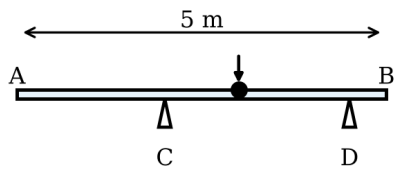
| Day 104 | A Level Maths: B Tier 10-a-day |
|---|---|
| **1** Prove that if n is odd then $n^2 + 3n + 7$ is odd. | |
| **2** Solve $\frac{dy}{dx} = 6xy$, given that $y = 3$ when $x = 0$.<br>Give y in terms of x. | |
| **3** A lift of mass 250 kg is raised and lowered by a vertical cable. The lift accelerates downwards at 0.25 m $s^{-2}$.<br>Take g = 9.8 m $s^{-2}$.<br>Find the tension in the cable. | |
| **4** Find the quotient and the remainder when $4x^3 + 4x^2 - 5x - 3$ is divided by $(2x - 1)$. | |
| **5** A uniform beam AB of length 5 m and mass 10 kg rests horizontally on supports at C and D, where AC = 2 m and BD = 0.5 m.<br>A particle of mass 15 kg is placed on the beam 2 m from B. Take g = 9.8 m $s^{-2}$.<br>Find the reactions at C and D.<br> | |

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**6** Solve $6\sin^2 x + 5\cos x - 7 = 0$ for $0 \leq x \leq 360°$,
giving answers to 1 d.p. where necessary.

**7** The line l has equation $y = -x$. The point P is $(-4, 2)$.
(a) Find the line through P perpendicular to l, as $ax + by + c = 0$ with integer a, b, c.
(b) Find the foot F and the exact distance PF.

**8** A class of width 20, frequency 40, is a bar 4 cm wide, 5 cm tall.
(a) Find the bar height for width 10, frequency 45.
(b) Find the frequency of a 3 cm by 3 cm bar.

**9** Line $l_1$: $\mathbf{r} = \begin{pmatrix} -3 \\ -9 \\ 1 \end{pmatrix} + \lambda \begin{pmatrix} 0 \\ 3 \\ -2 \end{pmatrix}$.
Line $l_2$: $\mathbf{r} = \begin{pmatrix} -4 \\ -2 \\ -1 \end{pmatrix} + \mu \begin{pmatrix} 1 \\ -1 \\ -2 \end{pmatrix}$.
Show that $l_1$ and $l_2$ intersect and find the point.

**10** The masses (kg) of parcels are normally distributed.
$P(X < 85) = 0.0668$ and $P(X > 110) = 0.1587$.
Find the mean and standard deviation (3 s.f.).