NAME: _____   PERIOD: _____   DATE: _____

Homework Problem Set
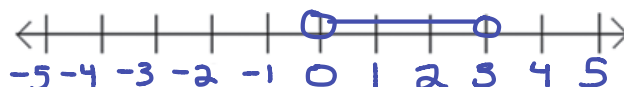
1. Consider the inequality $0 < x < 3$.

    A. Rewrite the inequality as a compound sentence and in interval notation.

    $x > 0$ and $x < 3$

    $(0,3)$

    B. Graph the inequality on a number line.

    C. How many solutions are there to the inequality? Explain.

    Infinite number of solutions between 0 and 3

    D. What are the largest and smallest possible values for x? Explain.

    None ⟶ x can be infinitely close to 0 or to 3, but cannot equal either value.

    E. If the inequality is changed to $0 \le x \le 3$, then what are the largest and smallest possible values for x?

    Smallest value: 0
    largest value: 3

Write a compound inequality for each graph. Then write it in interval notation.

2.

$x < 1$ or $x \ge 3$

$(-\infty, 1)$ or $[3, \infty)$

3.

$x \ne 2$

$(-\infty, 2)$ or $(2, \infty)$

Write a single or compound inequality for each scenario. Then write it in interval notation.

4. The scores on the last test ranged from 65% to 100%.

$$65 \leq x \leq 100$$

$$[65, 100]$$

5. To ride the roller coaster, one must be at least 4 feet tall.
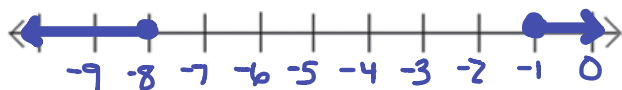
$$x \geq 4$$

$$[4, \infty)$$

6. Unsafe body temperatures are those lower than 96°F or above 104°F.

$$x < 96 \text{ or } x > 104$$
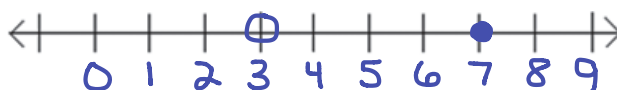
$$(-\infty, 96) \text{ or } (104, \infty)$$

Graph the solution(s) to each of the following on a number line.
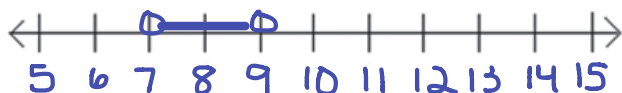
7. $x \leq -8$ or $x \geq -1$

8. $3(x - 6) = 3$ or $5 - x \neq 2$

$$3x - 18 = 3 \qquad 5 - x \neq 2$$
$$3x = 21 \qquad -x \neq -3$$
$$x = 7 \qquad x \neq 3$$

9. $x < 9$ and $x > 7$

10. $x + 5 < 7$ or $x = 2$

$$x < 2 \text{ or } x = 2$$
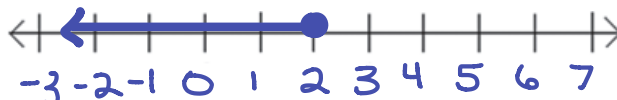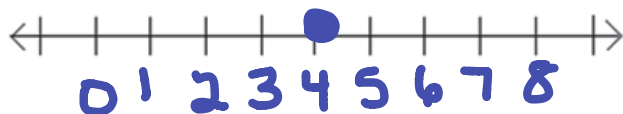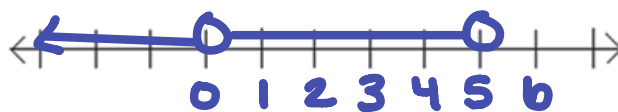
11. $x - 4 = 0$ and $3x + 6 = 18$

$$X=4 \quad X=4$$

12. $x < 5$ and $x \neq 0$

Solve each compound inequality for x, and graph the solution on a number line. Then write the solution in interval notation.

13. $x + 6 < 8$ and $x - 1 > -1$

$X<2$ and $x>0$

$0<x<2$

$(0,2)$

14. $-1 \leq 3 - 2x \leq 10$

$-3 \quad -3 \quad\quad -3$

$-4 \leq -2x \leq 7$

$-2 \quad -2 \quad -2$

$2 \geq x \geq -\frac{7}{2} \to -\frac{7}{2} \leq x \leq 2$ $[-\frac{7}{2}, 2]$

15. $5x + 1 < 0$ or $8 \leq x - 5$

$x < -\frac{1}{5}$ or $13 \leq x \to x \geq 13$

$x < -\frac{1}{5}$ or $x \geq 13$

$(-\infty, -\frac{1}{5})$ or $[13, \infty)$

16. $10 > 3x - 2$ or $x = 4$

$12 > 3x$

$4 > x$

$x < 4$ or $x \neq 4$

$(-\infty, 4)$

Solve each compound inequality for x, and graph the solution on a number line.

17. $x - 2 < 4$ or $x - 2 > 4$

$x < 6$ or $x > 6$

$x \neq 6$

$(-\infty, 6)$ or $(6, \infty)$

18. $x - 2 \leq 4$ and $x - 2 \geq 4$

$x \leq 6$ and $x \geq 6$

so

$x = 6$

Solve each compound inequality for x, and graph the solution on a number line. Pay careful attention to the inequality symbols and the "and" or "or" statements as you work.
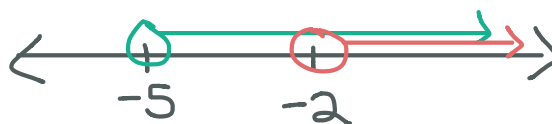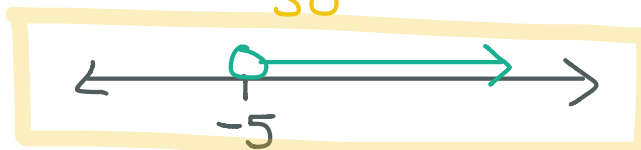
19. $1 + x > -4$ or $3x - 6 > -12$

$x > -5$ or $3x > -6$
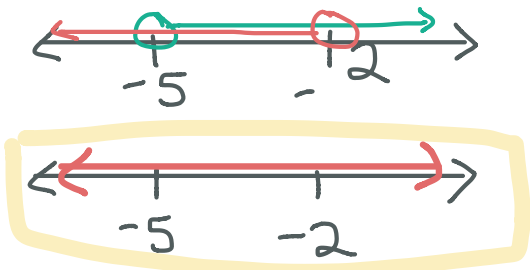
$x > -5$ or $x > -2$

so

$x > -5$

20. $1 + x > -4$ or $3x - 6 < -12$

$x > -5$ or $x < -2$
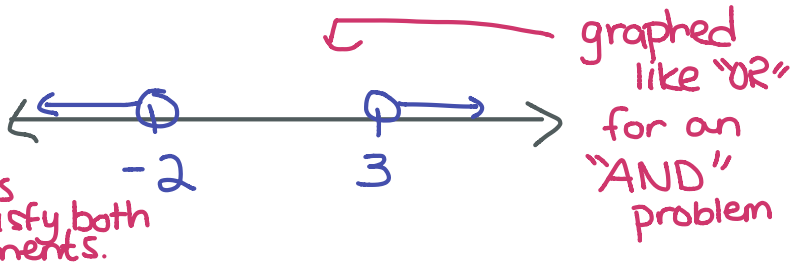
$\Downarrow$ so

ALL REAL Numbers

21. $1 + x > 4$ and $3x - 6 < -12$

$x > 3$ and $x < -2$

No SOLUTION or **Empty Set**

← No #'s will satisfy both statements.

graphed like "OR" for an "AND" problem

22. A. Solve the inequality $4x + 8 > 2x - 10$ or $\frac{1}{3}x - 3 < 2$ for x, and graph the solution on a number line.

B. If the inequalities in Part A were joined by "and" instead of "or," what would the solution set become?

23. A. Solve the inequality $7 - 3x < 16$ and $x + 12 < -8$ for x, and graph the solution on a number line.

B. If the inequalities in Part A were joined by "or" instead of "and," what would the solution set become?

24. A.   Is it possible to write a problem separated by "or" that has no solution? Explain or give an example.

   Or will always contain a set of solutions since the statement is a disjunction, either can be true.

   B.   Is it possible to have a problem separated by "and" that has a solution set consisting of all real numbers? Explain or give an example.

   It is not possible for a conjunction AND statement to have a solution set of all real #s because of the requirement that both statements have to be true.

Determine if each sentence is true or false. Explain your reasoning.
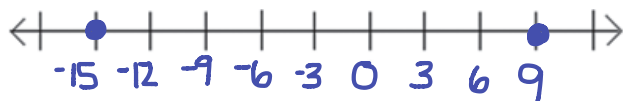
25. $8 + 6 \leq 14$ and $\dfrac{1}{3} < \dfrac{1}{2}$

26. $5 - 8 < 0$ or $10 + 13 \neq 23$

Solve each system, and graph the solution on a number line.
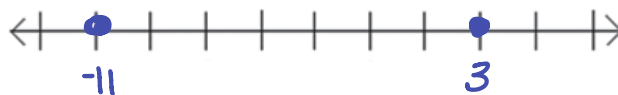
27. $x - 9 = 0$ or $x + 15 = 0$
   $X = 9$ or $X = -15$

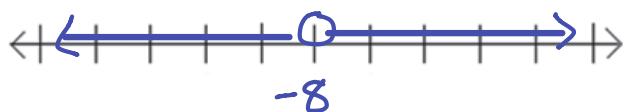28. $5x - 8 = -23$ or $x + 1 = -10$
   $X = 3$ or $X = -11$

Graph the solution set to each compound inequality on a number line.

29. $x < -8$ or $x > -8$

30. $0 < x \leq 10$

Write a compound inequality for each graph.

31.

$$-3 \le x \le 4$$

32.

$$x < -4 \text{ or } x > 0$$

33. A poll shows that a candidate is projected to receive 57% of the votes. If the margin for error is plus or minus 3%, write a compound inequality for the percentage of votes the candidate can expect to get.

$$x = \text{percentage of votes}$$

$$54 \le x \le 60$$

34. Mercury is one of only two elements that are liquid at room temperature. Mercury is non-liquid for temperatures less than $-38.0°F$ or greater than $673.8°F$. Write a compound inequality for the temperatures at which mercury is nonliquid.

$$x = \text{temp in °F for which Mercury is nonliquid.}$$

$$x < -38 \text{ or } x > 673.8$$

Spiral REVIEW—Solving Absolute Value Equations

Solve the two related equations below. Think about the differences between the two equations and their solutions. Do the solutions make sense?

35. $2|x + 7| - 3 = -9$	36. $2|x + 7| - 3 = 9$
$2\|x+7\|-3 = -9$ $2\|x+7\| = -6$ $\|x+7\| = -3 \longleftarrow$ negative No SOLUTION	$2\|x+7\| = 12$ $\|x+7\| = 6$ $x+7=6 \qquad x+7=-6$ $\boxed{x=-1 \quad \text{or} \quad x=-13}$
37. $-7 < x - 4 < -3$ $\quad +4 \qquad +4 \quad +4$ $\boxed{-3 < x < 1}$	38. $7 < x - 4 < -3$ $\quad +4 \qquad +4 \quad +4 \quad \longleftarrow$ AND problem $11 < x < -1$ No SOLUTION