Day 234 **A Level Maths: B Tier 10-a-day**

1 The vector $\mathbf{a} = \begin{pmatrix} 2 \\ 6 \\ 9 \end{pmatrix}$.

Find $|\mathbf{a}|$ and a unit vector in the direction of $\mathbf{a}$.

2 Describe the single transformation that maps the graph of $y = f(x)$ onto the graph of:

(a) $y = f(\frac{x}{4})$

(b) $y = 2f(x)$

(c) $y = f(-x)$

3 80 customers: 24 buy coffee, 13 buy tea, 49 do neither.

(a) How many do both?

(b) Given a person who buys tea, find P(this person buys coffee).

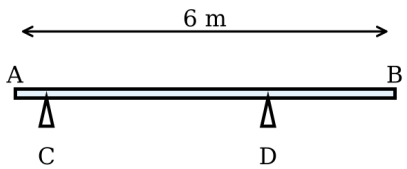
4 A curve has equation $x^2 + 2xy + 2x + 3y^2 + 4y = 3$.

Find $\frac{dy}{dx}$ in terms of x and y, and the gradient at $(-3, 0)$.

5 A uniform plank AB of length 6 m and mass 30 kg rests horizontally on supports at C and D, where AC = 0.5 m and DB = 2 m.

A girl of mass 15 kg walks from D towards B.

Find how far she is from D when the plank is about to tilt.



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6 The table summarises 36 measurements of m.
(a) Estimate the mean.
(b) Estimate the median using linear interpolation.

m (kg)	Frequency
$0 \le m < 20$	4
$20 \le m < 40$	4
$40 \le m < 60$	3
$60 \le m < 80$	11
$80 \le m < 100$	14

7 A ball is projected vertically upwards with speed 21 m s^{-1} from ground level.
Take g = 9.8 m s^{-2}. Find, to 3 significant figures,
(a) the greatest height reached, (b) the time of flight.

8 Given that $y = x^2e^{-x}$,
find $\frac{dy}{dx}$, and its value when x = 1.

9 Solve the equation $5^{2x} - 126\times5^x + 125 = 0$.

10 The curve $y = x^2 - 4x + 3$ and the line $y = -4x + 12$ meet at the points A and B.
Find the coordinates of A and B, and the exact length AB.