



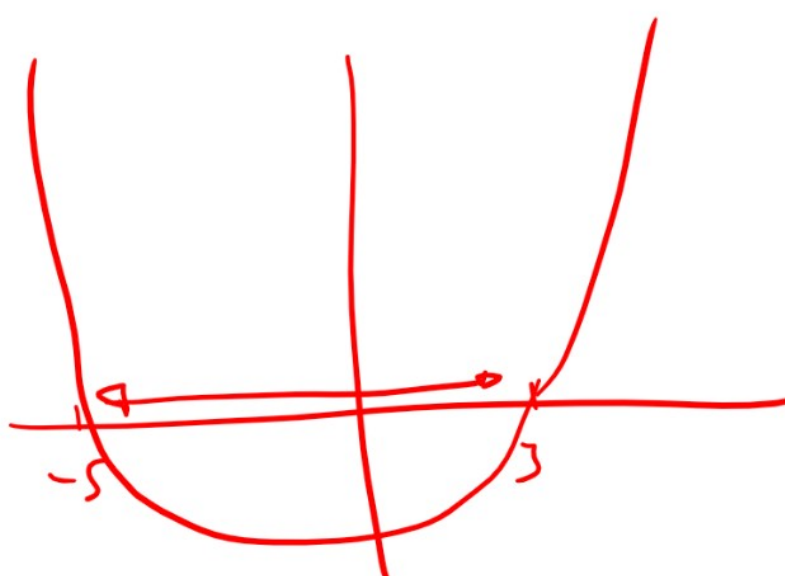
## Quadratic Inequalities Exam Practice

Q1. Solve the inequality:

$$x^2 + 2x - 15 < 0$$

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

$$x = -5, 3$$



$$-5 < x < 3$$

Answer:  $-5 < x < 3$   
(3 marks)

Q2. Solve the inequality:

$$x^2 - 2x - 80 < 0$$

$$(x + 8)(x - 10) < 0$$

$$x = -8, 10$$

$$-8 < x < 10$$

Answer:  $-8 < x < 10$   
(3 marks)



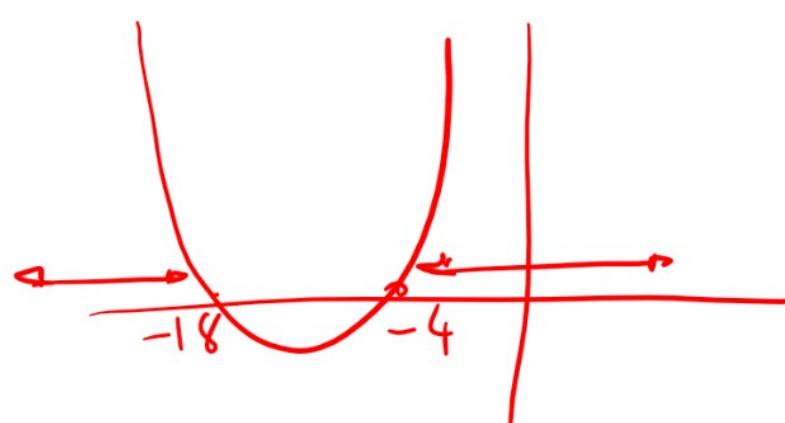
Q3. Solve the inequality:

$$x^2 + 22x + 72 > 0$$

$$(x+4)(x+18) > 0$$

$$x = -4, x = -18$$

$$x < -18, x > -4$$



Answer:  $x < -18, x > -4$   
(3 marks)

Q4. Solve the inequality:

$$2x^2 - x - 28 \geq 0$$

$$(2x+7)(x-4) \geq 0$$

$$x = -\frac{7}{2}, 4$$

$$x \leq -\frac{7}{2}, x \geq 4$$

Answer:  $x \leq -\frac{7}{2}, x \geq 4$   
(3 marks)



Q5. Solve the inequality:

$$3x^2 < 32x - 20$$

$$3x^2 - 32x + 20 < 0$$

$$(3x - 2)(x - 10) < 0$$

$$x = \frac{2}{3}, 10$$

$$\frac{2}{3} < x < 10$$

Answer:  $\frac{2}{3} < x < 10$   
(3 marks)

Q6. Solve the inequality:

$$4a^2 - 6a - 40 \leq 0$$

$$2a^2 - 3a - 20 \leq 0$$

$$(2a + 5)(a - 4) \leq 0$$

$$a = -\frac{5}{2}, 4$$

$$-\frac{5}{2} \leq a \leq 4$$

Answer:  $-\frac{5}{2} \leq a \leq 4$   
(3 marks)





Q7. Solve the inequality:

$$25x^2 + 275x + 750 < 0$$

$$x^2 + 11x + 30 < 0$$

$$(x + 5)(x + 6) < 0$$

$$x = -5, -6$$

$$-6 < x < -5$$

Answer:  $-6 < x < -5$   
(3 marks)

Q8. a) Show that the inequality,  $5 + \frac{29}{x} > \frac{6}{x^2}$

can be written in the form  $5x^2 + 29x - 6 > 0$

$$5x^2 + 29x > 6 \quad (\times \text{ both sides by } x^2)$$

$$5x^2 + 29x - 6 > 0$$

Answer: \_\_\_\_\_  
(2 marks)

b) Hence solve the inequality  $5 + \frac{29}{x} > \frac{6}{x^2}$

$$(5x - 1)(x + 6) > 0$$

$$x = \frac{1}{5}, -6$$

$$x < -6, x > -\frac{1}{5}$$

Answer:  $x < -6, x > -\frac{1}{5}$   
(3 marks)



Q9. Solve the inequality:

$$4x^2 + 12x - 27 < 7x^2 + 53x - 87$$

$$0 < 3x^2 + 41x + 60$$

$$0 < (3x + 5)(x + 12)$$

$$x = -\frac{5}{3}, -12$$

$$x < -12, x > -\frac{5}{3}$$

Answer:  $x < -12, x > -\frac{5}{3}$   
(4 marks)

### Applied Mixed Practice Problems

Q10. Find the range of numbers which satisfy both these inequalities:

$$b^2 - 36 < 0 \text{ and } 2b^2 - 2b - 12 \geq 0$$

$$(b - 6)(b + 6) < 0 \quad \text{and} \quad (2b - 6)(b + 2) \geq 0$$

$$b = 6, -6$$

$$b = 3, -2$$

$$-6 < b < 6$$

and

$$b \leq -2, b \geq 3$$

$$\Rightarrow -6 < b \leq -2 \text{ or } 3 \leq b < 6$$

Answer:  $-6 < b \leq -2 \text{ or } 3 \leq b < 6$   
(4 marks)





Q11. A cannon ball is fired from a gun which is mounted on a platform above the ground.

The height  $h$  of the ball in metres above the ground can be modelled by the quadratic equation,  $h = -t(t - 5) + 1.5$ , where  $t$  is the time in seconds after it is launched.

a) State the height of the platform.

$$t = 0 \Rightarrow h = 1.5$$

Answer: 1.5m  
(1 mark)

b) According to the model, how many seconds does the ball spend above a height of 3.75 meters above the ground?

$$-t(t - 5) + 1.5 > 3.75$$

$$-t^2 + 5t + 1.5 > 3.75$$

$$0 > t^2 - 5t + 2.25$$

$$0 > 4t^2 - 20t + 9$$

$$0 > (2t - 1)(2t - 9)$$

$$t = \frac{1}{2}, \frac{9}{2}$$

$$\frac{1}{2} < t < \frac{9}{2} \Rightarrow 4 \text{ seconds } \left(\frac{9}{2} - \frac{1}{2}\right)$$

Answer: 4 seconds  
(4 marks)



Q12. Find the range of whole numbers which satisfy the inequality  
 $4y^2 - 15y + 7 \leq 0$

Does not factorise,  $\Rightarrow$  use quadratic formula

$$\Rightarrow \frac{-(-15) \pm \sqrt{(-15)^2 - 4(4)(7)}}{2(4)}$$

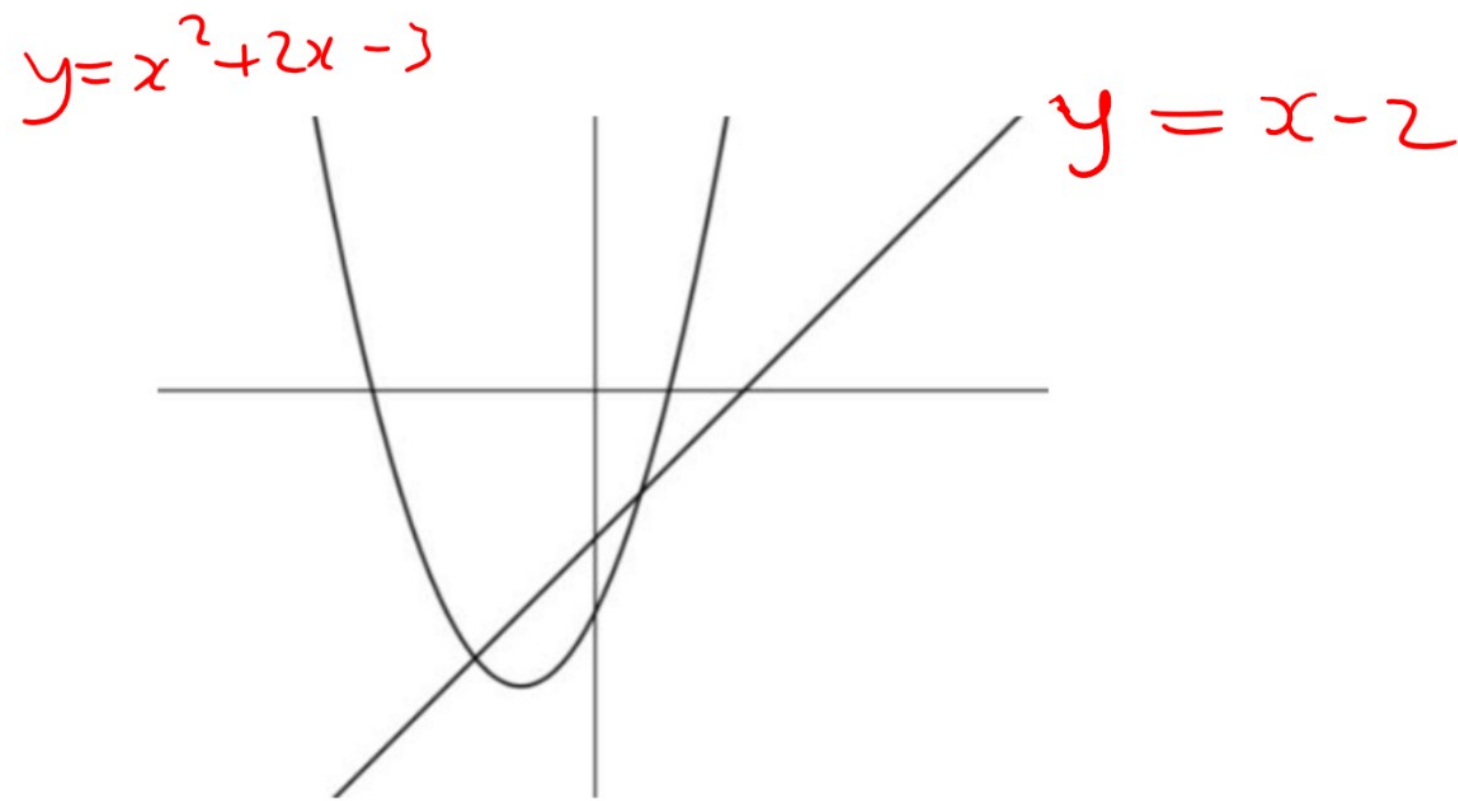
$$\Rightarrow y = 0.54 \dots; 3.203 \dots$$

$$\Rightarrow 0.54 \leq y \leq 3.203 \dots$$

$$\Rightarrow y = 1, 2, 3$$

Answer:  $y = 1, 2, 3$   
(4 marks)

Q13. Below is a sketch of the line  $x - y = 2$  and the curve  $y = x^2 + 2x - 3$ .



- a) Find an equality in  $x$  which describes when the curve is exactly below the line.

$$\begin{aligned} & \text{(curve)} \qquad \qquad \qquad \text{(line)} \\ & x^2 + 2x - 3 < x - 2 \\ & x^2 + x - 1 < 0 \end{aligned}$$

Answer:  $x^2 + x - 1 < 0$   
(2 marks)

- b) Hence, or otherwise, find the set of values of  $x$  for which the curve is under the line. Give your answers to 1 decimal place.

using quadratic formula:

$$\frac{-1 \pm \sqrt{1^2 - 4(1)(-1)}}{2(1)}$$

$$x = 0.618, -1.618$$

$$-1.618 < x < 0.618$$

Answer:  $-1.6 < x < 0.6$   
(3 marks)