

LINEAR AND QUADRATIC INEQUALITIES



Objective

- To solve linear and quadratic inequalities.

Examples

5.1e. Solve the following linear inequalities:

(a) $2(6 - 5x) > 3x + 1$

$$2(6 - 5x) > 3x + 1$$

$$12 - 10x > 3x + 1$$

$$11 > 13x$$

$$\frac{11}{13} > x$$

(b) $-\frac{3}{4}w \leq 2$

$$-\frac{3}{4}w \leq 2$$

$$-3w \leq 8$$

$$w \geq -\frac{8}{3}$$

When multiplying or dividing by a negative we flip the direction of the inequality sign.

5.1p. Solve the following linear inequalities:

(a) $\frac{2y+1}{5} < 1 - y$

(b) $-\frac{1}{5}t + 3 < 5$



TOP TIP

- Always sketch the graph when solving a quadratic inequality.



5.2e. Solve the following quadratic inequalities:

(a) $x^2 - 10x + 24 \leq 0$

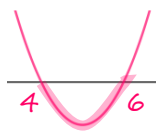
$$x^2 - 10x + 24 \leq 0$$

$$(x - 4)(x - 6) \leq 0$$

Critical values:

$$x = 4, x = 6$$

$$\therefore 4 \leq x \leq 6$$



(b) $x^2 - 4x - 21 > 0$

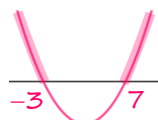
$$x^2 - 4x - 21 > 0$$

$$(x + 3)(x - 7) > 0$$

Critical values:

$$x = -3, x = 7$$

$$\therefore x < -3 \text{ or } x > 7$$



5.2p. Solve the following quadratic inequalities:

(a) $x^2 - 2x - 15 \leq 0$

(b) $x^2 + 2x - 35 \geq 0$

5.3e. Solve the following quadratic inequalities:

(a) $2y^2 + 10y + 17 < 5 - 3y - y^2$

$$2y^2 + 10y + 17 < 5 - 3y - y^2$$

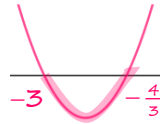
$$3y^2 + 13y + 12 < 0$$

$$(y + 3)(3y + 4) < 0$$

Critical values:

$$y = -3, y = -\frac{4}{3}$$

$$\therefore -3 \leq y \leq -\frac{4}{3}$$



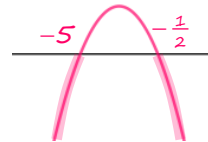
(b) $(5 - k)(2k + 1) \leq 0$

$$(5 - k)(2k + 1) \leq 0$$

Critical values:

$$k = 5, k = -\frac{1}{2}$$

$$\therefore k \leq -\frac{1}{2} \text{ or } k \geq 5$$



5.3p. Solve the following quadratic inequalities:

(a) $r^2 + 5r - 4 \leq 5r^2 - 6r + 2$

(b) $(3 - 2p)(5p - 1) > 0$

Quickfire Questions

5.4 Represent each of the inequalities below on a number line:

(a) $x > 5$

(b) $x \leq -2$

(c) $-3 \leq x < 4$

(d) $x < -1$ or $x \geq 3$

Example

5.5e. Find the range of values for which

$$2x^2 + 7x \leq 15 \text{ and } 7 - 4x < 19$$

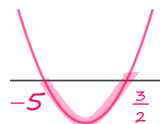
$$2x^2 + 7x - 15 \leq 0$$

$$(x + 5)(2x - 3) \leq 0$$

Critical values:

$$x = -5, x = \frac{3}{2}$$

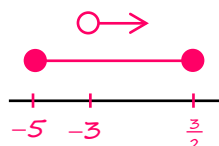
$$\therefore -5 \leq x \leq \frac{3}{2}$$



$$7 - 4x < 19$$

$$-12 < 4x$$

$$-3 < x$$



$$\therefore -3 < x \leq \frac{3}{2}$$

5.5p. Find the range of values for which

$$2y^2 > 13y + 7 \text{ and } \frac{1}{4}y + 9 \geq 7$$
