Linear Inequations

Q1. The solution set for the inequation $2x + 4 \leq 14$, $x \in W$ 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]

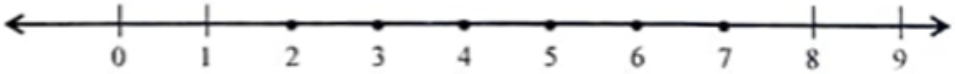
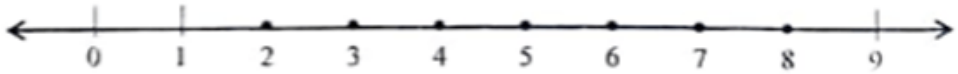
Answer: (c) {x: $x \geq -2$, $x \in R$}

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:

$$\begin{aligned} 2y - 6 &< y + 2 \quad ; y + 2 \leq 2y \\ 2y - y &< 2 + 6 \quad ; y - 2y \leq -2 \\ y &< 8 \quad ; -y \leq -2 \\ & \quad ; y \geq 2 \end{aligned}$$

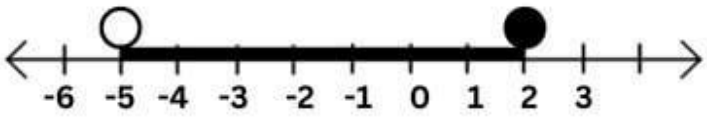
$$Solution\ set\ for\ x = \{2, 3, 4, 5, 6, 7\}$$

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:

$$\frac{3x}{5} + 2 < x + 4 \ ; \ x + 4 \leq \frac{x}{2} + 5$$
$$\frac{3x}{5} - x < 4 - 2 \ ; \ x - \frac{x}{2} \leq 5 - 4$$
$$\frac{3x - 5x}{5} < 2 \ ; \ \frac{2x - x}{2} \leq 1$$
$$-2x < 10 \ ; \ x \leq 2$$
$$2x > -10 \ ; \ x \leq 2$$
$$x > -5 \ ; \ x \leq 2$$
$$Solution\ set\ for\ x = \{x : \ -5 < x \leq 2, \ x \in R\}$$

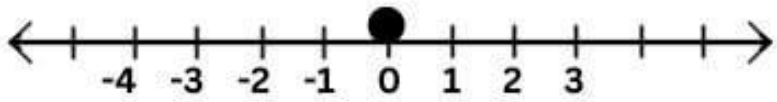


Q5. Solve the following in equation and write down the solution set: [3]

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

Step-by-step Explanation:

$$11x - 4 < 15x + 4 \ ; \ 15x + 4 \leq 3x + 14,$$
$$11x - 15x < 4 + 4 \ ; \ 15x - 3x \leq 14 - 4$$
$$-4x < 8 \ ; \ 12x \leq 10$$
$$4x > -8 \ ; \ x \leq \frac{10}{12}$$
$$x > -2 \ ; \ x \leq \frac{5}{6}$$
$$Solution\ set\ for\ x = \{\ 0\ \}$$

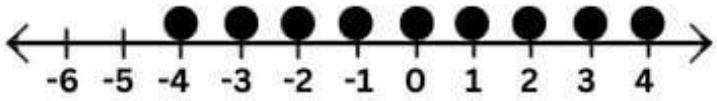


Q6. Solve the following inequation, write down the solution set and represent it on the real number line: [3]

– 2 + 10x ≤ 13x + 10 < 24 + 10x, x ∈ Z [2018]

Step-by-step explanation:

$$-2 + 10x \leq 13x + 10 \;\; ; \; 13x + 10 < 24 + 10x \; , \; x \in Z$$
$$10x - 13x \leq 10 + 2 \;\; ; \; 13x - 10x < 24 - 10$$
$$-3x \leq 12 \;\; ; \; 3x < 14$$
$$3x \geq -12 \;\; ; \; x < \frac{14}{3}$$
$$x \geq -4 \;\; ; \; x < 4\frac{2}{3}$$
$$Solution\ set\ for\ x = \{ -4, -3, -2, -1, 0, 1, 2, 3, 4 \}$$



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

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

Step-by-step Explanation:

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

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

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

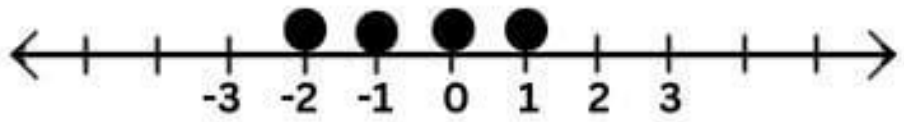
$$\frac{-16}{2} < -4x \;\; ; -4x \leq \frac{16}{2}$$

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

$$8 > 4x \;\; ; 4x \geq -8$$

$$2 > x \;\; ; x \geq -2$$

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

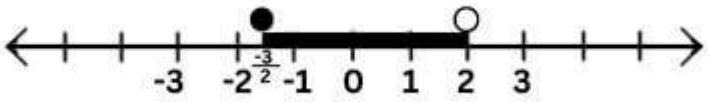


Q8. Solve the following inequation, write the solution set and represent it on the number line. [2016]

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

Step-by-step Explanation:

$$-3(x-7) \geq 15-7x \quad ; \; 15-7x > \frac{x+1}{3}$$
$$-3x+21 \geq 15-7x \quad ; \; 3(15-7x) > x+1$$
$$-3x+7x \geq 15-21 \quad ; \; 45-21x > x+1$$
$$4x \geq -6 \quad ; \; -21x-x > 1-45$$
$$x \geq \frac{-6}{4} \quad ; \; -22x > -44$$
$$x \geq \frac{-3}{2} \quad ; \; 22x < 44$$
$$x \geq -1\frac{1}{2} \quad ; \; x < 2$$
$$\textit{Solution set for } x = \{x : \; -\frac{3}{2} \leq x < 2, \; x \in R\}$$

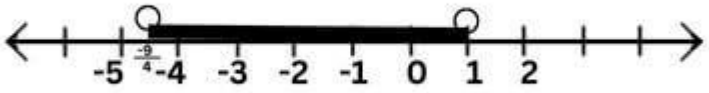


Q9. Solve the following inequation and write the solution set:

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

Step-by-step Explanation:

$$13x-5 < 15x+4 \quad ; \quad 15x+4 < 7x+12$$
$$13x-15x < 4+5 \quad ; \quad 15x-7x < 12-4$$
$$-2x < 9 \quad ; \quad 8x < 8$$
$$2x > -9 \quad ; \quad x < 1$$
$$x > -\frac{9}{2} \quad ; \quad x < 1$$
$$x > -4\frac{1}{2} \quad ; \quad x < 1$$
$$\textit{Solution set for } x = \{x : \; -4\frac{1}{2} < x < 1, \; x \in R\}$$



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:

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

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

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

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

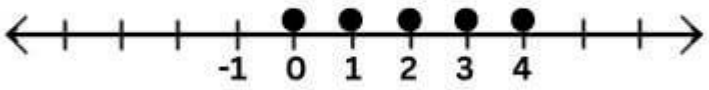
$$\frac{-10}{3} < \frac{-2x}{3} \quad ; \quad -4x \leq 9$$

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

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

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

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



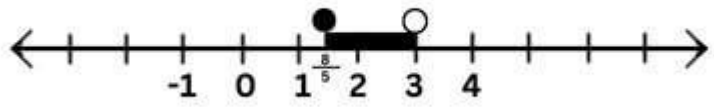
Q11. Solve the following inequation, write the solution set and represent it on the number line:[2013]

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

Step-by-step Explanation:

$$-\frac{x}{3} \leq \frac{x}{2} - 1\frac{1}{3} \quad ; \quad \frac{x}{2} - 1\frac{1}{3} < \frac{1}{6}$$
$$\frac{-x}{3} - \frac{x}{2} \leq -\frac{4}{3} \quad ; \quad \frac{x}{2} < \frac{1}{6} + \frac{4}{3}$$
$$\frac{-2x - 3x}{6} \leq -\frac{4}{3} \quad ; \quad \frac{x}{2} < \frac{1+8}{6}$$
$$\frac{-5x}{6} \leq \frac{-4}{3} \quad ; \quad 6x < 18$$
$$-15x \leq -24 \quad ; \quad x < 3$$
$$15x \geq 24 \quad ; \quad x < 3$$
$$x \geq \frac{24}{15} \quad ; \quad x < 3$$
$$x \geq \frac{8}{5} \quad ; \quad x < 3$$
$$x \geq 1\frac{3}{5} \quad ; \quad x < 3$$

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

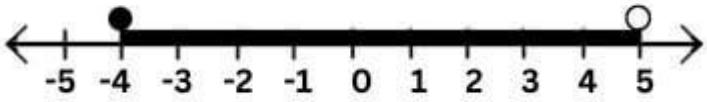


Q12. Solve the following inequation and represent the solution set on the number line:[2012]

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

Step-by-step Explanation:

$$4x - 19 < \frac{3x}{5} - 2 \quad ; \quad \frac{3x}{5} - 2 \leq -\frac{2}{5} + x$$
$$4x - \frac{3x}{5} < -2 + 19 \quad ; \quad \frac{3x}{5} - x \leq -\frac{2}{5} + 2$$
$$\frac{20x - 3x}{5} < 17 \quad ; \quad \frac{3x - 5x}{5} \leq \frac{-2 + 10}{5}$$
$$\frac{17x}{5} < 17 \quad ; \quad \frac{-2x}{5} \leq \frac{8}{5}$$
$$17x < 85 \quad ; \quad -10x \leq 40$$
$$x < 5 \quad ; \; 10\, x \geq -40$$
$$x < 5 \quad ; \quad x \geq -4$$
$$Solution\ set\ for\ x = \{\ x :\ -4 \leq x < 5,\ x \in R\ \}$$

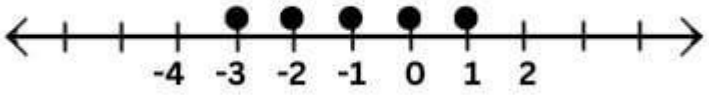


Q13. Solve the following inequation and represent the solution set on the number line:

2x – 5 ≤ 5x + 4 < 11, where x ∈ I. [3] [2011]

Step-by-step Explanation:

$$2x - 5 \leq 5x + 4 \quad ; \quad 5x + 4 \ < 11,$$
$$2x - 5x \leq 4 + 5 \quad ; \quad 5x < 11 - 4$$
$$-3x \leq 9 \quad ; \quad 5x < 7$$
$$3x \geq -9 \quad ; \quad x < \frac{7}{5}$$
$$x \geq -3 \quad ; \quad x < 1\frac{2}{5}$$
$$Solution\ set\ for\ x = \{\ -3, -2, -1, 0, 1\ \}$$



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:

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

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

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

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

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

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

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

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

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