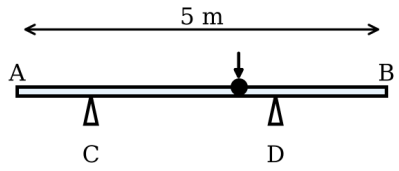
Day 223 **A Level Maths: B Tier 10-a-day**

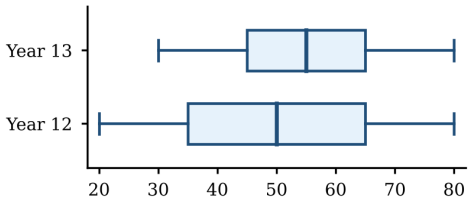
1 A uniform beam AB of length 5 m and mass 60 kg rests horizontally on supports at C and D, where AC = 1 m and BD = 1.5 m.
A particle of mass 5 kg is placed on the beam 2 m from B. Take g = 9.8 m s^{-2}.
Find the reactions at C and D.



2 (a) Write $-2x^2 + 24x - 80$ in the form $a(x + p)^2 + q$.
(b) Write down the coordinates of the maximum point of $y = -2x^2 + 24x - 80$.

3 (a) Show that $x^2 - x - 7 = 0$ can be written as $x = \sqrt{x + 7}$.
(b) Use $x_{n+1} = \sqrt{x_n + 7}$ with $x_0 = 3$ to find x_1, x_2, x_3 to 4 d.p.

4 The box plots show the test scores for two groups.
(a) Find the interquartile range of each group.
(b) Compare the two distributions.

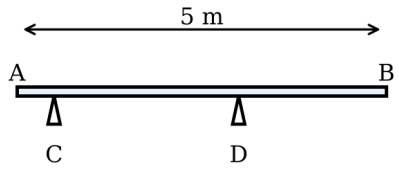


5 Find the x-coordinate(s) of the stationary point(s) of the curve $y = \frac{x}{x^2 + 2}$.

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6 Solve $|4x - 2| = |-2x - 5|$.

7 A uniform plank AB of length 5 m and mass 50 kg rests horizontally on supports at C and D, where AC = 0.5 m and DB = 2 m.
A girl of mass 25 kg walks from D towards B.
Find how far she is from D when the plank is about to tilt.



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

9 Bottle volumes are normal, s.d. 4 ml. Set mean 50 ml; 9 bottles have mean 51.9 ml.
Test at the 5% level whether the true mean is greater than 50.

10 The line l has equation $y = -\frac{1}{2}x + 5$. The point P is $(-1, 8)$.
(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.