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JC MATHEMATICS (H2) STUDY TIPS

**AN EXCELLENT APPROACH TO
TACKLE INEQUALITY INVOLVING
ABSOLUTE BARS ON BOTH SIDES**

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JC_H2Maths_005



- Given that $x, y \in \mathbb{R}$,

(i) $|x| \leq |y| \Rightarrow x^2 \leq y^2$, (ii) $|x| \geq |y| \Rightarrow x^2 \geq y^2$.

EXAMPLE 15

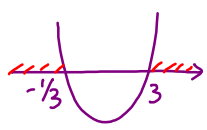
Solve $|2x-1| \geq |x+2|$.

$$(2x-1)^2 \geq (x+2)^2$$

$$(2x-1)^2 - (x+2)^2 \geq 0 \quad \left. \begin{array}{l} \\ \end{array} \right\} a^2 - b^2 = (a-b)(a+b)$$

$$(2x-1-x-2)(2x-1+x+2) \geq 0$$

$$(x-3)(3x+1) \geq 0$$



$$\Rightarrow x \leq -\frac{1}{3} \text{ OR } x \geq 3$$

Quick Practice

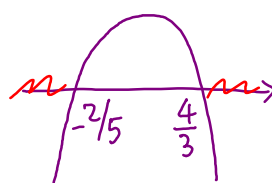
Solve $|x+3| < |4x-1|$.

$$(x+3)^2 < (4x-1)^2$$

$$(x+3)^2 - (4x-1)^2 < 0$$

$$(x+3+4x-1)(x+3-4x+1) < 0$$

$$(5x+2)(4-3x) < 0$$



$$\Rightarrow x < -\frac{2}{5} \text{ OR } x > \frac{4}{3}$$

Good to know

Solve $|x+1| \geq 2$.

$$** \begin{cases} |x+1| \geq 2 \\ (x+1)^2 \geq 2^2 \end{cases}$$

$$(x+1)^2 - 2^2 \geq 0$$

$$(x+1+2)(x+1-2) \geq 0$$

$$(x+3)(x-1) \geq 0$$



$$\therefore x \leq -3 \text{ OR } x \geq 1$$



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Explanation

Here is a hidden trick of mastering the inequality which involves the absolute value bars on both sides. Instead of dealing with more tedious case-by-case scenarios, the ultimate secret is to square both sides of the inequality right away, which instantly strips away the two absolute value bars.

Once the bars disappear, you can simply shift all the terms over to one side to create a difference of squares, smoothly factor them into two basic brackets, and sketch a quick quadratic curve to see exactly which regions of the graph to shade for your final intervals.

Best of all, this clever shortcut is highly versatile; it works equally well even when an absolute value is stacked up against a positive number, allowing you to follow the exact same rhythm from start to finish.

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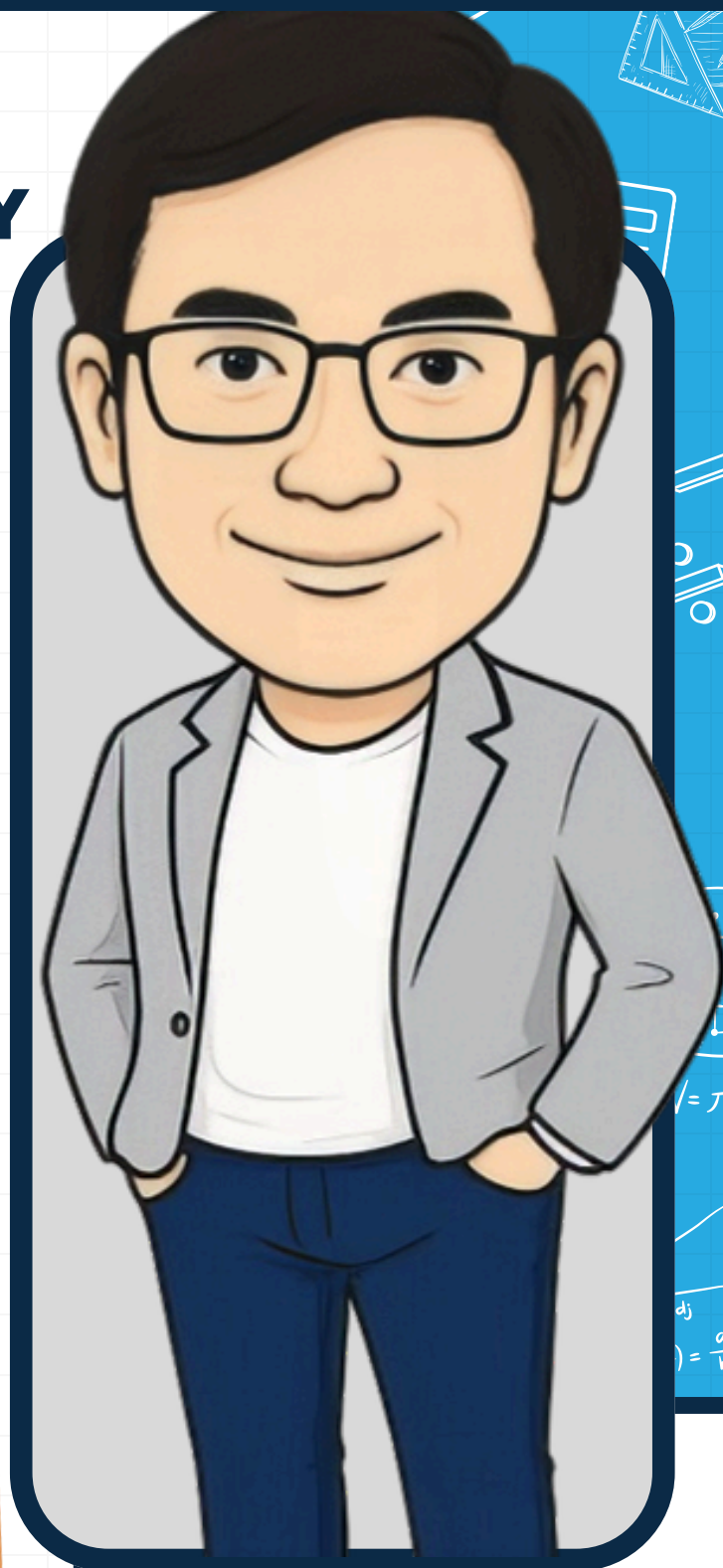
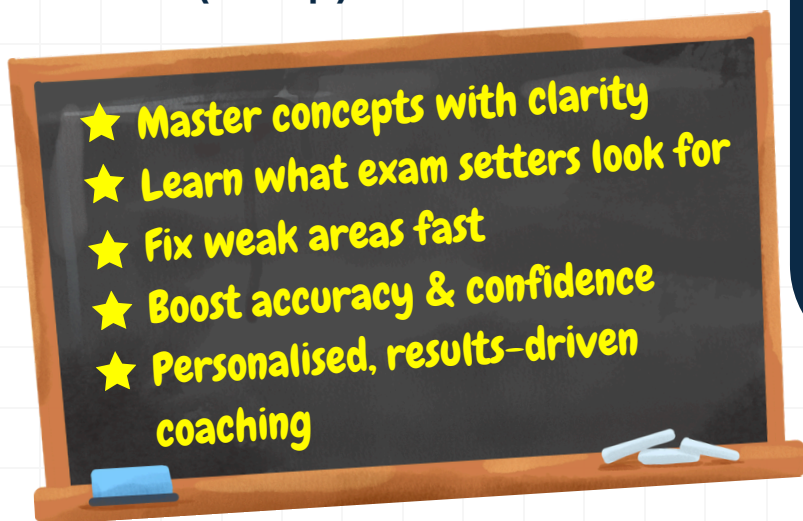
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