Name _____ Date _____ Class _____

LESSON 3-6

Reteach

Solving Compound Inequalities

Compound inequalities using AND require you to find solutions so that two inequalities will be satisfied at the same time.

Solve $2 < x + 3 \leq 5$ and graph the solutions.

The two inequalities are: $2 < x + 3$ AND $x + 3 \leq 5$.

Solve $2 < x + 3$.

$2 < x + 3$

$-3 \quad -3$ *Add -3 to both sides.*

$-1 < x$

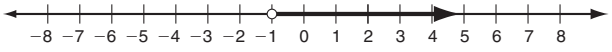
Solve $x + 3 \leq 5$.

$x + 3 \leq 5$

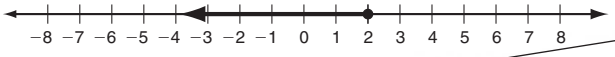
$-3 \quad -3$ *Add -3 to both sides.*

$x \leq 2$

Graph $x > -1$.



Graph $x \leq 2$.



Graph $-1 < x \leq 2$.

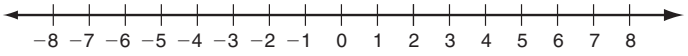
Use **overlapping** regions for compound inequalities with **AND**.

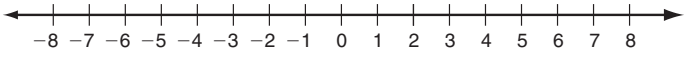
Write the two inequalities that must be solved in order to solve each compound inequality.

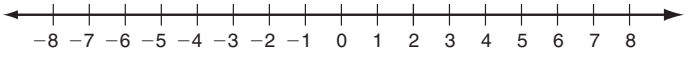
1. $-3 < x - 4 \leq 10$ _____ AND _____

2. $8 \leq m + 4 \leq 15$ _____ AND _____

3. Graph $-2 \leq w < 6$ by graphing each inequality separately. Then graph the compound inequality.

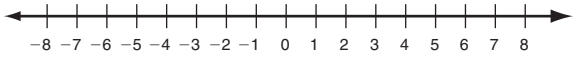




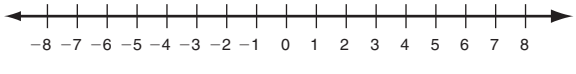


Solve each compound inequality and graph the solutions.

4. $-5 < k - 1 < 0$



5. $-4 < 2x - 8 \leq 6$



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Name _____ Date _____ Class _____

LESSON 3-6

Reteach

Solving Compound Inequalities (continued)

Compound inequalities using OR require you to find solutions that satisfy either inequality.

Solve $4x > 12$ OR $3x \leq -15$ and graph the solutions.

The two inequalities are: $4x > 12$ OR $3x \leq -15$.

Solve $4x > 12$.

$\frac{4x}{4} > \frac{12}{4}$ *Divide both sides by 4.*

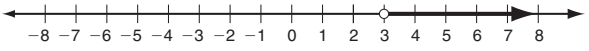
$x > 3$.

Solve $3x \leq -15$.

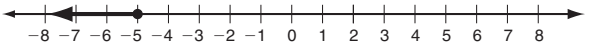
$\frac{3x}{3} \leq \frac{-15}{3}$ *Divide both sides by 3.*

$x \leq -5$

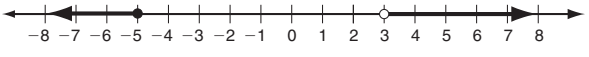
Graph $x > 3$.



Graph $x \leq -5$.



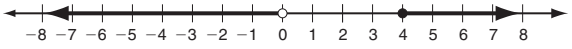
Graph $x > 3$ OR $x \leq -5$.



Use **both** regions for compound inequalities with **OR**.

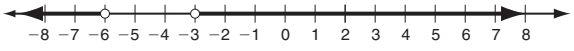
Write the compound inequality shown by each graph.

6.



_____

7.



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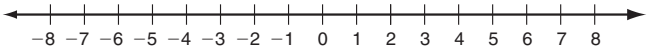
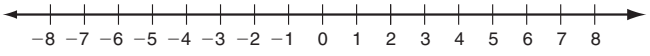
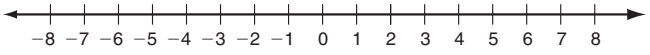
8. Graph $k \leq -1$ OR $k > 4$ by graphing each inequality separately. Then graph the compound inequality.



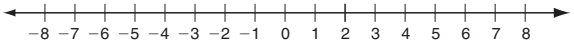




Solve each compound inequality and graph the solutions.

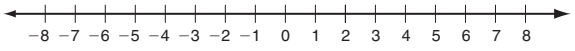
9. $x + 2 \geq 5$ OR $x + 6 < 2$

_____



10. $6b \geq 42$ OR $3b \leq -3$

_____



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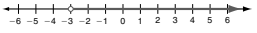
LESSON 3-6

Practice A

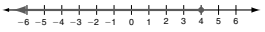
Solving Compound Inequalities

Graph each inequality, and then graph the compound inequality.

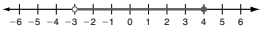
1. $x > -3$



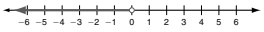
$x \le 4$



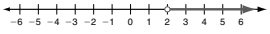
intersection: $x > -3$ AND $x \le 4$



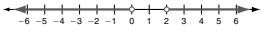
2. $z < 0$



$z > 2$

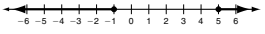


union: $z < 0$ OR $z > 2$



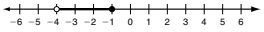
Write the compound inequality shown by each graph.

3.



$x \le -1$ OR $x \ge 5$

4.



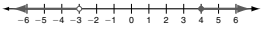
$x > -4$ AND $x \le -1$

Fill in the blanks to solve each compound inequality. Graph the solutions.

5. $n + 5 < 2$ OR $n + 5 \ge 9$

$-\underline{5} \quad -\underline{5} \qquad -\underline{5} \quad -\underline{5}$

$n < \underline{-3}$ OR $n \ge \underline{4}$



6. $-11 \le 2x - 1 \le 1$

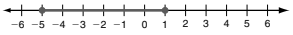
$-11 \le 2x - 1$ AND $2x - 1 \le 1$

$+\underline{1} \quad +\underline{1} \qquad +\underline{1} \quad +\underline{1}$

$\underline{-10} \le 2x$ AND $2x \le \underline{2}$

$\div\underline{2} \quad \div\underline{2} \qquad \div\underline{2} \quad \div\underline{2}$

$\underline{-5} \le x$ AND $x \le \underline{1}$



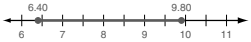
Write a compound inequality for each problem. Graph the solutions.

7. To relieve arthritis, Dr. Stoll recommends taking between 400 and 600 mg of ibuprofen, inclusive.

$400 \le m \le 600$

8. An advertisement for a part-time job says that the hourly rate is between \$6.40 and \$9.80 inclusive, depending on experience.

$6.40 \le r \le 9.80$



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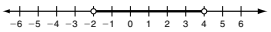
LESSON 3-6

Practice B

Solving Compound Inequalities

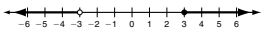
Write the compound inequality shown by each graph.

1.



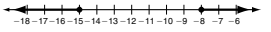
$-2 < x < 4$

2.



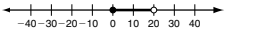
$x < -3$ OR $x \ge 3$

3.



$x \le -15$ OR $x \ge -8$

4.

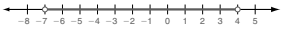


$0 \le x < 20$

Solve each compound inequality and graph the solutions.

5. $-15 < x - 8 < -4$

$-7 < x < 4$



6. $12 \le 4n < 28$

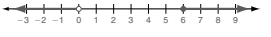
$3 \le n < 7$

7. $-2 \le 3b + 7 \le 13$

$-3 \le b \le 2$

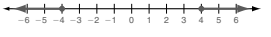
8. $x - 3 < -3$ OR $x - 3 \ge 3$

$x < 0$ OR $x \ge 6$



9. $5k \le -20$ OR $2k \ge 8$

$k \le -4$ OR $k \ge 4$



10. $2s + 3 \le 7$ OR $3s + 5 > 26$

$s \le 2$ OR $s > 7$

Write a compound inequality for each problem. Graph the solutions.

11. The human ear can distinguish sounds between 20 Hz and 20,000 Hz, inclusive.

$20 \le h \le 20{,}000$

12. For a man to box as a welterweight, he must weigh more than 140 lbs, but at most 147 lbs.

$140 < w \le 147$

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LESSON 3-6

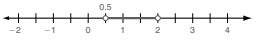
Practice C

Solving Compound Inequalities

Solve each compound inequality and graph the solutions.

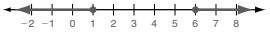
1. $-1 < 4x - 3 < 5$

$0.5 < x < 2$



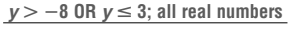
2. $3a - 5 \le -2$ OR $3a - 5 \ge 13$

$a \le 1$ OR $a \ge 6$



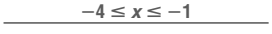
3. $-y - 2 > 6$ OR $4y + 8 \le 20$

$y > -8$ OR $y \le 3$; all real numbers



4. $3 \le -2x + 1 \le 9$

$-4 \le x \le -1$



5. $-5k < -10$ OR $3k > -9$

$k > -3$

6. $\frac{1}{2}z + 3 < -4$ OR $\frac{2}{3}z - 1 \ge \frac{1}{5}$

$z < -14$ OR $z \ge 1.8$

7. $-2 \le \frac{n+2}{3} \le 4$

$-8 \le n \le 10$

8. $p + 4 > 6$ AND $3p \le -18$

$p > 2$ AND $p \le -6$; no solutions

9. The United States Postal Service charges a "nonmachinable surcharge" for first-class mail if the length of the envelope (parallel to the address) divided by the height of the envelope is less than 1.3 or more than 2.5. Charlene has an envelope with a height of 3.5 inches. Write a compound inequality to show the lengths in inches for which Charlene will have to pay the surcharge. Graph the solutions.

$0 < \ell < 4.55$ OR $\ell > 8.75$

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LESSON 3-6

Reteach

Solving Compound Inequalities

Compound inequalities using AND require you to find solutions so that two inequalities will be satisfied at the same time.

Solve $2 < x + 3 \le 5$ and graph the solutions.

The two inequalities are: $2 < x + 3$ AND $x + 3 \le 5$.

Solve $2 < x + 3$.

$2 < x + 3$

$\underline{-3} \quad \underline{-3}$ *Add −3 to both sides.*

$-1 < x$

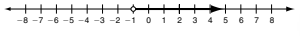
Solve $x + 3 \le 5$.

$x + 3 \le 5$

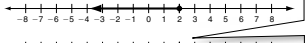
$\underline{-3} \quad \underline{-3}$ *Add −3 to both sides.*

$x \le 2$

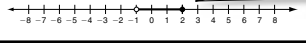
Graph $x > -1$.



Graph $x \le 2$.



Graph $-1 < x \le 2$.



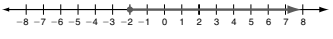
Use **overlapping** regions for compound inequalities with **AND**.

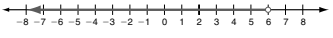
Write the two inequalities that must be solved in order to solve each compound inequality.

1. $-3 < x - 4 \le 10$ $\quad -3 < x - 4$ AND $x - 4 \le 10$

2. $8 \le m + 4 \le 15$ $\quad 8 \le m + 4$ AND $m + 4 \le 15$

3. Graph $-2 \le w < 6$ by graphing each inequality separately. Then graph the compound inequality.

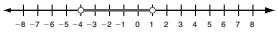




Solve each compound inequality and graph the solutions.

4. $-5 < k - 1 < 0$

$-4 < k < 1$



5. $-4 < 2x - 8 \le 6$

$2 < x \le 7$

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LESSON 3-6

Reteach

Solving Compound Inequalities (continued)

Compound inequalities using OR require you to find solutions that satisfy either inequality.

Solve $4x > 12$ OR $3x \leq -15$ and graph the solutions.

The two inequalities are: $4x > 12$ OR $3x \leq -15$.

Solve $4x > 12$.

$\frac{4x}{4} > \frac{12}{4}$ *Divide both sides by 4.*

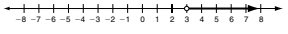
$x > 3$.

Solve $3x \leq -15$.

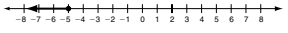
$\frac{3x}{3} \leq \frac{-15}{3}$ *Divide both sides by 3.*

$x \leq -5$

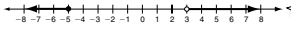
Graph $x > 3$.



Graph $x \leq -5$.

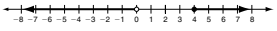


Graph $x > 3$ OR $x \leq -5$.

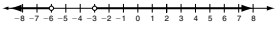


Use **both** regions for compound inequalities with **OR**.

Write the compound inequality shown by each graph.

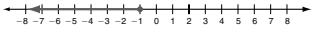
6. 

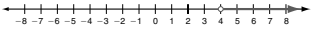
$x < 0$ OR $x \geq 4$

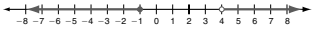
7. 

$x < -6$ OR $x > -3$

8. Graph $k \leq -1$ OR $k > 4$ by graphing each inequality separately. Then graph the compound inequality.



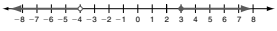




Solve each compound inequality and graph the solutions.

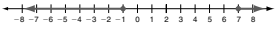
9. $x + 2 \geq 5$ OR $x + 6 < 2$

$x \geq 3$ OR $x < -4$



10. $6b \geq 42$ OR $3b \leq -3$

$b \geq 7$ OR $b \leq -1$



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LESSON 3-6

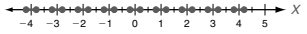
Challenge

Solving Compound Inequalities

The inequality $a \leq x \leq b$, where $a < b$, is the set of all real numbers between a and b, including a and b. The corresponding set of points on the number line is called a *closed inverval.*

In Exercises 1–7, n is an integer and $n - \frac{1}{4} \leq x \leq n + \frac{1}{4}$. Graph the solutions for the given values of n on the number line below.

1. $n = 0$
2. $n = 0$ or $n = 1$
3. n = 0 or $n = -1$
4. $n = -2, -1, 0, 1$, or 2
5. $n = -3, -2, -1, 0, 1, 2$, or 3
6. $n = -4, -3, -2, -1, 0, 1, 2, 3$, or 4

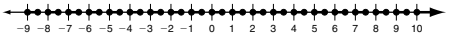


7. Suppose that the graphs for all values of n are shown on the number line. Describe the graph.

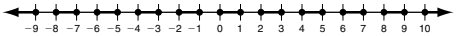
Answers may vary. Sample answer: closed intervals centered at each integer with each interval being $\frac{1}{2}$ unit long

For each set of intervals on the given number line, write a compound inequality involving n, x, and conjunction to describe the entire graph.

8. $n \leq x \leq n + \frac{1}{2}$



9. $2n \leq x \leq 2n + 1$



10. $4n - 1 \leq x \leq 4n + 1$

11. **a.** Let n be an integer. Describe the interval $1 - \frac{1}{n} \leq x \leq 1 + \frac{1}{n}$.

Answers may vary. Sample answers: The center of the interval is 1, and its length is $\frac{2}{n}$.

b. What can you say about the interval as n gets larger.

As n gets larger, the center remains at 1, but the length of the interval gets smaller.

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LESSON 3-6

Problem Solving

Solving Compound Inequalities

Write and solve an inequality for each situation.

1. The Mexican Tetra is a tropical fish that requires a water temperature between 68 and 77 degrees Fahrenheit, inclusive. An aquarium is heated 8 degrees so that a Tetra can live in it. What temperatures could the water have been before the heating?

$68 \leq t + 8 \leq 77$;

$60 \leq t \leq 69$

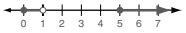
2. Nerissa's car can travel between 380 and 410 miles on a full tank of gas. She filled her gas tank and drove 45 miles. How many more miles can she drive without running out of gas?

$380 \leq m + 45 \leq 410$;

$335 \leq m \leq 365$

3. A local company is hiring trainees with less than 1 year of experience and managers with 5 or more years of experience. Graph the solutions.

$y < 1$ OR $y \geq 5$



4. Marty's allowance is doubled and is now between \$10 and \$15, inclusive. What amounts could his allowance have been before the increase? Graph the solutions.

$10 \leq 2a \leq 15$;

$5 \leq a \leq 7.5$

The elliptical orbits of planets bring them closer to and farther from the Sun at different times. The closest (perihelion) and furthest (aphelion) points are given for three planets below. Use this data to answer questions 5–7.

Planet	Perihelion (in 10^6 km)	Aphelion (in 10^6 km)
Uranus	2741.3	3003.6
Neptune	4444.5	4545.7
Pluto	4435.0	7304.3

5. Which inequality represents the distances d from the sun to Neptune?
   - **A** $d \leq 4444.5$
   - **B** $d \leq 4545.7$
   - **C** $4444.5 \leq d \leq 4545.7$
   - **D** $d = 4444.5$ OR $d \geq 4545.7$

6. A NASA probe is traveling between Uranus and Neptune. It is currently between their orbits. Which inequality shows the possible distance p from the probe to the Sun?
   - **F** $1542.1 < p < 1703.2$
   - **G** $2741.3 < p < 4545.7$
   - **H** $3003.6 < p < 4444.5$
   - **J** $7185.8 < p < 7549.3$

7. At what distances o do the orbits of Neptune and Pluto overlap?
   - **A** $4435.0 \leq o \leq 4444.5$
   - **B** $4435.0 \leq o \leq 4545.7$
   - **C** $4444.5 \leq o \leq 7304.3$
   - **D** $4545.7 \leq o \leq 7304.3$

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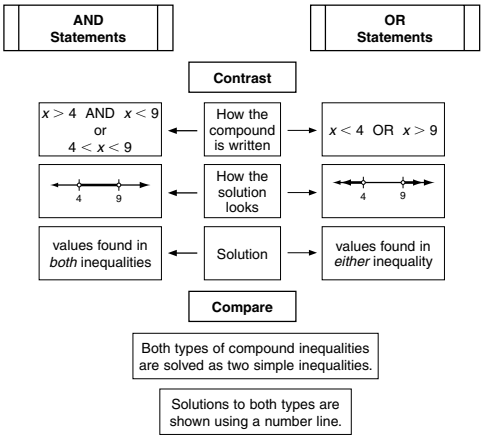
LESSON 3-6

Reading Strategies

Compare and Contrast

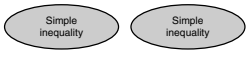
There are two types of compound inequalities: AND statements and OR statements. The chart below shows their similarities and differences.



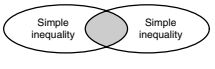
Answer each question using the examples given above.

1. Which has more *whole number* solutions: the AND or the OR statement? OR
2. List 3 *whole number* solutions to the AND statement. Possible answer: 5, 6, 7
3. List 3 *whole number* solutions to the OR statement. Possible answer: 3, 10, 11
4. Which is best described as having solutions *between* two values: the AND statement or the OR statement? AND
5. The shaded region in each Venn diagram represents the solutions to compound inequalities. Label them either *OR statement* or *AND statement.*

OR statement



AND statement



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