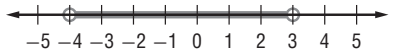
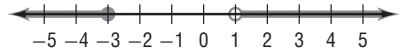
NAME _____ DATE _____ PERIOD _____

1-6 Study Guide and Intervention

Solving Compound and Absolute Value Inequalities

Compound Inequalities A compound inequality consists of two inequalities joined by the word *and* or the word *or*. To solve a compound inequality, you must solve each part separately.

***And* Compound Inequalities**	The graph is the intersection of solution sets of two inequalities.	Example: $x > -4$ and $x < 3$ 
***Or* Compound Inequalities**	The graph is the union of solution sets of two inequalities.	Example: $x \leq -3$ or $x > 1$ 

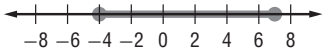
Example 1 **Solve $-3 \leq 2x + 5 \leq 19$. Graph the solution set on a number line.**

$-3 \leq 2x + 5$ and $2x + 5 \leq 19$

$-8 \leq 2x$ $2x \leq 14$

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

$-4 \leq x \leq 7$

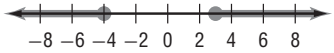


Example 2 **Solve $3y - 2 \geq 7$ or $2y - 1 \leq -9$. Graph the solution set on a number line.**

$3y - 2 \geq 7$ or $2y - 1 \leq -9$

$3y \geq 9$ or $2y \leq -8$

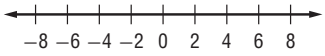
$y \geq 3$ or $y \leq -4$



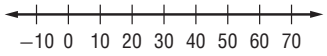
Exercises

Solve each inequality. Graph the solution set on a number line.

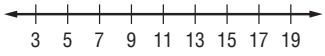
1. $-10 < 3x + 2 \leq 14$



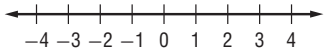
2. $3a + 8 < 23$ or $\frac{1}{4}a - 6 > 7$



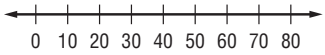
3. $18 < 4x - 10 < 50$



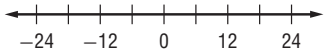
4. $5k + 2 < -13$ or $8k - 1 > 19$



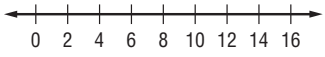
5. $100 \leq 5y - 45 \leq 225$



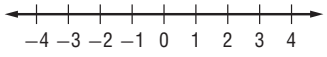
6. $\frac{2}{3}b - 2 > 10$ or $\frac{3}{4}b + 5 < -4$



7. $22 < 6w - 2 < 82$



8. $4d - 1 > -9$ or $2d + 5 < 11$



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1-6 Study Guide and Intervention *(continued)*

Solving Compound and Absolute Value Inequalities

Absolute Value Inequalities Use the definition of absolute value to rewrite an absolute value inequality as a compound inequality.

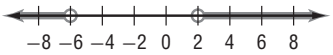
For all real numbers a and b, $b > 0$, the following statements are true.

1. If $|a| < b$, then $-b < a < b$.
2. If $|a| > b$, then $a > b$ or $a < -b$.

These statements are also true for $\leq$ and $\geq$, respectively.

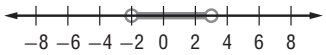
Example 1 **Solve $|x + 2| > 4$. Graph the solution set on a number line.**

By statement 2 above, if $|x + 2| > 4$, then $x + 2 > 4$ or $x + 2 < -4$. Subtracting 2 from both sides of each inequality gives $x > 2$ or $x < -6$.



Example 2 **Solve $|2x - 1| < 5$. Graph the solution set on a number line.**

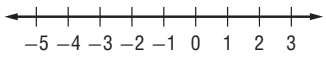
By statement 1 above, if $|2x - 1| < 5$, then $-5 < 2x - 1 < 5$. Adding 1 to all three parts of the inequality gives $-4 < 2x < 6$. Dividing by 2 gives $-2 < x < 3$.



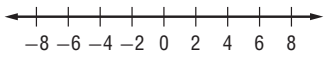
Exercises

Solve each inequality. Graph the solution set on a number line.

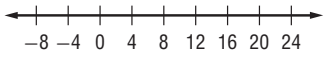
1. $|3x + 4| < 8$



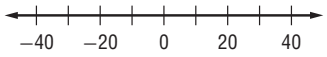
2. $|4k| + 1 > 27$



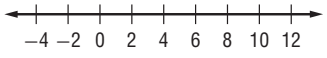
3. $\left|\frac{c}{2} - 3\right| \leq 5$



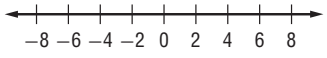
4. $|a + 9| \geq 30$



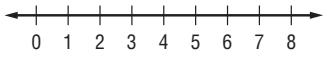
5. $|2f - 11| > 9$



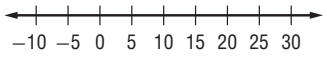
6. $|5w + 2| < 28$



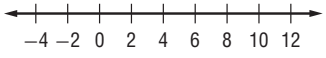
7. $|10 - 2k| < 2$



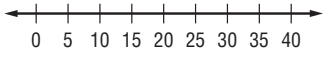
8. $\left|\frac{x}{2} - 5\right| + 2 > 10$



9. $|4b - 11| < 17$



10. $|100 - 3m| > 20$



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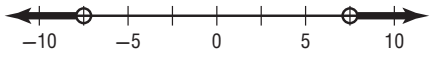
1-6 Skills Practice

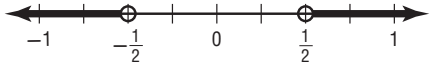
Solving Compound and Absolute Value Inequalities

Write an absolute value inequality for each graph.

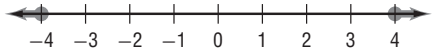
1. 

2. 

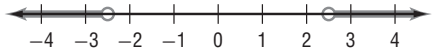
3. 

4. 

5. 

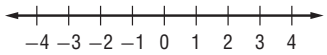
6. 

7. 

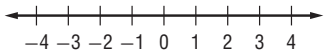
8. 

Solve each inequality. Graph the solution set on a number line.

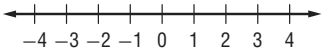
9. $2c + 1 > 5$ or $c < 0$



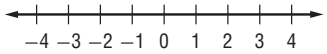
10. $-11 \leq 4y - 3 \leq 1$



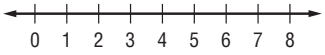
11. $10 > -5x > 5$



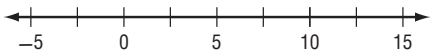
12. $4a \geq -8$ or $a < -3$



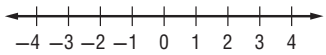
13. $8 < 3x + 2 \leq 23$



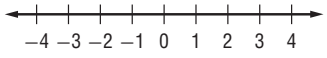
14. $w - 4 \leq 10$ or $-2w \leq 6$



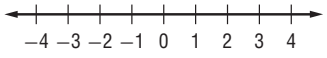
15. $|t| \geq 3$



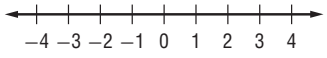
16. $|6x| < 12$



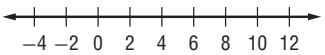
17. $|-7r| > 14$



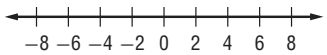
18. $|p + 2| \leq -2$



19. $|n - 5| < 7$



20. $|h + 1| \geq 5$



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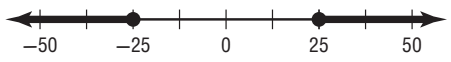
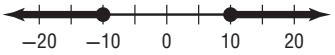
1-6 Practice

Solving Compound and Absolute Value Inequalities

Write an absolute value inequality for each graph.

1. 

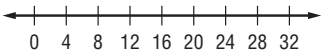
2. 

3. 

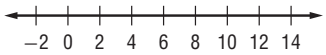
4. 

Solve each inequality. Graph the solution set on a number line.

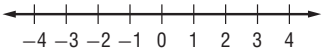
5. $-8 \leq 3y - 20 < 52$



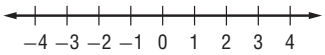
6. $3(5x - 2) < 24$ or $6x - 4 > 4 + 5x$



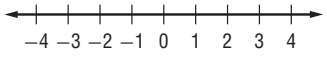
7. $2x - 3 > 15$ or $3 - 7x < 17$



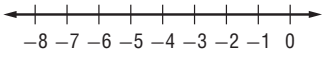
8. $15 - 5x \leq 0$ and $5x + 6 \geq -14$



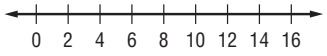
9. $|2w| \geq 5$



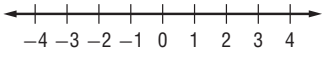
10. $|y + 5| < 2$



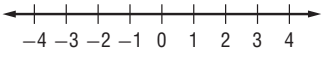
11. $|x - 8| \geq 3$



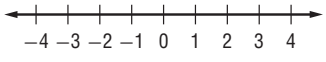
12. $|2z - 2| \leq 3$



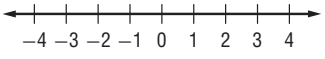
13. $|2x + 2| - 7 \leq -5$



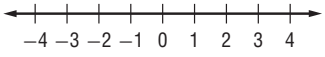
14. $|x| > x - 1$



15. $|3b + 5| \leq -2$



16. $|3n - 2| - 2 < 1$



17. RAINFALL In 90% of the last 30 years, the rainfall at Shell Beach has varied no more than 6.5 inches from its mean value of 24 inches. Write and solve an absolute value inequality to describe the rainfall in the other 10% of the last 30 years.

18. MANUFACTURING A company's guidelines call for each can of soup produced not to vary from its stated volume of 14.5 fluid ounces by more than 0.08 ounces. Write and solve an absolute value inequality to describe acceptable can volumes.

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1-6 Word Problem Practice

Solving Compound and Absolute Value Inequalities

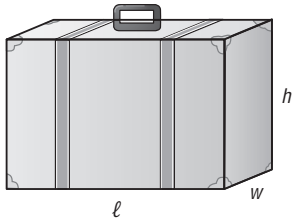
1. AQUARIUM The depth d of an aquarium tank for dolphins satisfies $|d - 50| < 5$. Rewrite this as a compound inequality that does not involve the absolute value function.

2. HIKING For a hiking trip, everybody must bring at least one backpack. However, because of space limitations, nobody is allowed to bring more than two backpacks. Let n be the number of people going on the hiking trip and b be the number of backpacks allowed. Write a compound inequality that describes how b and n are related.

3. CONCERT Jacinta is organizing a large fund-raiser concert in a space with a maximum capacity of 10,000 people. Her goal is to raise at least \$100,000. Tickets cost \$20 per person. Jacinta spends \$50,000 to put the event together. Write and solve a compound inequality that describes N, the number of attendees needed to achieve Jacinta's goal.

4. NUMBERS Amy is thinking of two numbers a and b. The sum of the two numbers must be within 10 units of zero. If a is between -100 and 100, write a compound inequality that describes the possible values of b.

5. AIRLINE BAGGAGE Many airlines have a size limitation for carry-on luggage. The limitation states that the sum of the length, width, and height of the suitcase must not exceed 45 inches.



a. Write an inequality that describes the airlines' carry-on size limitation.

b. A passenger needs to bring a soil sample on the plane that is at least 1 cubic foot. The passenger is bringing it in a suitcase that is in the shape of a cube with side length n inches. Write an inequality that gives the minimum length for n.

c. Write a compound inequality for n using parts **a** and **b**. Find the maximum and minimum values for n.

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1-6 Enrichment

Conjunctions and Disjunctions

The compound sentence that solves an absolute value inequality is called either a *conjunction* or a *disjunction*.

Example 1 **Solve $|2x| < 10$.**

$|2x| < 10$ means $2x < 10$ and $2x > -10$.

Solve each inequality. $x < 5$ and $x > -5$.

Every solution for $|2x| < 10$ is a replacement for x that makes both $x < 5$ and $x > -5$ true.

A compound sentence that combines two statements by the word *and* is a *conjunction.*

Example 2 **Solve $|3x - 7| \geq 11$.**

$|3x - 7| \geq 11$ means $3x - 7 \geq 11$ or $3x - 7 \leq -11$.

Solve each inequality. $3x \geq 18$ or $3x \leq -4$

$x \geq 6$ or $x \leq -\frac{4}{3}$

Every solution for the inequality is a replacement for x that makes either $x \geq 6$ or $x \leq -\frac{4}{3}$ true.

A compound sentence that combines two statements by the word *or* is a *disjunction.*

Exercises

Solve each inequality. Then write whether the solution is a conjunction or disjunction.

1. $|4x| > 24$

2. $|x - 7| \leq 8$

3. $|2x + 5| < 1$

4. $|x - 1| \geq 1$

5. $|3x - 1| \leq x$

6. $7 - |2x| > 5$

7. $\left|\frac{x}{2} + 1\right| \geq 7$

8. $\left|\frac{x - 4}{3}\right| < 4$

9. $|8 - x| > 2$

10. $|5 - 2x| \leq 3$