NAME: _____ PERIOD: _____ DATE: _____

Homework Problem Set

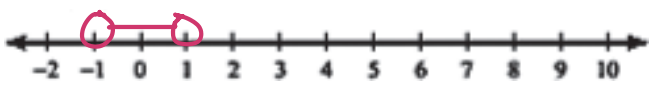
Solve and graph each absolute value inequality.

1. $|r| < 1$

AND

$r < 1$ AND $r > -1$

$-1 < r < 1$

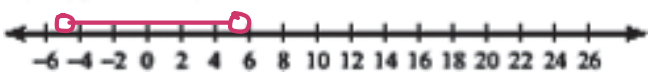


2. $|p - 10| < 15$

$p - 10 < 15$ AND $p - 10 > -15$

$p < 5$ AND $p > -5$

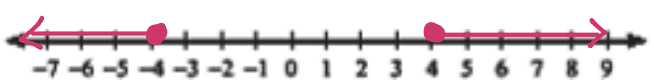
$-5 < p < 5$



3. $|n| - 9 \geq -5$

$|n| \geq 4$

$n \geq 4$ or $n \leq -4$

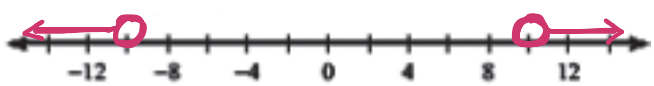


4. $-1 + \left|\frac{r}{10}\right| > 0$

$\left|\frac{r}{10}\right| > 1$

$\frac{r}{10} > 1$ or $\frac{r}{10} < -1$

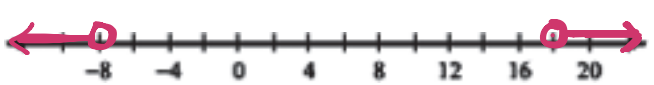
$r > 10$ or $r < -10$



5. $|k - 5| > 13$

$k - 5 > 13$ or $k - 5 < -13$

$k > 18$ or $k < -8$



6. $\frac{|4 - 7n|}{3} > 2$

$|4 - 7n| > 6$

$4 - 7n > 6$ or $4 - 7n < 6$

$n < -\frac{2}{7}$ or $n > \frac{10}{7}$

7. $-10|p| - 7 > -97$

$+7 \quad +7$

$-10|p| > -90$

$-10 \quad -10$

$|p| < 9$

$p < 9$ and $p > -9$

$-9 < p < 9$

8. $8|-5 + 6m| - 7 \leq 49$

$+7 \quad +7$

$8|-5+6m| \leq 56$

$8 \quad 8$

$|-5+6m| \leq 7$

$-5+6m \leq 7$ and $-5+6m \geq -7$

$6m \leq 12$ $6m \geq -2$

$m \leq 2$ $m \geq -\frac{1}{3}$

$-\frac{1}{3} \leq x \leq 2$

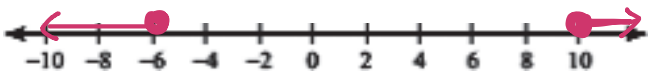
9. $1 \leq \frac{|v-2|}{8}$

$8 \leq |v-2|$

$|v-2| \geq 8$

$v-2 \geq 8$ OR $v-2 \leq -8$

$v \geq 10$ or $v \leq -6$



10. $-132 > 12|n-9|$

$-11 > |n-9|$

negative

NO SOLUTION

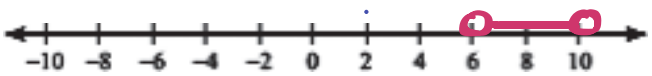
11. $\left|\frac{-8+n}{2}\right| < 1$

$\frac{-8+n}{2} < 1$ $\frac{-8+n}{2} > -1$

$-8+n < 2$ AND $-8+n > -2$

$n < 10$ AND $n > 6$

$6 < n < 10$



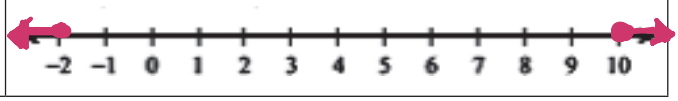
12. $-30 \geq -5|k-4|$

$6 \leq |k-4|$

$|k-4| \geq 6$

$k-4 \geq 6$ OR $k-4 \leq -6$

$k \geq 10$ or $k \leq -2$



13. Lindsey is making some home-made toffee. The recipe says that she must bring the mixture to a boil at 285 degrees. If she is 7 degrees above or below, the toffee should turn out fine.

    Write, solve, and graph an absolute value inequality to model the range of temperatures that will make yummy toffee. $|x - 285| \leq 7$ $x \leq 292$ and $x \geq 278$

    $278 \leq x \leq 292$

Challenge Problems 14–16

14. Solve for x using the inequality $a|x - b| + c \leq d$. Assume that $d - c > 0$.

$a|x-b| \leq d-c$

$|x-b| \leq \frac{d-c}{a}$

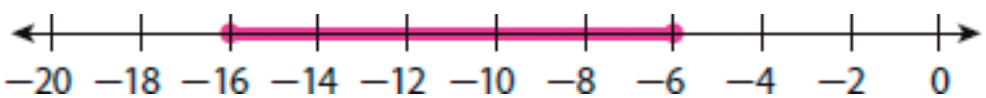
$x-b \leq \frac{d-c}{a}$ AND $x-b \geq -\left(\frac{d-c}{a}\right)$

$x \leq \left(\frac{d-c}{a}\right)+b$ AND $x \geq -\left(\frac{d-c}{a}\right)+b$

$-\left(\frac{d-c}{a}\right)+b \leq x \leq \left(\frac{d-c}{a}\right)+b$

15. Write a simple inequality with an absolute value symbol whose solution would be represented by the graph shown below.

Answers will vary $\longrightarrow$ $|x+11| \leq 5$



16. A student made an error in the following problem. Determine where the error was made and then complete the problem correctly.

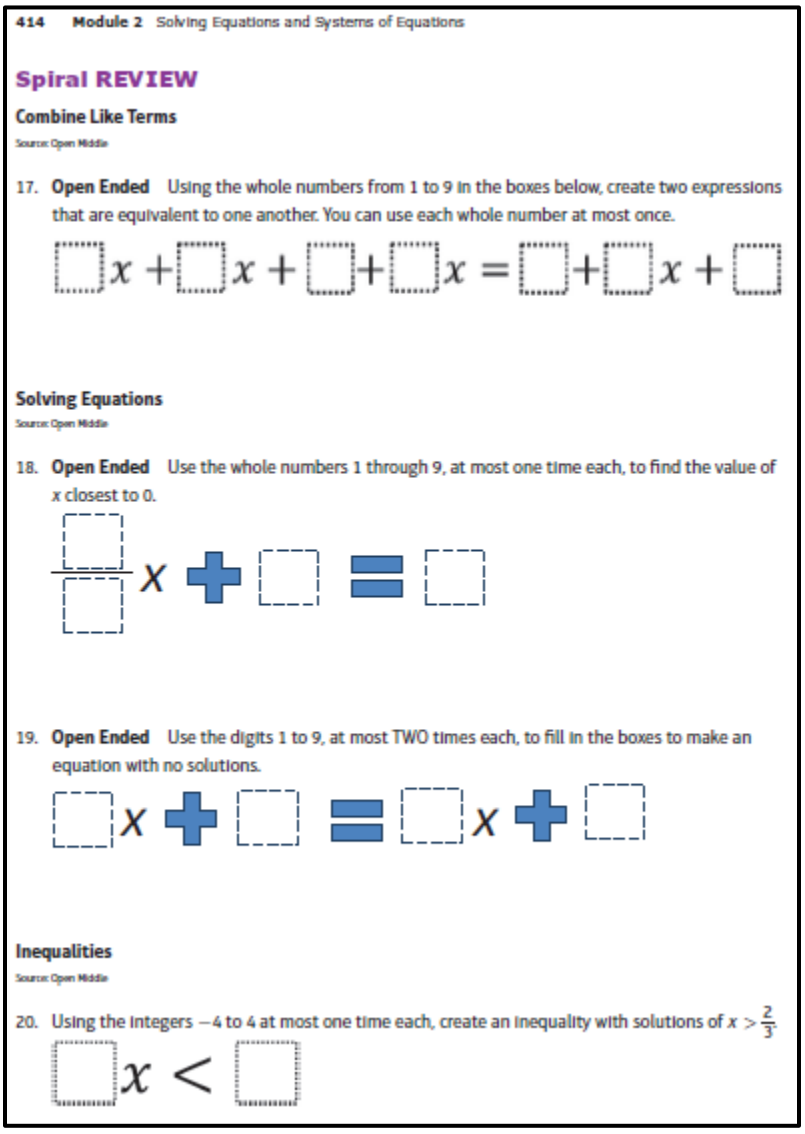
$$|x + 3| + 9 < 5$$

$$|x + 3| < -4$$

$$4 < x + 3 < -4$$

$$1 < x < -7$$

← When an absolute value is less than a negative number then there is no solution.



414 **Module 2** Solving Equations and Systems of Equations

Spiral REVIEW

Combine Like Terms

Source: Open Middle

17. **Open Ended** Using the whole numbers from 1 to 9 in the boxes below, create two expressions that are equivalent to one another. You can use each whole number at most once.

$\square x + \square x + \square + \square x = \square + \square x + \square$

Solving Equations

Source: Open Middle

18. **Open Ended** Use the whole numbers 1 through 9, at most one time each, to find the value of x closest to 0.

$\frac{\square}{\square} x + \square = \square$

19. **Open Ended** Use the digits 1 to 9, at most TWO times each, to fill in the boxes to make an equation with no solutions.

$\square x + \square = \square x + \square$

Inequalities

Source: Open Middle

20. Using the integers -4 to 4 at most one time each, create an inequality with solutions of $x > \frac{2}{3}$.

$\square x < \square$

17. Hints:
    - What values will make the constants equivalent?
    - What values will make the variable terms equivalent?

    Answers will vary.
    Sample responses:

    1x + 2x + 9 + 3x = 4 + 6x + 5;

    1x + 2x + 8 + 4x = 3 + 7x + 5

18. Answers will vary.
    Sample response:
    $\frac{9}{1}x + 2 = 3$

19. Hints:
    - How can you tell when an equation has no solution?
    - How can you tell when an equation has infinite solutions?

    There are many answers, but the coefficient of both x terms have to be the same and the constants must have different values. So, 2x + 3 = 2x + 4 is an answer because it is equivalent to 3 = 4, for which there is no solution.

20. Hints:
    - How does an inequality symbol change from greater than to less than?
    - How do we ensure that the signs of the numbers do not change?

    Sample response:
    $-3x < -2$

21. $n = -9$

22. $x = 12$

23. $m = -6$

24. $p = -8$

25. $x = 16$

26. no solution

27. 8, -8

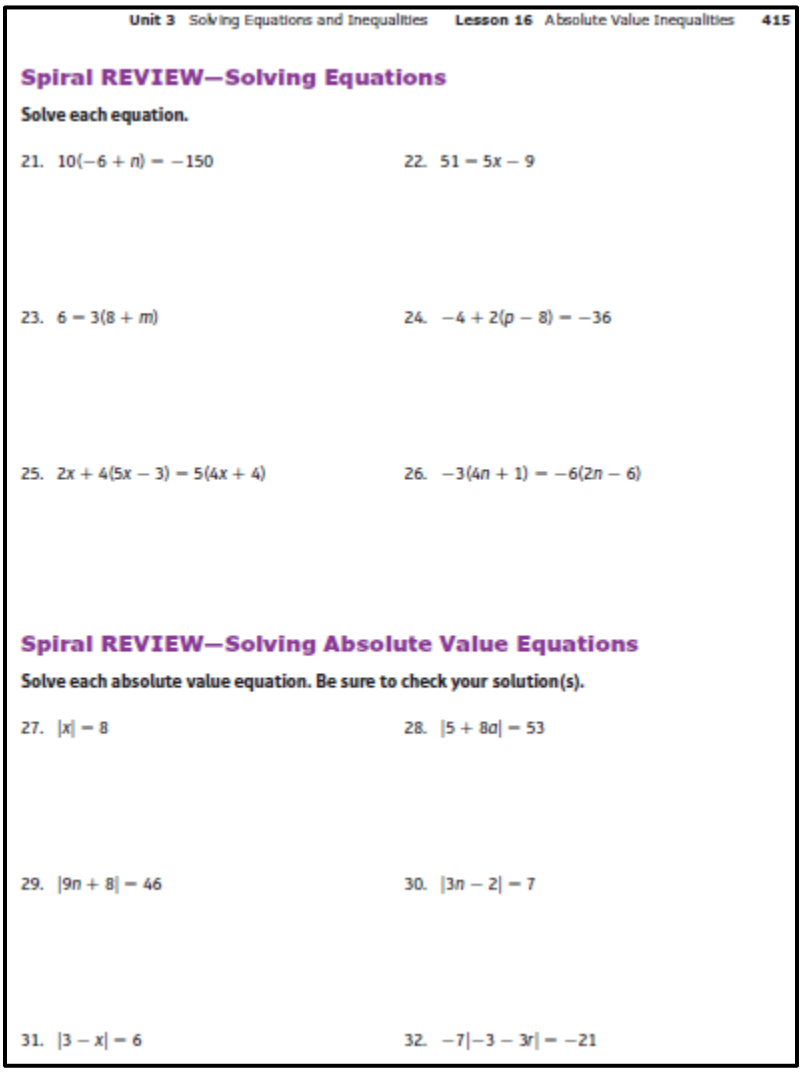
28. 6, $-\frac{29}{4}$

29. $\frac{38}{9}$, -6

30. 3, $-\frac{5}{3}$

31. -3, 9

32. -2, 0



Unit 3 Solving Equations and Inequalities Lesson 16 Absolute Value Inequalities 415

Spiral REVIEW—Solving Equations

Solve each equation.

21. $10(-6 + n) = -150$

22. $51 = 5x - 9$

23. $6 = 3(8 + m)$

24. $-4 + 2(p - 8) = -36$

25. $2x + 4(5x - 3) = 5(4x + 4)$

26. $-3(4n + 1) = -6(2n - 6)$

Spiral REVIEW—Solving Absolute Value Equations

Solve each absolute value equation. Be sure to check your solution(s).

27. $|x| = 8$

28. $|5 + 8a| = 53$

29. $|9n + 8| = 46$

30. $|3n - 2| = 7$

31. $|3 - x| = 6$

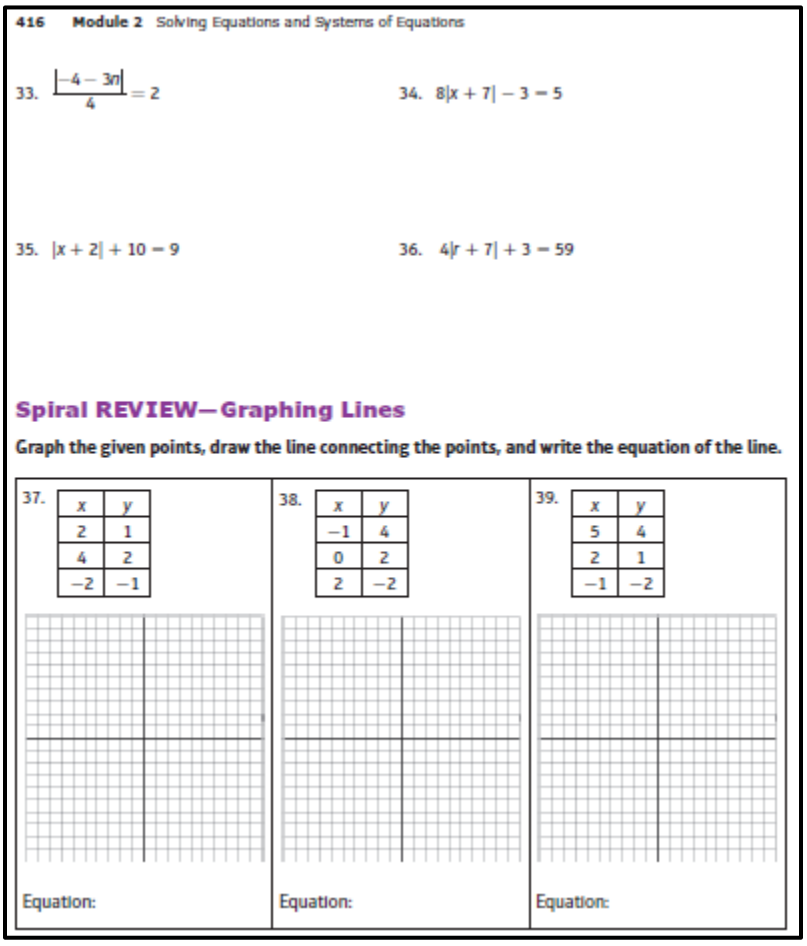
32. $-7|-3 - 3r| = -21$

33. $\frac{4}{3}$, -4

34. -6, -8

35. No solution

36. 7, -21



416 **Module 2** Solving Equations and Systems of Equations

33. $\frac{|-4-3n|}{4}=2$

34. $8|x+7|-3=5$

35. $|x+2|+10=9$

36. $4|r+7|+3=59$

Spiral REVIEW—Graphing Lines

Graph the given points, draw the line connecting the points, and write the equation of the line.

37.

x	y
2	1
4	2
−2	−1

Equation:

38.

x	y
−1	4
0	2
2	−2

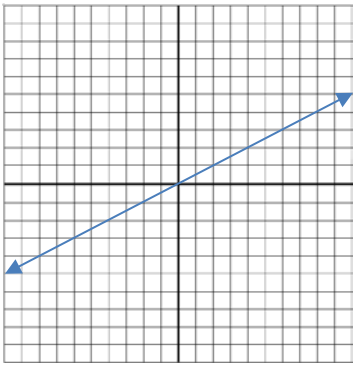
Equation:

39.

x	y
5	4
2	1
−1	−2

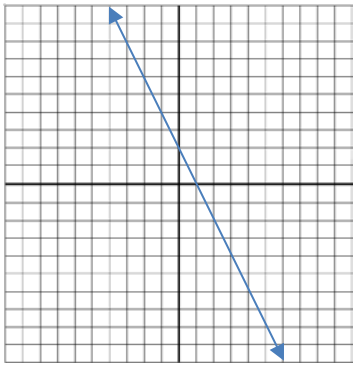
Equation:

37.



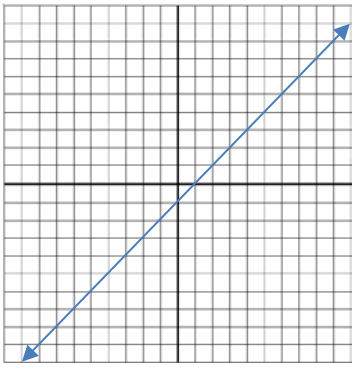
Equation: $y=\frac{1}{2}x$

38.



Equation: $y = -2x + 2$

39.



Equation: $y = x - 1$

40. $y = x - 3$

41. $y = 2$

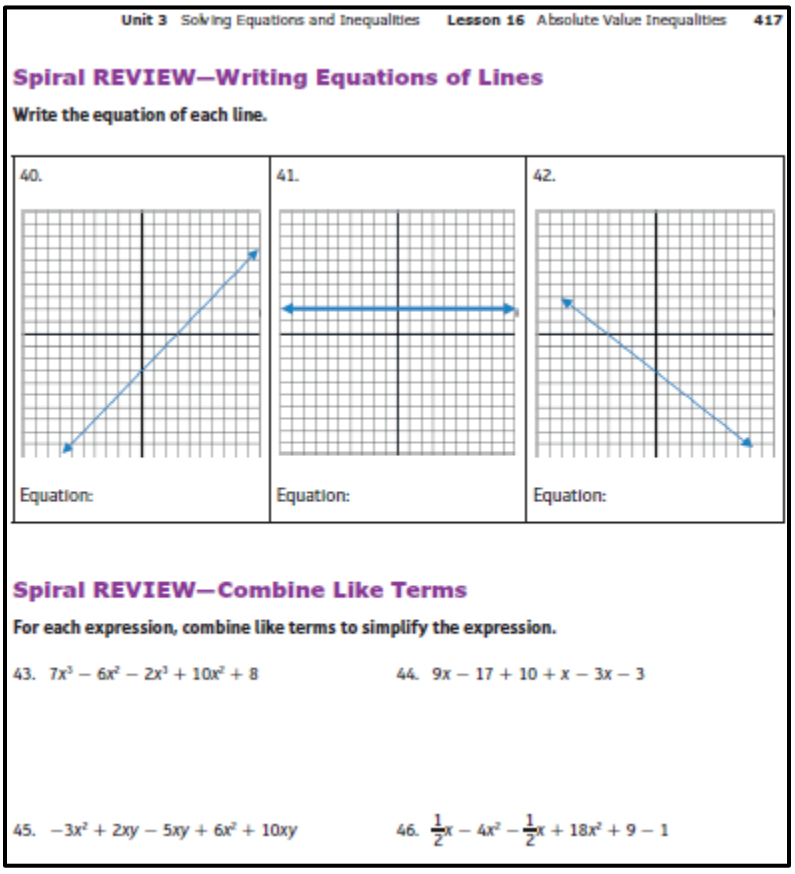
42. $y = -\frac{3}{4}x - 3$

43. $5x^3 + 4x^2 + 8$

44. $7x - 10$

45. $3x^2 + 7xy$

46. $14x^2 + 8$



Unit 3 Solving Equations and Inequalities Lesson 16 Absolute Value Inequalities 417

Spiral REVIEW—Writing Equations of Lines

Write the equation of each line.

40. Equation:

41. Equation:

42. Equation:

Spiral REVIEW—Combine Like Terms

For each expression, combine like terms to simplify the expression.

43. $7x^3 - 6x^2 - 2x^3 + 10x^2 + 8$

44. $9x - 17 + 10 + x - 3x - 3$

45. $-3x^2 + 2xy - 5xy + 6x^2 + 10xy$

46. $\frac{1}{2}x - 4x^2 - \frac{1}{2}x + 18x^2 + 9 - 1$

47.

Reasons
1. Given
2. combine like terms
3. division property

48.

Reasons
1. Given
2. multiplication property or multiply both sides by 6
3. distributive property
4. combine like terms or addition property
5. multiplication or distributive property
6. division property

418 **Module 2** Solving Equations and Systems of Equations

Spiral REVIEW—Properties

47. Use algebraic properties to prove that $x + 2x = 30$ results in $x = 10$.

Statements	Reasons
1. $x + 2x = 30$	1. Given
2. $3x = 30$	2.
3. $x = 10$	3.

48. Use algebraic properties to prove that if $\frac{2(3(n+6)-18)}{6} = 7$, then $n = 7$.

Statements	Reasons
1. $\frac{2(3(n+6)-18)}{6} = 7$	1. Given
2. $2(3(n+6)-18) = 42$	2.
3. $2(3n+18-18) = 42$	3.
4. $2(3n) = 42$	4.
5. $6n = 42$	5.
6. $n = 7$	6.

Spiral REVIEW—Rearranging Formulas

Use algebraic properties to isolate the indicated variable.

49. $\frac{w}{138} = p$, for w

50. $\frac{4a+2}{5} = b$, for a

51. $200p + 10 = b$, for p

52. $42x - 5y = x$, for y

49. $w = 138p$

50. $a = \frac{5b-2}{4}$

51. $p = \frac{b-10}{200}$

52. $y = \frac{z-42x}{-5}$ *or* $y = \frac{42x-z}{5}$

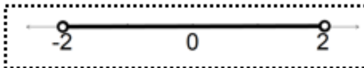
Optional Resource for Exercise 5 – One per student

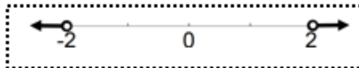
No solution.

$x > 2$ or $x < -2$

All real numbers.

$-2 < x < 2$





$|x| > 2$ $|x| > -2$ $|x| < 2$ $|x| < -2$

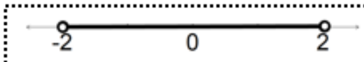
$|x| > 2$ $|x| > -2$ $|x| < 2$ $|x| < -2$

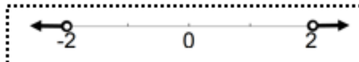
No solution.

$x > 2$ or $x < -2$

All real numbers.

$-2 < x < 2$





$|x| > 2$ $|x| > -2$ $|x| < 2$ $|x| < -2$

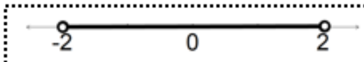
$|x| > 2$ $|x| > -2$ $|x| < 2$ $|x| < -2$

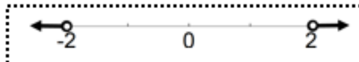
No solution.

$x > 2$ or $x < -2$

All real numbers.

$-2 < x < 2$





$|x| > 2$ $|x| > -2$ $|x| < 2$ $|x| < -2$

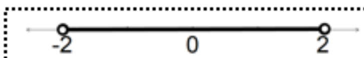
$|x| > 2$ $|x| > -2$ $|x| < 2$ $|x| < -2$

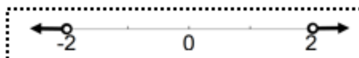
No solution.

$x > 2$ or $x < -2$

All real numbers.

$-2 < x < 2$





$|x| > 2$ $|x| > -2$ $|x| < 2$ $|x| < -2$

$|x| > 2$ $|x| > -2$ $|x| < 2$ $|x| < -2$