theta + 5\cos\theta}$<br>(a) Write $12\sin\theta + 5\cos\theta$ as $R\sin(\theta + \alpha)$, $R > 0$, $0 < \alpha < 90°$.<br>(b) Find the greatest and least values of $f(\theta)$, and the smallest positive $\theta$ at which the greatest value occurs, to 1 d.p. | |

**Day 195** **A Level Maths: S Tier 10-a-day**

**6** Two ships A and B move with constant velocities. At time t = 0 hours, A is at (10**i**) km relative to a fixed origin and B is at (−3**i** − 16**j**) km. A has velocity (−2**i** + 2**j**) km $h^{-1}$ and B has velocity (2**i** + 5**j**) km $h^{-1}$.
Find (a) the time at which the ships are closest together, (b) the least distance between them.

**7** Find the binomial expansion of $(27 - x)^{\frac{1}{3}}$ in ascending powers of x up to and including the term in $x^3$.
State the values of x for which it is valid.

**8** In the diagram, line $l_1$ passes through A and B. Line $l_2$ is perpendicular to $l_1$ at B and meets the x-axis at C. Find the coordinates of C and the area of triangle ABC.




**9** A particle P moves on a straight line. At time t seconds, where t ≥ 0, its velocity is v m $s^{-1}$, where
$v = 72\sqrt{t} - 12t$.
Find (a) the greatest speed of P, (b) the greatest displacement of P from its starting point.

**10** Solve $8\text{cosec}^2\theta - 6\cot\theta - 10 = 0$
for $0 \leq \theta < 360°$, giving answers to 1 d.p.