Inequality Notation

Starter

1. **(Review of last lesson)** A quadratic curve of the form $y = x^2 + bx + c$ has its vertex at the point (2, 3). Find its equation.

Working: Vertex is (2, 3): $y = (x-2)^2 + 3$

N.B. No number in front of bracket because coefficient of x^2 is 1

Expanding gives $y = x^2 - 4x + 7$

2. **(Review of last lesson)** By completing the square, find the coordinates of the vertex of the curve $y = 13 + 8x - 2x^2$ and state whether it is a maximum or minimum.

Working:
$$\begin{aligned} y = 13 + 8x - 2x^2 &\equiv 13 - 2\left[x^2 - 4x\right] \\ &= 13 - 2\left[(x-2)^2 - 4\right] \\ &= 13 - 2(x-2)^2 + 8 \\ &= 21 - 2(x-2)^2 \end{aligned}$$

Coordinates of the vertex are (2, 21)

The coefficient of x^2 is negative so the parabola is concave-down — therefore it is a maximum

3. **(Review of last lesson)**

(a) Write $3x^2 - 24x + 11$ in completed square form and state the coordinates of the vertex of the graph $y = 3x^2 - 24x + 11$.

(b) State, without any further working, for what values of k is the curve $y = 3x^2 - 24x + 11 + k$ completely above the $x-$axis.

Working: (a)
$$\begin{aligned} 3x^2 - 24x + 11 &\equiv 3\left[x^2 - 8x\right] + 11 \\ &= 3\left[(x-4)^2 - 16\right] + 11 \\ &= 3(x-4)^2 - 37 \end{aligned}$$

Vertex is at (4, −37)

(b) The least value is −37 so the graph has to move up 37 units

$k > 37$

E.g. 1 Copy and complete the table:

Inequality	Set notation	Interval notation
x > 4		
	{x : x ≥ −3} ∩ {x : x ≤ 8}	
x ≤ 6		
		(-∞, 9] ∪ [15, ∞)

Working:

Inequality	Set notation	Interval notation
$x > 4$	$\{x : x > 4\}$	$(4, \infty)$
$-3 \leq x \leq 8$	$\{x : x \geq -3\} \cap \{x : x \leq 8\}$	$[-3, 8]$
$x \leq 6$	$\{x : x \leq 6\}$	$(\infty, 6]$
$x < 9, x > 15$	$\{x : x < 9\} \cup \{x : x \geq 15\}$	$(-\infty, 9] \cup [15, \infty)$

Video: Solving doubles inequalities

Solutions to Starter and E.g.s

Exercise
p8 1B Qu 1iac, 2iac, 3iac, 4iac, 5iac