

## QUADRATIC INEQUALITIES - PRACTICE QUESTIONS



metatutor

1.

Solve  $x^2 > 25$ .

$$x^2 - 25 > 0$$

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

$$\underline{x < -5 \text{ or } x > 5}$$

2.

Solve  $x^2 + 11 \leq 60$ .

$$x^2 - 49 \leq 0$$

$$(x-7)(x+7) \leq 0$$

$$\underline{-7 \leq x \leq 7}$$

3.

Solve  $x^2 - 10x \geq 0$ .

$$x(x-10) \geq 0$$

$$\underline{x \geq 10 \text{ or } x \leq 0}$$

4.

Solve  $x^2 + 9x + 18 < 0$ .

$$(x+6)(x+3) < 0$$

$$\underline{-6 < x < -3}$$

5.

Solve  $x^2 + 8x - 20 < 0$ .

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

$$\underline{-10 < x < 2}$$

6.

Solve  $x^2 - 6x - 9 < 7$ .

$$x^2 - 6x - 16 < 0$$

$$(x-8)(x+2) < 0$$

$$\underline{-2 < x < 8}$$

7.

Solve  $x^2 + 9x + 37 \leq 7 - 2x$ .

$$x^2 + 11x + 37 \leq 7$$

$$x^2 + 11x + 30 \leq 0$$

$$(x+6)(x+5) \leq 0$$

$$\underline{-6 \leq x \leq -5}$$

8.

Solve  $2x^2 + 13x - 17 \geq x^2 + 4x + 5$ .

$$x^2 + 13x - 17 \geq 4x + 5$$

$$x^2 + 9x - 17 \geq 5$$

$$x^2 + 4x - 22 \geq 0$$

$$(x+11)(x-2) \geq 0$$

$$\underline{x \leq -11 \text{ or } x \geq 2}$$

9.

Solve  $3x^2 - 11x + 15 > 2x^2 - 8x + 25$ .

$$x^2 - 11x + 15 > -8x + 25$$

$$x^2 - 3x + 15 > 25$$

$$x^2 - 3x - 10 > 0$$

$$(x-5)(x+2) > 0$$

$$\underline{x < -2 \text{ or } x > 5}$$

10.

Solve  $2x^2 + 9x + 9 \leq 0$ .

$$\begin{array}{r} \times 18 \\ + 9 \end{array}$$

$$2x^2 + 6x + 3x + 9$$

$$2x(x+3) + 3(x+3)$$

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

$$\underline{-3 \leq x \leq -3/2}$$

11.

Solve  $3x^2 + 13x + 4 \geq 0$ .

$$\begin{array}{r} \times 12 \\ + 13 \end{array}$$

$$3x^2 + 12x + x + 4$$

$$3x(x+4) + 1(x+4)$$

$$(3x+1)(x+4) \geq 0$$

$$\underline{x \leq -4 \text{ or } x \geq -1/3}$$

12.

Solve  $4x^2 - 5x - 6 < 0$ .

$$\begin{array}{r} \times -24 \\ + -5 \end{array}$$

$$4x^2 - 8x + 3x - 6$$

$$4x(x-2) + 3(x-2)$$

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

$$\underline{-3/4 < x < 2}$$

13.

Solve  $4x^2 + 8x - 5 \leq 0$ .

$$\begin{array}{r} \times -20 \\ + 8 \end{array}$$

$$4x^2 + 10x - 2x - 5$$

$$2x(2x+5) - 1(2x+5)$$

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

$$\underline{-5/2 \leq x \leq 1/2}$$

14.

Solve  $5x^2 + 19x + 12 > 2x^2 + 18x + 22$ .

$$3x^2 + 19x + 12 > 18x + 22$$

$$3x^2 + x + 12 > 22$$

$$3x^2 + x - 10 > 0$$

$$\begin{array}{r} x - 30 \\ + 1 \end{array}$$

$$3x^2 + 6x - 5x - 10$$

$$3x(x+2) - 5(x+2)$$

$$(3x-5)(x+2) > 0$$

$$\underline{x < -2 \text{ or } x > 5/3}$$

15.

Solve  $8x^2 + 11x + 3 < 2x^2$ .

$$6x^2 + 11x + 3 < 0$$

$$\begin{array}{r} \times 18 \\ + 11 \end{array}$$

$$6x^2 + 9x + 2x + 3$$

$$3x(2x+3) + 1(2x+3)$$

$$(3x+1)(2x+3) < 0$$

$$\underline{-3/2 < x < -1/3}$$

16.

Find a range of values for  $x$  for which  $x^2 - 21 < 4$  and  $12x - 11 \geq 13$ .

$$x^2 - 21 < 4$$

$$x^2 - 25 < 0$$

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

$$-5 < x < 5$$

$$12x - 11 \geq 13$$

$$12x \geq 24$$

$$x \geq 2$$

$$\underline{2 \leq x < 5}$$

17.

Find a range of values for  $x$  for which  $x^2 + 5x - 24 \leq 0$  and  $2x^2 - x \geq 10$ .

$$x^2 + 5x - 24 \leq 0$$

$$(x+8)(x-3) \leq 0$$

$$-8 \leq x \leq 3$$

$$2x^2 - x \geq 10$$

$$2x^2 - x - 10 \geq 0$$

$$2x^2 - 5x + 4x - 10 \geq 0$$

$$x(2x-5) + 2(2x-5) \geq 0$$

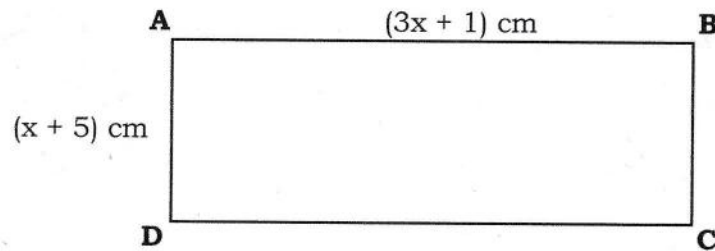
$$(x+2)(2x-5) \geq 0$$

$$x \leq -2 \text{ or } x \geq 5/2$$

$$\underline{-8 \leq x \leq -2 \text{ or } 5/2 \leq x \leq 3}$$

18.

Below is the rectangle ABCD.



ABCD has an area of greater than  $62 \text{ cm}^2$ .

Given that  $x$  is a positive integer, find the smallest possible perimeter of ABCD. You may use a calculator.

$$(3x + 1)(x + 5) = 3x^2 + x + 15x + 5$$

$$3x^2 + 16x + 5 > 62$$

$$3x^2 + 16x - 57 > 0$$

$$a = 3, b = 16, c = -57$$

$$x = \frac{-16 \pm \sqrt{16^2 - 4 \times 3 \times -57}}{2 \times 3}$$

$$= 2.44 \dots \text{ or } -7.77 \dots$$

$$x < -7.7 \dots \text{ or } x > 2.44 \dots$$

smallest positive integer = 3

$$3 \times 3 + 1 = 10 \text{ cm}$$

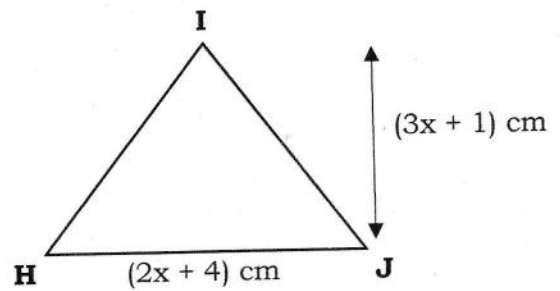
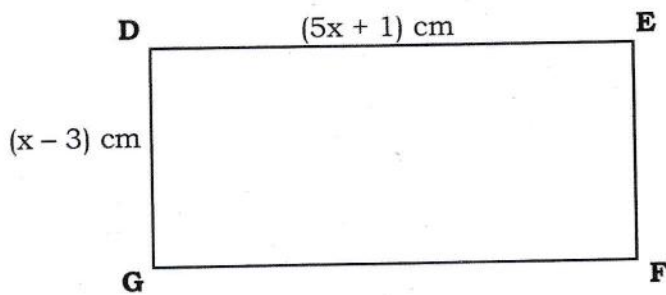
$$3 + 5 = 8 \text{ cm}$$

$$10 + 8 + 10 + 8 = \underline{\underline{36 \text{ cm}}}$$



19.

Below is the rectangle DEFG and the triangle HIJ.



The area of the rectangle is larger than the area of the triangle.  
The difference between the areas is less than  $31 \text{ cm}^2$ .

Find a range of possible values for  $x$ .

$$\begin{aligned} \text{DEFG} &= (5x + 1)(x - 3) \\ &= 5x^2 + x - 15x - 3 \\ &= 5x^2 - 14x - 3 \end{aligned}$$

$$\begin{aligned} \text{IHJ} &= (3x + 1)(2x + 4) \div 2 \\ &= (3x + 1)(x + 2) \\ &= 3x^2 + x + 6x + 2 \\ &= 3x^2 + 7x + 2 \end{aligned}$$

$$\text{DEFG} - \text{IHJ} < 31$$

$$5x^2 - 14x - 3 - 3x^2 - 7x - 2 < 31$$

$$2x^2 - 21x - 5 < 31$$

$$2x^2 - 21x - 36 < 0$$

$$2x^2 - 24x + 3x - 36 < 0$$

$$2x(x - 12) + 3(x - 12) < 0$$

$$(2x + 3)(x - 12) < 0$$

$$-3/2 < x < 12$$

$x$  must be greater than 3 otherwise DG would be less than 0.

$$\text{So } \underline{3 < x < 12}$$