Linear Inequations

Q1. The solution set for the inequation $2x + 4 \leq 14$, x ε W is:
(a) {1, 2, 3, 4, 5} (b) {0, 1, 2, 3, 4, 5}
(c) {1, 2, 3, 4} (d) {0, 1, 2, 3, 4} [2023]

Answer: (b) {0,1,2,3,4,5}

Step-by-step Explanation:

$2x + 4 \leq 14$
$2x \leq 14 - 4$
$2x \leq 10$
$x \leq 5$

Solution set for x = {0,1,2,3,4,5}

Q2. The solution set of the inequation $x - 3 \geq -5$, $x \in R$ is: [1]
(a) {x: $x > -2$, $x \in R$} (b) {x: $x \leq -2$, $x \in R$}
(c) {x: $x \geq -2$, $x \in R$} (d) {-2, -1, 0, 1, 2} [2021 Semester-1]

Answer: (c) {x: $x \geq -2$, x∈R}

Step-by-step Explanation:
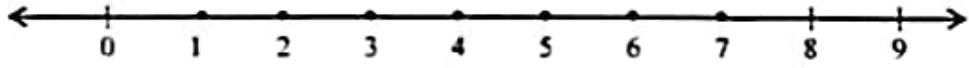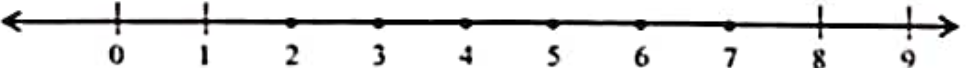
$$x - 3 \geq -5$$
$$x \geq -5 + 3$$
$$x \geq -2$$
Solution set for $x = \{x : x \geq -2, x \in R\}$

Q3. The solution set on the number line of the linear inequation: [2]

$2y - 6 < y + 2 \leq 2y$, $y \in N$ is [2021 Semester-1]

(a)	
(b)	
(c)	
(d)	

Answer: (b)

Step-by-step Explanation:

$$2y - 6 < y + 2 \quad ; \quad y + 2 \leq 2y$$
$$2y - y < 2 + 6 \quad ; \quad y - 2y \leq -2$$
$$y < 8 \quad\quad\quad\quad ; \quad -y \leq -2$$
$$\quad\quad\quad\quad\quad\quad ; \quad y \geq 2$$

$Solution\ set\ for\ x = \{2, 3, 4, 5, 6, 7\}$

Q4. Solve the following inequation and represent the solution set on the number line. [2020]

$$\frac{3x}{5} + 2 < x + 4 \leq \frac{x}{2} + 5. \quad x \in R$$

Step-by-step Explanation:

$$\frac{3x}{5} + 2 < x + 4 \; ; \; x + 4 \leq \frac{x}{2} + 5$$

$$\frac{3x}{5} - x < 4 - 2 \; ; \; x - \frac{x}{2} \leq 5 - 4$$

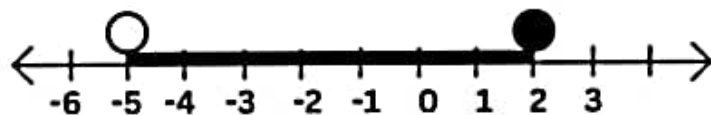$$\frac{3x - 5x}{5} < 2 \; ; \; \frac{2x - x}{2} \leq 1$$

$$-2x < 10 \quad ; \; x \leq 2$$

$$2x > -10 \quad ; \; x \leq 2$$

$$x > -5 \quad ; \; x \leq 2$$

Solution set for $x = \{x : -5 < x \leq 2, \, x \in R\}$

Q5. Solve the following in equation and write down the solution set: [3]

$11x - 4 < 15x + 4 \leq 3x + 14, x \in W$
Represent the solution on a real number line. [2019]

Step-by-step Explanation:

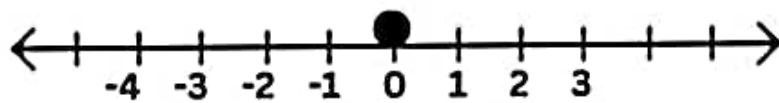$$11x - 4 < 15x + 4 \; ; \; 15x + 4 \leq 3x + 14,$$

$$11x - 15x < 4 + 4 \; ; \; 15x - 3x \leq 14 - 4$$

$$-4x < 8 \; ; \; 12x \leq 10$$

$$4x > -8 \; ; \; x \leq \frac{10}{12}$$

$$x > -2 \; ; \; x \leq \frac{5}{6}$$

Solution set for $x = \{\, 0 \,\}$

Q6. Solve the following inequation, write down the solution set and represent it on the real number line: [3]

$-2 + 10x \le 13x + 10 < 24 + 10x, x \in Z$ [2018]

Step-by-step explanation:

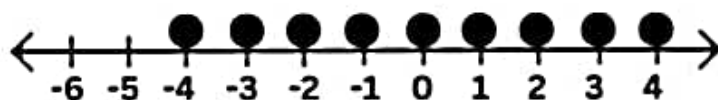$$-2 + 10x \le 13x + 10 \quad ; \quad 13x + 10 < 24 + 10x \ , \ x \in Z$$

$$10x - 13x \le 10 + 2 \quad ; \quad 13x - 10x < 24 - 10$$

$$-3x \le 12 \quad ; \quad 3x < 14$$

$$3x \ge -12 \quad ; \quad x < \frac{14}{3}$$

$$x \ge -4 \ ; \ x < 4\frac{2}{3}$$

Solution set for $x = \{ -4, -3, -2, -1, 0, 1, 2, 3, 4 \}$

Q7. Solve the following inequation and represent the solution set on a number line. [3] [2017]

$$-8\frac{1}{2} < -\frac{1}{2} - 4x \le 7\frac{1}{2}, \ x \in I$$

Step-by-step Explanation:

$$-8\frac{1}{2} < -\frac{1}{2} - 4x \quad ; \quad -\frac{1}{2} - 4x \le 7\frac{1}{2}$$

$$-\frac{17}{2} + \frac{1}{2} < -4x \quad ; \quad -4x \le \frac{15}{2} + \frac{1}{2}$$

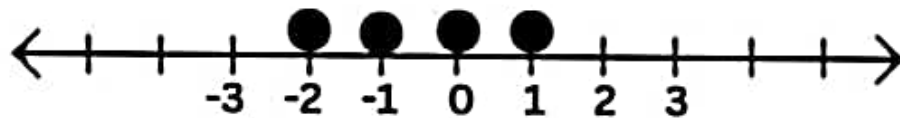$$\frac{-17+1}{2} < -4x \quad ; \quad -4x \le \frac{15+1}{2}$$

$$\frac{-16}{2} < -4x \quad ; \quad -4x \le \frac{16}{2}$$

$$-8 < -4x \quad ; \quad -4x \le 8$$

$$8 > 4x \quad ; \quad 4x \ge -8$$

$$2 > x \quad ; \quad x \ge -2$$
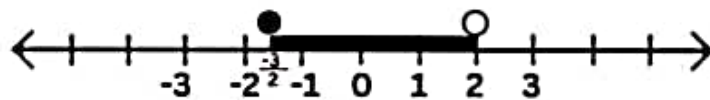
$$\text{Solution set for } x = \{-2, -1, 0, 1\}$$

Q8. Solve the following inequation, write the solution set and represent it on the number line. [2016]

$$-3(x - 7) \ge 15 - 7x \quad ; \quad 15 - 7x > \frac{x+1}{3}, \quad x \in R$$

Step-by-step Explanation:

$$-3(x - 7) \geq 15 - 7x \quad ; \quad 15 - 7x > \frac{x+1}{3}$$
$$-3x + 21 \geq 15 - 7x \quad ; \quad 3(15 - 7x) > x + 1$$
$$-3x + 7x \geq 15 - 21 \quad ; \quad 45 - 21x > x + 1$$
$$4x \geq -6 \quad ; \quad -21x - x > 1 - 45$$
$$x \geq \frac{-6}{4} \quad ; \quad -22x > -44$$
$$x \geq \frac{-3}{2} \quad ; \quad 22x < 44$$
$$x \geq -1\frac{1}{2} \quad ; \quad x < 2$$

Solution set for $x = \{x : -\frac{3}{2} \leq x < 2, x \in R\}$

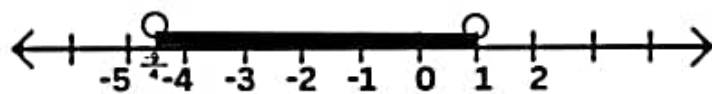## Q9. Solve the following inequation and write the solution set:

$$13x - 5 < 15x + 4 < 7x + 12, x \, \varepsilon \, R$$
Represent the solution on a real number line. [3] [2015]

Step-by-step Explanation:

$$13x - 5 < 15x + 4 \quad ; \quad 15x + 4 < 7x + 12$$
$$13x - 15x < 4 + 5 \quad ; \quad 15x - 7x < 12 - 4$$
$$-2x < 9 \quad ; \quad 8x < 8$$
$$2x > -9 \quad ; \quad x < 1$$
$$x > -\frac{9}{2} \quad ; \quad x < 1$$
$$x > -4\frac{1}{2} \quad ; \quad x < 1$$

Solution set for $x = \{x : -4\frac{1}{2} < x < 1, x \in R\}$

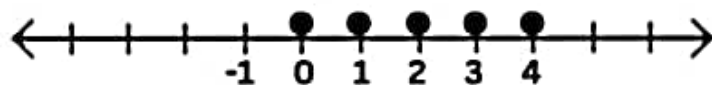## Q10. Find the value of x, which satisfy the inequation

$$-2\frac{5}{6} < \frac{1}{2} - \frac{2x}{3} \leq 2, \; x \in W.$$

Graph the solution set on the number line. [3] [2014]

Step-by-step Explanation:

$$-2\frac{5}{6} < \frac{1}{2} - \frac{2x}{3} \quad ; \quad \frac{1}{2} - \frac{2x}{3} \leq 2$$

$$\frac{-17}{6} - \frac{1}{2} < -\frac{2x}{3} \quad ; \quad -\frac{2x}{3} \leq 2 - \frac{1}{2}$$

$$\frac{-17-3}{6} < -\frac{2x}{3} \quad ; \quad -\frac{2x}{3} \leq \frac{4-1}{2}$$

$$\frac{-20}{6} < \frac{-2x}{3} \quad ; \quad \frac{-2x}{3} \leq \frac{3}{2}$$

$$\frac{-10}{3} < \frac{-2x}{3} \quad ; \quad -4x \leq 9$$

$$-30 < -6x \quad ; \quad 4x \geq -9$$

$$30 > 6x \quad ; \quad x \geq \frac{-9}{4}$$

$$5 > x \quad ; \quad x \geq -2\frac{1}{4}$$

Solution set for $x = \{0, 1, 2, 3, 4\}$

Q11. Solve the following inequation, write the solution set and represent it on the number line:[2013]

$$-\frac{x}{3} \le \frac{x}{2} - 1\frac{1}{3} < \frac{1}{6}, \; x \in R$$

Step-by-step Explanation:

$$-\frac{x}{3} \le \frac{x}{2} - 1\frac{1}{3} \quad ; \quad \frac{x}{2} - 1\frac{1}{3} < \frac{1}{6}$$

$$\frac{-x}{3} - \frac{x}{2} \le -\frac{4}{3} \quad ; \quad \frac{x}{2} < \frac{1}{6} + \frac{4}{3}$$

$$\frac{-2x - 3x}{6} \le -\frac{4}{3} \quad ; \quad \frac{x}{2} < \frac{1+8}{6}$$

$$\frac{-5x}{6} \le \frac{-4}{3} \quad ; \quad 6x < 18$$
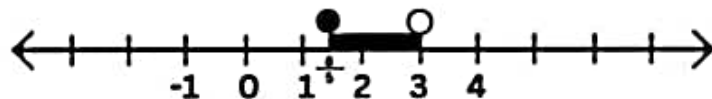
$$-15x \le -24 \quad ; \quad x < 3$$

$$15x \ge 24 \quad ; \quad x < 3$$

$$x \ge \frac{24}{15} \quad ; \quad x < 3$$

$$x \ge \frac{8}{5} \quad ; \quad x < 3$$

$$x \ge 1\frac{3}{5} \quad ; \quad x < 3$$

$$\cdot$$

$$Solution \; set \; for \; x = \{ \, x : \frac{8}{5} \le x < 3, \, x \in R \, \}$$

Q12. Solve the following inequation and represent the solution set on the number line:[2012]

$$4x - 19 < \frac{3x}{5} - 2 \le -\frac{2}{5} + x, \; x \in R$$

Step-by-step Explanation:

$$4x - 19 < \frac{3x}{5} - 2 \quad ; \quad \frac{3x}{5} - 2 \le -\frac{2}{5} + x$$

$$4x - \frac{3x}{5} < -2 + 19 \quad ; \quad \frac{3x}{5} - x \le -\frac{2}{5} + 2$$

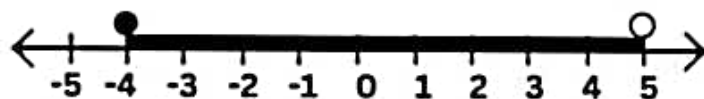$$\frac{20x - 3x}{5} < 17 \quad ; \quad \frac{3x - 5x}{5} \le \frac{-2 + 10}{5}$$

$$\frac{17x}{5} < 17 \quad ; \quad \frac{-2x}{5} \le \frac{8}{5}$$

$$17x < 85 \quad ; \quad -10x \le 40$$

$$x < 5 \quad ; \quad 10\,x \ge -40$$

$$x < 5 \quad ; \quad x \ge -4$$

Solution set for $x = \{\, x : -4 \le x < 5,\ x \in R \,\}$

Q13. Solve the following inequation and represent the solution set on the number line:

$2x - 5 \le 5x + 4 < 11$, where $x \in I$. [3] [2011]

Step-by-step Explanation:
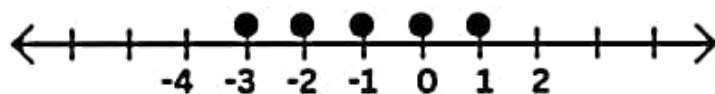
$$2x - 5 \le 5x + 4 \quad ; \quad 5x + 4 < 11,$$

$$2x - 5x \le 4 + 5 \quad ; \quad 5x < 11 - 4$$

$$-3x \le 9 \quad ; \quad 5x < 7$$

$$3x \ge -9 \quad ; \quad x < \frac{7}{5}$$

$$x \ge -3 \quad ; \quad x < 1\frac{2}{5}$$

Solution set for $x = \{\, -3, -2, -1, 0, 1 \,\}$

Q14. Solve the following inequation and represent the solution set on the number line. [2010]

$$-3 < -\frac{1}{2} - \frac{2x}{3} \leq \frac{5}{6} \; , x \in R$$

Step-by-step Explanation:

$$-3 < -\frac{1}{2} - \frac{2x}{3} \quad ; \quad -\frac{1}{2} - \frac{2x}{3} \leq \frac{5}{6}$$

$$-3 + \frac{1}{2} < -\frac{2x}{3} \quad ; \quad -\frac{2x}{3} \leq \frac{5}{6} + \frac{1}{2}$$

$$\frac{-6+1}{2} < -\frac{2x}{3} \quad ; \quad -\frac{2x}{3} \leq \frac{5+3}{6}$$

$$\frac{-5}{2} < -\frac{2x}{3} \quad ; \quad -\frac{2x}{3} \leq \frac{8}{6}$$

$$-15 < -4x \quad ; \quad -12x \leq 24$$

$$15 > 4x \quad ; \quad 12x \geq -24$$

$$\frac{15}{4} > x \quad ; \quad x \geq -2$$

$$3\frac{3}{4} > x \quad ; \quad x \geq -2$$

$$\text{Solution set for } x = \{ x : -2 \leq x < 3\frac{3}{4}, \; x \in R \}$$