

## EXERCISE 15.2

PAGE NO: 15.15

Solve each of the following system of equations in R.

1.  $x + 3 > 0$ ,  $2x < 14$

**Solution:**

Given:  $x + 3 < 0$  and  $2x < 14$

Let us consider the first inequality.

$$x + 3 < 0$$

$$x + 3 - 3 < 0 - 3$$

$$x < -3$$

Now, let us consider the second inequality.

$$2x < 14$$

Divide both the sides by 2 we get,

$$2x/2 < 14/2$$

$$x < 7$$

∴ The solution of the given system of inequation is  $(-3, 7)$ .

2.  $2x - 7 > 5 - x$ ,  $11 - 5x \leq 1$

**Solution:**

Given:

$$2x - 7 > 5 - x \text{ and } 11 - 5x \leq 1$$

Let us consider the first inequality.

$$2x - 7 > 5 - x$$

$$2x - 7 + 7 > 5 - x + 7$$

$$2x > 12 - x$$

$$2x + x > 12 - x + x$$

$$3x > 12$$

Divide both the sides by 3 we get,

$$3x/3 > 12/3$$

$$x > 4$$

$$\therefore x \in (4, \infty) \dots (1)$$

Now, let us consider the second inequality.

$$11 - 5x \leq 1$$

$$11 - 5x - 11 \leq 1 - 11$$

$$-5x \leq -10$$

Divide both the sides by 5 we get,

$$\begin{aligned} -5x/5 &\leq -10/5 \\ -x &\leq -2 \\ x &\geq 2 \\ \therefore x &\in (2, \infty) \dots (2) \end{aligned}$$

From (1) and (2) we get

$$x \in (4, \infty) \cap (2, \infty)$$

$$x \in (4, \infty)$$

$\therefore$  The solution of the given system of inequations is  $(4, \infty)$ .

**3.  $x - 2 > 0$ ,  $3x < 18$**

**Solution:**

Given:

$$x - 2 > 0 \text{ and } 3x < 18$$

Let us consider the first inequality.

$$x - 2 < 0$$

$$x - 2 + 2 < 0 + 2$$

$$x < 2$$

$$\therefore x \in (2, \infty) \dots (1)$$

Now, let us consider the second inequality.

$$3x < 18$$

Divide both the sides by 3 we get,

$$3x/3 < 18/3$$

$$x < 6$$

$$\therefore x \in (-\infty, 6) \dots (2)$$

From (1) and (2), we get

$$x \in (2, \infty) \cap (-\infty, 6)$$

$$x \in (2, 6)$$

$\therefore$  The solution of the given system of inequations is  $(2, 6)$ .

**4.  $2x + 6 \geq 0$ ,  $4x - 7 < 0$**

**Solution:**

Given:

$$2x + 6 \geq 0 \text{ and } 4x - 7 < 0$$

Let us consider the first inequality.

$$2x + 6 \geq 0$$

$$2x + 6 - 6 \geq 0 - 6$$

$$2x \geq -6$$

Divide both the sides by 2 we get,

$$2x/2 \geq -6/2$$

$$x \geq -3$$

$$\therefore x \in [-3, \infty) \dots(1)$$

Now, let us consider the second inequality.

$$4x - 7 < 0$$

$$4x - 7 + 7 < 0 + 7$$

$$4x < 7$$

Divide both the sides by 4 we get,

$$4x/4 < 7/4$$

$$x < 7/4$$

$$\therefore x \in [-\infty, 7/4) \dots(2)$$

From (1) and (2), we get

$$x \in (-3, \infty) \cap (-\infty, 7/4)$$

$$x \in (-3, 7/4)$$

$\therefore$  The solution of the given system of inequations is  $(-3, 7/4)$ .

**5.  $3x - 6 > 0$ ,  $2x - 5 > 0$**

**Solution:**

Given:

$$3x - 6 > 0 \text{ and } 2x - 5 > 0$$

Let us consider the first inequality.

$$3x - 6 > 0$$

$$3x - 6 + 6 > 0 + 6$$

$$3x > 6$$

Divide both the sides by 3 we get,

$$3x/3 > 6/3$$

$$x > 2$$

$$\therefore x \in (2, \infty) \dots (1)$$

Now, let us consider the second inequality.

$$2x - 5 > 0$$

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

$$2x > 5$$

Divide both the sides by 2 we get,

$$2x/2 > 5/2$$

$$x > 5/2$$

$$\therefore x \in (5/2, \infty) \dots (2)$$

From (1) and (2), we get

$$x \in (2, \infty) \cap (5/2, \infty)$$

$$x \in (5/2, \infty)$$

$\therefore$  The solution of the given system of inequations is  $(5/2, \infty)$ .

**6.  $2x - 3 < 7, 2x > -4$**

**Solution:**

Given:

$$2x - 3 < 7 \text{ and } 2x > -4$$

Let us consider the first inequality.

$$2x - 3 < 7$$

$$2x - 3 + 3 < 7 + 3$$

$$2x < 10$$

Divide both the sides by 2 we get,

$$2x/2 < 10/2$$

$$x < 5$$

$$\therefore x \in (-\infty, 5) \dots (1)$$

Now, let us consider the second inequality.

$$2x > -4$$

Divide both the sides by 2 we get,

$$2x/2 > -4/2$$

$$x > -2$$

$$\therefore x \in (-2, \infty) \dots (2)$$

From (1) and (2), we get

$$x \in (-\infty, 5) \cap (-2, \infty)$$

$$x \in (-2, 5)$$

$\therefore$  The solution of the given system of inequations is  $(-2, 5)$ .

**7.  $2x + 5 \leq 0, x - 3 \leq 0$**

**Solution:**

Given:

$$2x + 5 \leq 0 \text{ and } x - 3 \leq 0$$

Let us consider the first inequality.

$$2x + 5 \leq 0$$

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

$$2x \leq -5$$

Divide both the sides by 2 we get,

$$2x/2 \leq -5/2$$

$$x \leq -5/2$$

$$\therefore x \in (-\infty, -5/2] \dots (1)$$

Now, let us consider the second inequality.

$$x - 3 \leq 0$$

$$x - 3 + 3 \leq 0 + 3$$

$$x \leq 3$$

$$\therefore x \in (-\infty, 3] \dots (2)$$

From (1) and (2), we get

$$x \in (-\infty, -5/2) \cap (-\infty, 3)$$

$$x \in (-\infty, -5/2)$$

$\therefore$  The solution of the given system of inequations is  $(-\infty, -5/2)$ .

### 8. $5x - 1 < 24$ , $5x + 1 > -24$

**Solution:**

Given:

$$5x - 1 < 24 \text{ and } 5x + 1 > -24$$

Let us consider the first inequality.

$$5x - 1 < 24$$

$$5x - 1 + 1 < 24 + 1$$

$$5x < 25$$

Divide both the sides by 5 we get,

$$5x/5 < 25/5$$

$$x < 5$$

$$\therefore x \in (-\infty, 5) \dots (1)$$

Now, let us consider the second inequality.

$$5x + 1 > -24$$

$$5x + 1 - 1 > -24 - 1$$

$$5x > -25$$

Divide both the sides by 5 we get,

$$5x/5 > -25/5$$

$$x > -5$$

$$\therefore x \in (-5, \infty) \dots (2)$$

From (1) and (2), we get

$$x \in (-\infty, 5) \cap (-5, \infty)$$

$$x \in (-5, 5)$$

$\therefore$  The solution of the given system of inequations is  $(-5, 5)$ .

**9.  $3x - 1 \geq 5, x + 2 > -1$**

**Solution:**

Given:

$$3x - 1 \geq 5 \text{ and } x + 2 > -1$$

Let us consider the first inequality.

$$3x - 1 \geq 5$$

$$3x - 1 + 1 \geq 5 + 1$$

$$3x \geq 6$$

Divide both the sides by 3 we get,

$$3x/3 \geq 6/3$$

$$x \geq 2$$

$$\therefore x \in (2, \infty) \dots (1)$$

Now, let us consider the second inequality.

$$x + 2 > -1$$

$$x + 2 - 2 > -1 - 2$$

$$x > -3$$

$$\therefore x \in (-3, \infty) \dots (2)$$

From (1) and (2), we get

$$x \in (2, \infty) \cap (-3, \infty)$$

$$x \in (2, \infty)$$

 $\therefore$  The solution of the given system of inequations is  $(2, \infty)$ .

**10.  $11 - 5x > -4, 4x + 13 \leq -11$**

**Solution:**

Given:

$$11 - 5x > -4 \text{ and } 4x + 13 \leq -11$$

Let us consider the first inequality.

$$11 - 5x > -4$$

$$11 - 5x - 11 > -4 - 11$$

$$-5x > -15$$

Divide both the sides by 5 we get,

$$-5x/5 > -15/5$$

$$-x > -3$$

$$x < 3$$

$$\therefore x \in (-\infty, 3) (1)$$

Now, let us consider the second inequality.

$$4x + 13 \leq -11$$

$$4x + 13 - 13 \leq -11 - 13$$

$$4x \leq -24$$

Divide both the sides by 4 we get,

$$4x/4 \leq -24/4$$

$$x \leq -6$$

$$\therefore x \in (-\infty, -6] \text{ (2)}$$

From (1) and (2), we get

$$x \in (-\infty, 3) \cap (-\infty, -6]$$

$$x \in (-\infty, -6]$$

$\therefore$  The solution of the given system of inequations is  $(-\infty, -6]$ .

