Quadratic Inequalities - Worksheet

Skill

Group A - Solving inequalities by factorising

Solve the following inequalities:

1) $x^2 + 8x + 12 < 0$

2) $x^2 - 8x + 12 \leq 0$

3) $x^2 + 4x - 12 > 0$

4) $x^2 - 4x - 12 \geq 0$

5) $x^2 + 4x - 21 < 0$

6) $x^2 + 10x + 21 \leq 0$

7) $x^2 + 8x + 16 \geq 0$

8) $x^2 - 8x + 16 > 0$

9) $x^2 - 36 < 0$

10) $x^2 \leq 81$

11) $x^2 < 100$

12) $x^2 + 5x + 2 \leq -4$

Group B - Solving inequalities using the quadratic formula

Solve the following inequalities. Round all solutions to 2 decimal places:

1) $3x^2 - 6x + 2 \leq 0$

2) $3x^2 + 6x - 2 < 0$

3) $3x^2 + 2x - 6 > 0$

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

5) $2x^2 - x - 4 < 0$

6) $5x^2 - 2x - 6 < 0$

7) $5x^2 - 6x - 2 \leq 0$

8) $x^2 - x - 4 > 0$

9) $x^2 - x - 4 < 0$

10) $x^2 + x - 4 \leq 0$

11) $x^2 + x - 4 \geq 0$

12) $x^2 + x \leq 4$

Quadratic Inequalities - Worksheet

Group C - Listing integer values

Solve the following inequalities, sketch the graph to highlight the solution then list the integer values that are in the solution set:

1) $x^2 + 10x + 16 < 0$

2) $x^2 - 10x + 16 \leq 0$

3) $x^2 - 6x - 16 \leq 0$

4) $x^2 + 6x - 16 < 0$

5) $x^2 - 16 < 0$

6) $x^2 \leq 16$

7) $x^2 + 10x + 10 <- 6$

8) $2x^2 + 11x + 5 \leq 0$

9) $2x^2 - 11x + 5 < 0$

10) $2x^2 + 9x - 5 < 0$

11) $2x^2 - 9x - 5 \leq 0$

12) $2x^2 - 9x - 3 \leq 2$

Group D - Representing on a number line

Solve the inequalities, sketch the graph to highlight the solution then represent the solution sets on a number line:

1) $x^2 + 11x + 24 < 0$

2) $x^2 - 11x + 24 \leq 0$

3) $x^2 + 11x + 24 > 0$

4) $x^2 - 5x - 24 \leq 0$

5) $x^2 + 5x - 24 \geq 0$

6) $x^2 + 6x + 9 \leq 0$

7) $x^2 - 6x + 9 \geq 0$

8) $x^2 - 9 > 0$

9) $x^2 < 9$

10) $x^2 - 1 \leq 8$

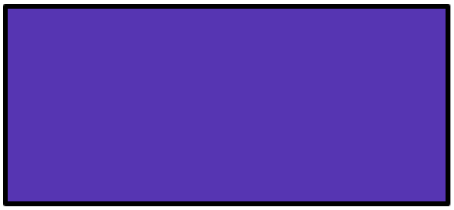
11) $2x^2 + 13x + 6 < 0$

12) $2x^2 + 11x - 6 \leq 0$

Quadratic Inequalities - Worksheet

Applied

1) **(a)** This rectangle has an area less than $14cm^2$.
Calculate the range of values of x.



(b) Sam says there are two possible values of x. Explain why Sam is wrong.

2) **(a)** John thinks the solution to $x^2 > 64$ is 8. Explain why John is wrong.

(b) Represent the correct solution on a number line.

3) Harvey says it is not possible to solve the inequality $10x^2 + 3x + 8 < 0$.
Lily says it is possible to solve this inequality but all values satisfy it. Who is correct and why?

4) **(a)** The width of the garden is 20 metres shorter than the length. The area is less than or equal to $96m^2$. Write an inequality to represent the area of the garden.

(b) What is the largest possible length of the garden?

Quadratic Inequalities - Exam Questions

1) **(a)** Find the interval for which $x^2 + 13x + 36 < 0$

.....

(3)

(b) Solve $x^2 - 13x + 40 \leq 0$

.....

(3)

(6 marks)

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2) **(a)** Solve $2x^2 - 8x + 7 \leq 0$

.....

(3)

(b) List the integer values that satisfy part (a).

.....

(2)

(5 marks)

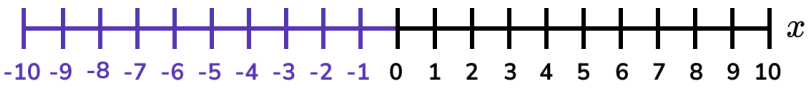
Quadratic Inequalities - Exam Questions

3) **(a)** Solve $(x + 4)(x - 1) \geq (x + 1)^2$

.....

(3)

(b) Represent the solution which satisfies part (a) on the number line



(2)

(5 marks)

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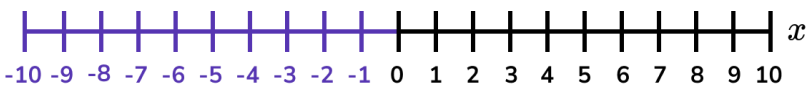
4) **(a)** Solve $x^2 - 3x \geq 10$

.....

(3)

(b) Represent your solution to part (a) on the number line



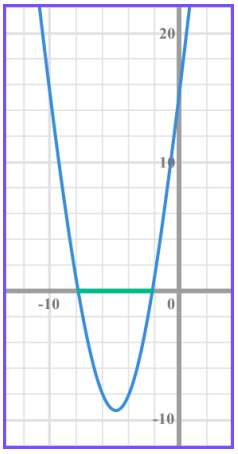
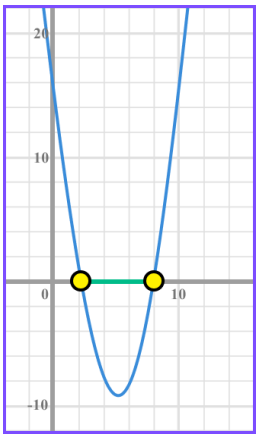
(1)

(4 marks)

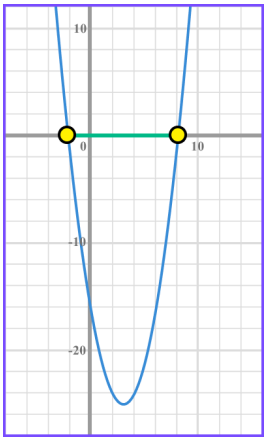
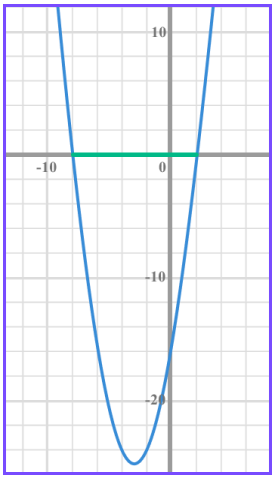
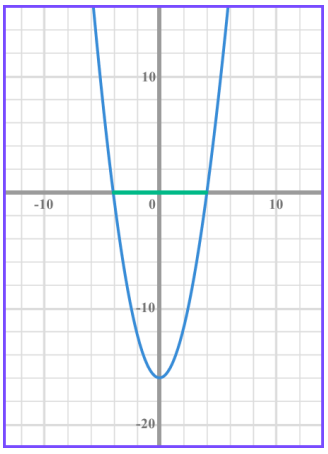
Quadratic Inequalities - Answers

	Question	Answer
	Skill Questions	
Group A	Solve the following inequalities: **1)** $x^2 + 8x + 12 < 0$ **2)** $x^2 - 8x + 12 \leq 0$ **3)** $x^2 + 4x - 12 > 0$ **4)** $x^2 - 4x - 12 \geq 0$ **5)** $x^2 + 4x - 21 < 0$ **6)** $x^2 + 10x + 21 \leq 0$ **7)** $x^2 + 8x + 16 \geq 0$ **8)** $x^2 - 8x + 16 > 0$ **9)** $x^2 - 36 < 0$ **10)** $x^2 \leq 81$ **11)** $x^2 < 100$ **12)** $x^2 + 5x + 2 \leq -4$	**1)** $-6 < x < -2$ **2)** $2 \leq x \leq 6$ **3)** $x < -6$ and $x > 2$ **4)** $x \leq -2$ and $x \geq 6$ **5)** $-7 < x < 3$ **6)** $-3 \leq x \leq -7$ **7)** All values of x **8)** All values of x except $x = 4$ **9)** $-6 < x < 6$ **10)** $-9 \leq x \leq 9$ **11)** $-10 < x < 10$ **12)** $-3 \leq x \leq -2$
Group B	Solve the following inequalities: **1)** $3x^2 - 6x + 2 \leq 0$ **2)** $3x^2 + 6x - 2 < 0$ **3)** $3x^2 + 2x - 6 > 0$ **4)** $2x^2 - 4x + 1 < 0$ **5)** $2x^2 - x - 4 < 0$ **6)** $5x^2 - 2x - 6 < 0$	**1)** $0.43 \leq x \leq 1.58$ **2)** $-2.29 < x < 0.29$ **3)** $x < -1.79$ and $x > 1.12$ **4)** $0.29 < x < 1.71$ **5)** $-1.19 < x < 1.69$ **6)** $-0.91 < x < 1.31$

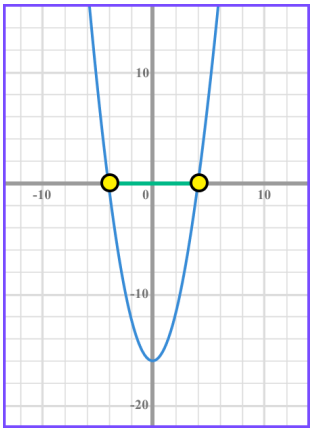
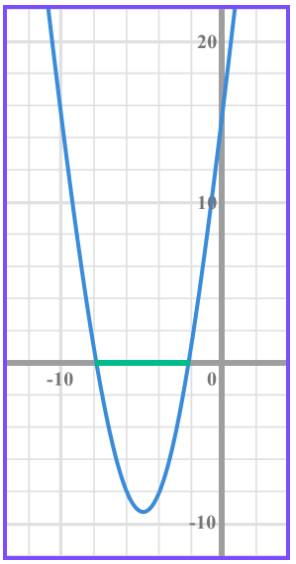
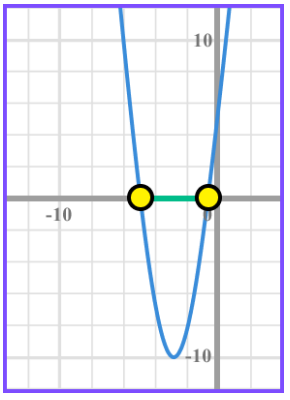
Quadratic Inequalities - Answers

Group B contd	**7)** $5x^2 - 6x - 2 \leq 0$ **8)** $x^2 - x - 4 > 0$ **9)** $x^2 - x - 4 < 0$ **10)** $x^2 + x - 4 \leq 0$ **11)** $x^2 + x - 4 \geq 0$ **12)** $x^2 + x \leq 4$	**7)** $-0.27 \leq x \leq 1.47$ **8)** $x <- 1.56$ and $x > 2.56$ **9)** $-1.56 < x < 2.56$ **10)** $-2.56 \leq x \leq 1.56$ **11)** $x \leq- 2.56$ and $x \geq 1.56$ **12)** $-2.56 \leq x \leq 1.56$
Group C	Solve the following inequalities, sketch the graph to highlight the solution then list the integer values that are in the solution set. **1)** $x^2 + 10x + 16 < 0$ **2)** $x^2 - 10x + 16 \leq 0$	**1)** $-7.\ -6,\ -5,\ -4,\ -3$  **2)** $2,\ 3,\ 4,\ 5,\ 6,\ 7,\ 8$ 

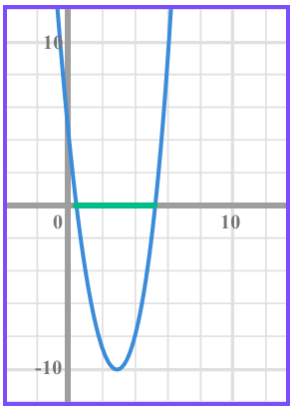
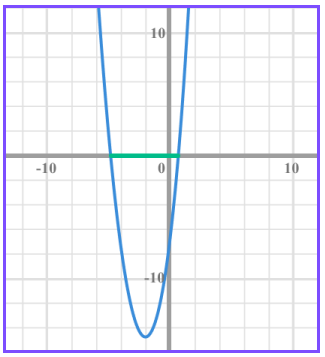
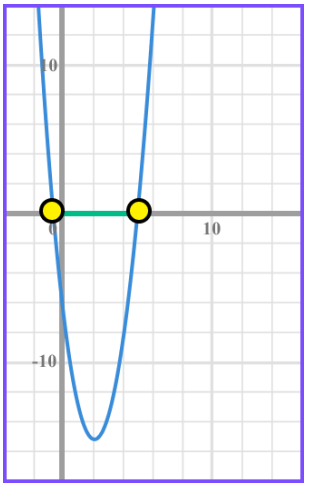
Quadratic Inequalities - Answers

Group C contd	**3)** $x^2 - 6x - 16 \leq 0$	**3)** $-2, -1, 0, 1, 2, 3, 4, 5, 6, 7, 8$ 
	4) $x^2 + 6x - 16 < 0$	**4)** $-7, -6, -5, -4, -3, -2, -1, 0, 1$ 
	5) $x^2 - 16 < 0$	**5)** $-3, -2, -1, 0, 1, 2, 3$ 

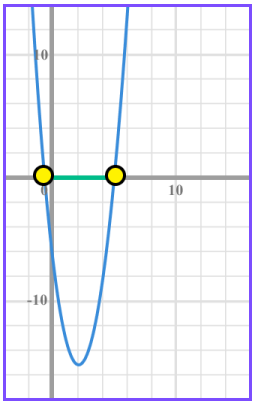
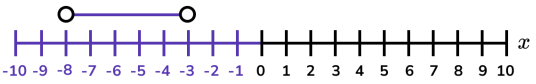
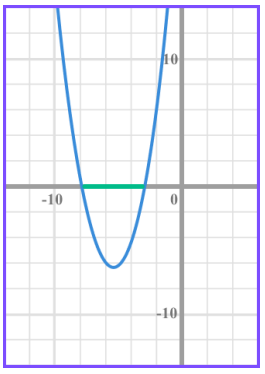
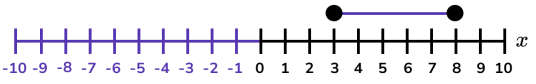
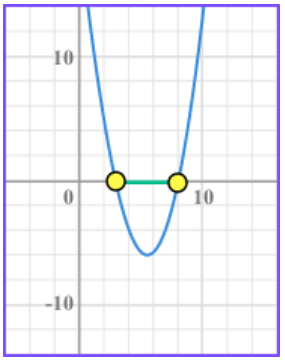
Quadratic Inequalities - Answers

Group C contd	**6)** $x^2 \leq 16$	**6)** $-4, -3, -2, -1, 0, 1, 2, 3, 4$ 
	7) $x^2 + 10x + 10 <- 6$	**7)** $-7. -6, -5, -4, -3$ 
	8) $2x^2 + 11x + 5 \leq 0$	**8)** $-5, -4, -3, -2, -1$ 

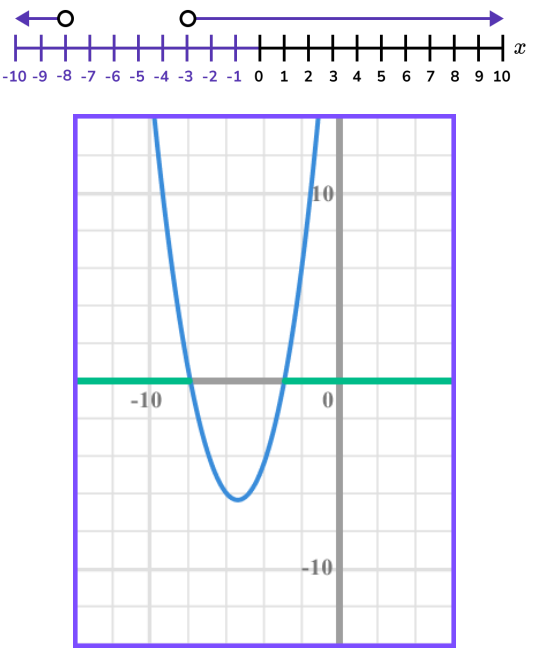
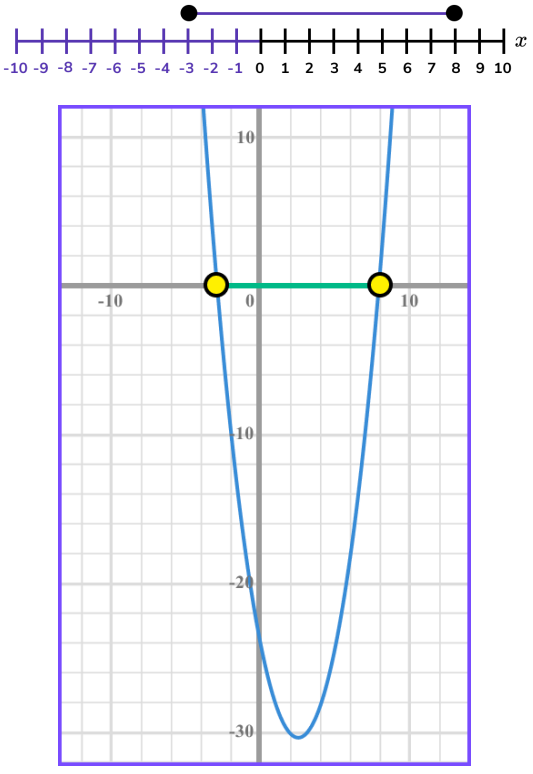
Quadratic Inequalities - Answers

Group C	**9)** $2x^2 - 11x + 5 < 0$	**9)** $1,\ 2,\ 3,\ 4$ 
	10) $2x^2 + 9x - 5 < 0$	**10)** $-4,\ -3,\ -2,\ -1,\ 0$ 
	11) $2x^2 - 9x - 5 \leq 0$	**11)** $0,\ 1,\ 2,\ 3,\ 4,\ 5$ 

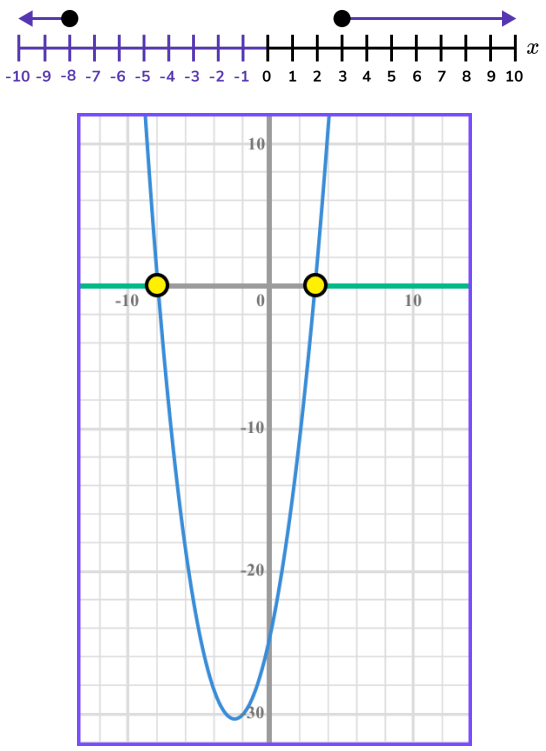
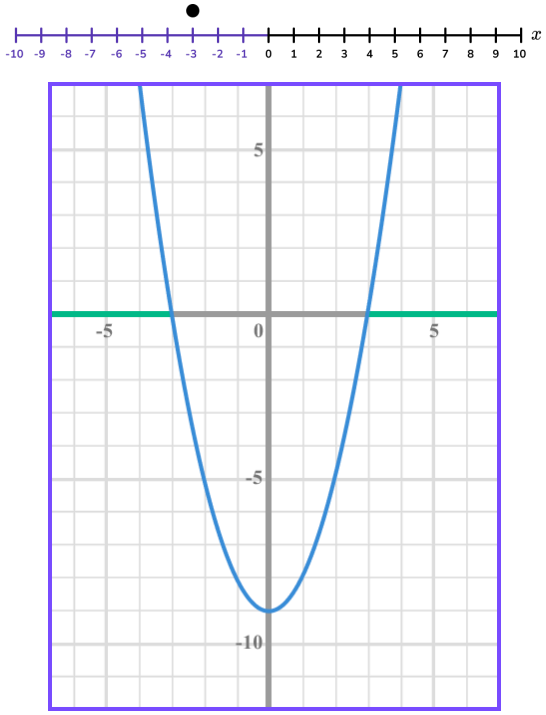
Quadratic Inequalities - Answers

Group C	**12)** $2x^2 - 9x - 3 \leq 2$	**12)** 0, 1, 2, 3, 4, 5 
Group D	Represent the solution sets on a number line **1)** $x^2 + 11x + 24 < 0$ **2)** $x^2 - 11x + 24 \leq 0$	**1)**   **2)**  

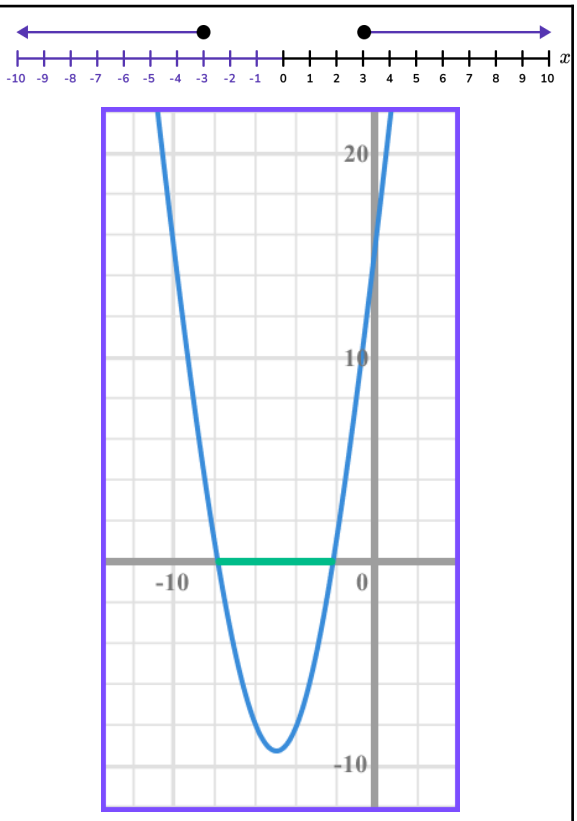
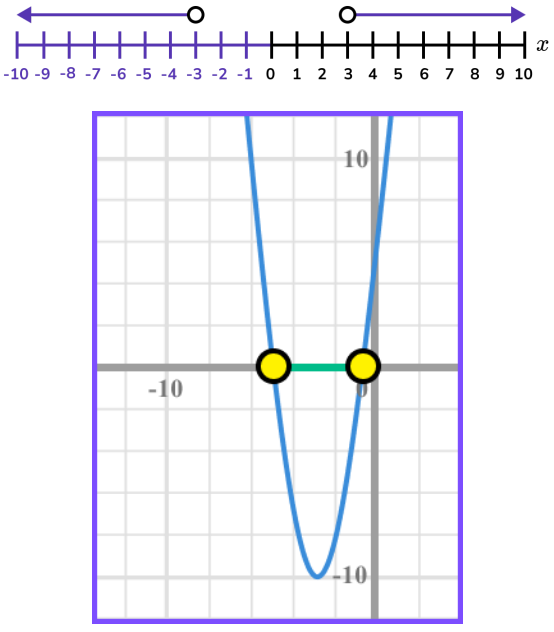
Quadratic Inequalities - Answers

Group D	**3)** $x^2 + 11x + 24 > 0$	**3)** 
	4) $x^2 - 5x - 24 \leq 0$	**4)** 

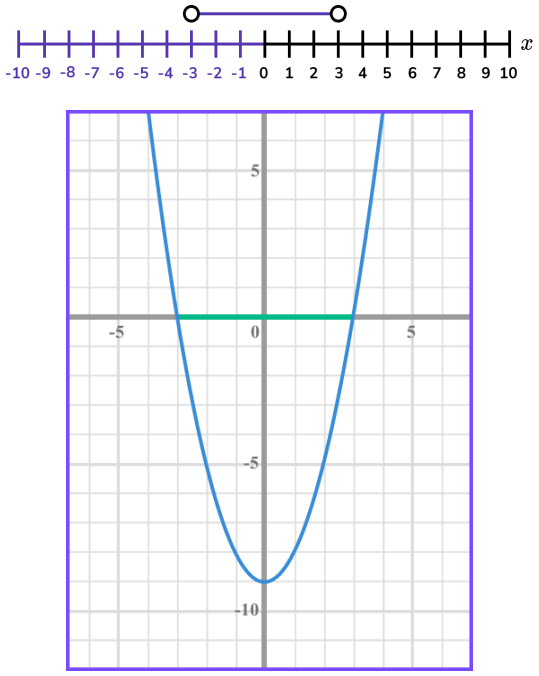
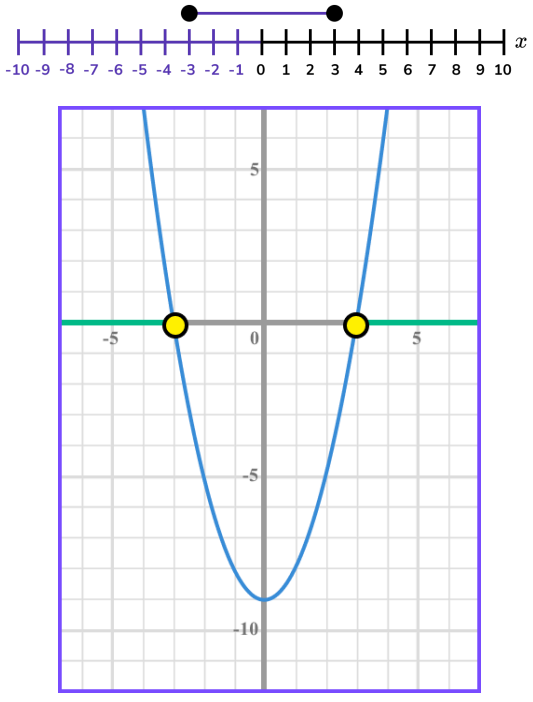
Quadratic Inequalities - Answers

Group D	**5)** $x^2 + 5x - 24 \geq 0$	**5)** 
	6) $x^2 + 6x + 9 \leq 0$	**6)** 

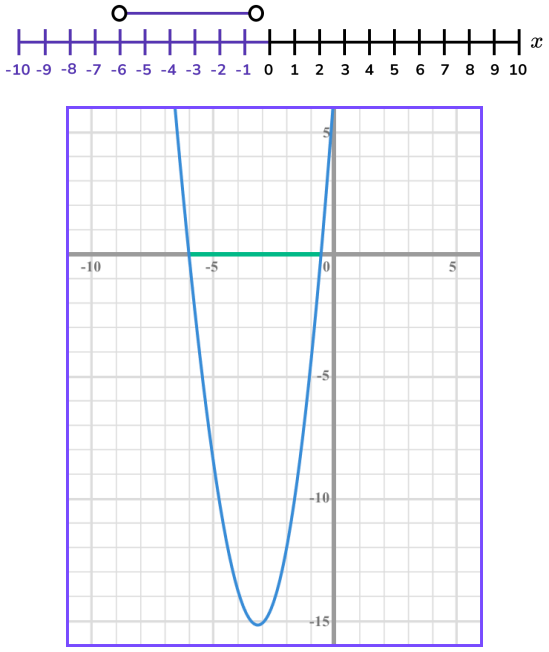
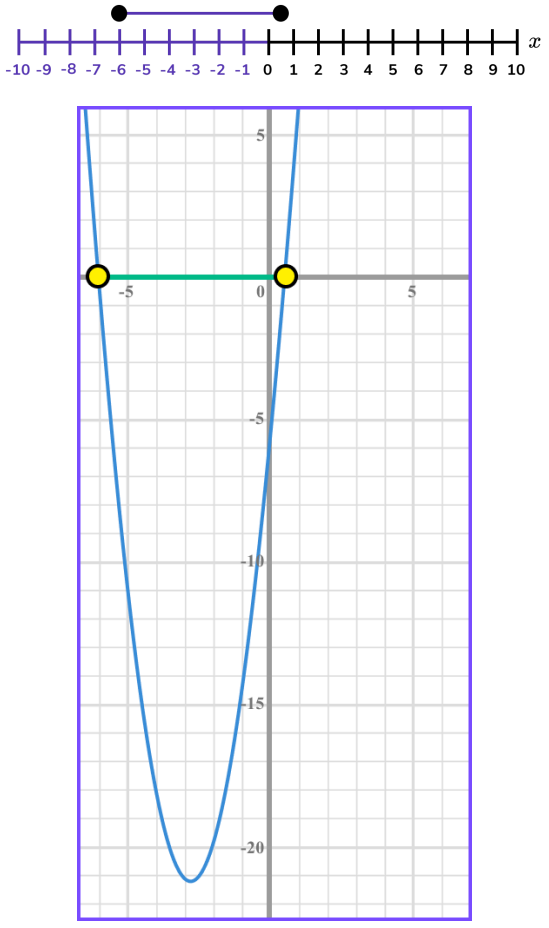
Quadratic Inequalities - Answers

Group D	**7)** $x^2 - 6x + 9 \geq 0$	**7)** 
	8) $x^2 - 9 > 0$	**8)** 

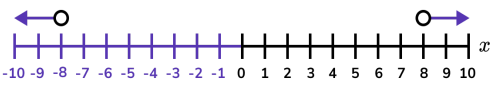
Quadratic Inequalities - Answers

Group D	**9)** $x^2 < 9$	**9)** 
	10) $x^2 - 1 \leq 8$	**10)** 

Quadratic Inequalities - Answers

Group D	**11)** $2x^2 + 13x + 6 < 0$	**11)** 
	12) $2x^2 + 11x - 6 \leq 0$	**12)** 

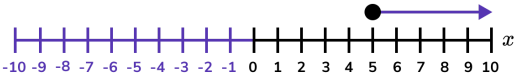
Quadratic Inequalities - Answers

	Question	Answer
	Applied Questions	
1)	**a)** This rectangle has an area less than $14cm^2$. Calculate the range of values of x.  $x - 5cm$ xcm **b)** Sam says there are two possible values of x. Explain why Sam is wrong.	**a)** $x^2 - 5x < 14$ $x^2 - 5x - 14 < 0$ $(x - 7)(x + 2) < 0$ $-2 < x < 7$ $5 < x < 7$ You cannot have a negative distance. **b)** He has just solve the quadratic $= 0$ and got $x = 7$ and $x = -2$ and it's an inequality that needs to be solved.
2)	**a)** John thinks the solution to $x^2 > 64$ is 8. Explain why John is wrong. **b)** Represent the correct solution on a number line	**a)** The solution set for $x^2 > 64$ is $x < -8$ and $x > 8$. The solution is a range of values. **b)** 
3)	Harvey says it is not possible to solve this inequality. Lily says it is possible to solve this inequality but all values satisfy it. Who is correct and why? $10x^2 + 3x + 8 < 0$	Harvey is correct as when you substitute the values of a, b and c into the quadratic formula, the discriminant is a negative value so the parabola is above the x axis

Quadratic Inequalities - Answers

4)	**a)** The width of the garden is 20 metres shorter than the length. The area is less than or equal to $96m^2$. Write an inequality to represent the area of the garden.	**a)** $x^2 - 20x \leq 96$
	b) What is the largest possible length of the garden?	**b)** $x^2 - 20x - 96 \leq 0$ $(x - 24)(x + 4) \leq 0$ $-4 \leq x \leq 24$ The largest possible length is $24m$

Quadratic Inequalities - Mark Scheme

	Question	Answer	
	Exam Questions		
1) (a)	Find the interval for which $x^2 + 13x + 36 < 0$	(a) $(x + 4)(x + 9)$ -4 **and** -9 $-9 < x < -4$	(1) (1) (1)
(b)	Solve $x^2 - 13x + 40 \leq 0$	(b) $(x - 8)(x - 5)$ 5 **and** 8 $5 < x < 8$	(1) (1) (1)
2) (a)	Solve $2x^2 - 8x + 7 \leq 0$	(a) $x = \frac{-(-8) \pm \sqrt{(-8)^2 - 4 \times 2 \times 7}}{2 \times 2}$ 1.292.. **and** 2.707... $1.292.. \leq x \leq 2.707...$	(1) (1) (1)
(b)	List the integer values that satisfy part (a).	(b) 2	(1)
3) (a)	Solve $(x + 4)(x - 1) \geq (x + 1)^2$	(a) $x^2 + 2x + 1$ $x^2 + 3x - 4$ $x \geq 5$	(1) (1) (1)
(b)	Represent the solution which satisfies part (a) on the number line	'5' indicated Closed circle with line to the right 	(1) (1)
4) (a)	Solve $x^2 - 3x \geq 10$	(a) $(x - 5)(x + 2)$ 5 **and** -2 $x \leq -2$ **and** $x \geq 5$	(1) (1) (1)
(b)	Represent your solution to part (a) on the number line	-2 **and** 5 indicated Closed circles with two lines 	(1) (1)