

3.4 Compound Inequalities

Basic Concepts Symbolic Solutions and Number Lines Numerical and Graphical Solutions Interval Notation

Key Terms

Use the vocabulary terms listed below to complete the statements in exercises 1-5.

$A \cup B$	interval	set-builder
$A \cap B$	union	intersection
		compound inequality

1. A(n) _____ consists of two inequalities joined by the word *and* or *or*.
2. For any two sets A and B , the _____ of A and B is denoted as _____ and is defined as $\{x \mid x \text{ is an element of } A \text{ and an element of } B\}$.
3. For any two sets A and B , the _____ of A and B is denoted as _____ and is defined as $\{x \mid x \text{ is an element of } A \text{ or an element of } B\}$.
4. The expression $\{x \mid -1 < x \leq 2\}$ is written in _____ notation.
5. The expression $(-1, 2]$ is written in _____ notation.

Basic Concepts

Exercises 1-4: Determine whether the given x -values are solutions to the compound inequalities.

1. $x + 3 < -1$ or $3x + 2 > 4$ $x = -2, 2$

1. _____

2. $2x + 1 \leq 9$ and $x + 2 > -4$ $x = -5, 5$

2. _____

3. $3 - 2x \geq 5$ or $3x - 2 < 0$ $x = -1, 1$

3. _____

4. $-2x \leq 3x + 4$ and $x + 4 > 2x$ $x = 0, 1$


4. _____
_____**Symbolic Solutions and Number Lines**

Exercises 5-8: Solve each compound inequality. Write the solution set in set-builder notation and graph.

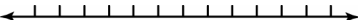
5. $4x - 3 < 5$ and $3x + 2 \geq 2x + 1$

5. _____

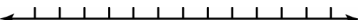

6. $3x - 2 \leq 8 - 3x$ and $x - 2 > -5$

6. _____


7. $2x - 1 \geq -3$ and $-4x - 1 < -3$

7. _____


8. $2x \leq 6 + x$ and $2 + 5x < -3$

8. _____


Exercises 9-12: Solve each three-part inequality. Write the solution set in set-builder notation.

9. $-2 < 3x - 5 \leq 1$

9. _____

10. $-3 < -x + 3 < 5$

10. _____

11. $-\frac{3}{2} \leq \frac{1-m}{2} < 3$

11. _____

12. $-2 \leq 3t + 4 \leq 9$

12. _____

Exercises 13-15: Write and solve a three-part inequality for each problem.

13. The formula $F = \frac{9}{5}C + 32$ is used to convert Celsius temperature to Fahrenheit temperature. The temperature in Leon, Mexico varied between $5^{\circ}C$ and $25^{\circ}C$ on November 9, 2007. Find the corresponding temperature range in degrees Fahrenheit.

13. _____

14. If the air temperature at ground level is $70^\circ F$, the air temperature x miles above Earth's surface is given by $T(x) = 70 - 19x$. Determine the altitudes at which the air temperature ranges from $43.4^\circ F$ to $30.1^\circ F$.

14. _____

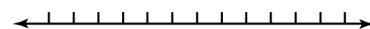
15. Medicare costs in billions of dollars may be modeled by $f(x) = 18x - 35,750$, where $1995 \leq x \leq 2007$. Estimate the years when Medicare costs were from 160 to 250 billion dollars.

15. _____

Exercises 16-19: Solve each compound inequality. Write the solution set in set-builder notation and graph.

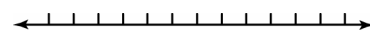
16. $x + 5 \leq 4$ or $3x > 6$

16. _____



17. $2x - 3 \geq -4$ or $1 - 4x > -1$

17. _____



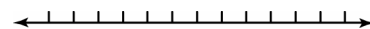
18. $\frac{x+3}{4} - 1 < -\frac{1}{2}$ or $\frac{4-x}{2} \geq \frac{7}{2}$

18. _____



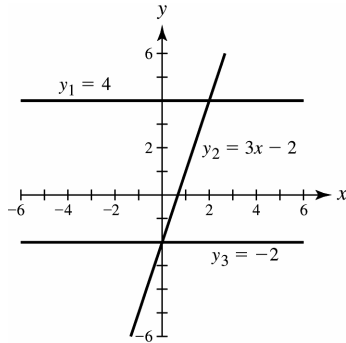
19. $\frac{2x-3}{3} < -3$ or $6x - 7 \geq 3$

19. _____



Numerical and Graphical Solutions

Exercises 20-22: Use the figure to solve each equation or inequality. Write the solution set in set-builder notation.



20. $y_1 = y_2$

20. _____

21. $y_3 \leq y_2 < y_1$

21. _____

22. $y_1 > y_3$

22. _____

Interval Notation

Exercises 23-26: Write each expression in interval notation.

23. $-3 < x \leq 4$

23. _____

24. $x \geq -\frac{4}{3}$

24. _____

25. $\{x \mid x < 0 \text{ and } x \geq -5\}$

25. _____

26. $\left\{x \mid x \leq -2 \text{ or } x > \frac{5}{2}\right\}$

26. _____

Exercises 27-30: Solve each inequality. Write the solution set in interval notation.

27. $3x - 4 \geq 4$ 27. _____

28. $-2 \leq 2x + 3 < 7$ 28. _____

29. $\frac{1}{2}(6 - x) \leq 3$ and $3x - 1 > 5$ 29. _____

30. $3x - 1 < -10$ or $2(x - 3) \geq x - 7$ 30. _____