

LESSON

Reteach

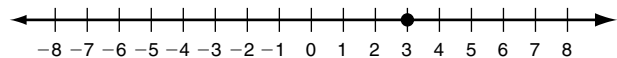
3-2 Solving Inequalities by Adding or Subtracting

The method for solving one-step inequalities by adding is just like the method for solving one-step equations by adding.

Solve $x - 2 = 1$ and graph the solution.

$$x - 2 = 1$$

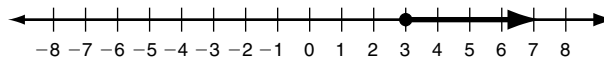
$$\begin{array}{r} +2 \quad +2 \\ \hline x = 3 \end{array} \quad \text{Add 2 to each side.}$$



Solve $x - 2 \geq 1$ and graph the solutions.

$$x - 2 \geq 1$$

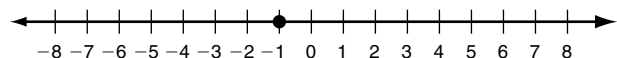
$$\begin{array}{r} +2 \quad +2 \\ \hline x \geq 3 \end{array} \quad \text{Add 2 to each side.}$$



Solve $-4 = a - 3$ and graph the solution.

$$-4 = a - 3$$

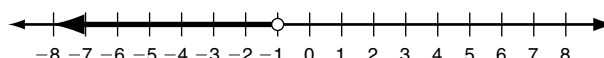
$$\begin{array}{r} +3 \quad +3 \\ \hline -1 = a \end{array} \quad \text{Add 3 to each side.}$$



Solve $-4 > a - 3$ and graph the solutions.

$$-4 > a - 3$$

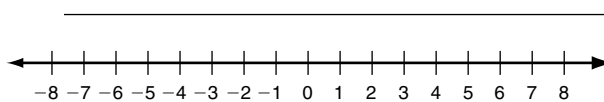
$$\begin{array}{r} +3 \quad +3 \\ \hline -1 > a \\ a < -1 \end{array} \quad \text{Add 3 to each side.}$$



Solve each inequality and graph the solutions.

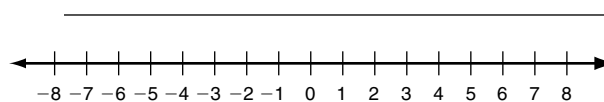
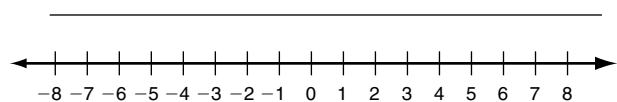
1. $b - 4 < 3$

2. $x - 5 < -2$



3. $-10 > -6 + x$

4. $1 \leq f - 3$



LESSON

Reteach

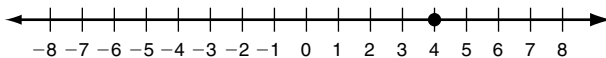
3-2 Solving Inequalities by Adding or Subtracting (continued)

The method for solving one-step inequalities by subtracting is just like the method for solving one-step equations by subtracting.

Solve $x + 3 = 7$ and graph the solution.

$$x + 3 = 7$$

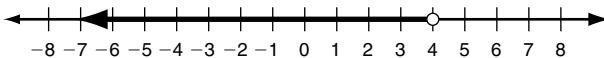
$$\begin{array}{r} \underline{-3} \quad \underline{-3} \\ x + 3 = 7 \\ \hline x = 4 \end{array} \quad \text{Subtract 3 from each side.}$$



Solve $x + 3 < 7$ and graph the solutions.

$$x + 3 < 7$$

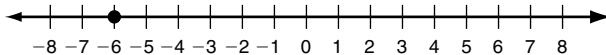
$$\begin{array}{r} \underline{-3} \quad \underline{-3} \\ x + 3 < 7 \\ \hline x < 4 \end{array} \quad \text{Subtract 3 from each side.}$$



Solve $-4 = h + 2$ and graph the solution.

$$-4 = h + 2$$

$$\begin{array}{r} \underline{-2} \quad \underline{-2} \\ -4 = h + 2 \\ \hline -6 = h \end{array} \quad \text{Subtract 2 from each side.}$$

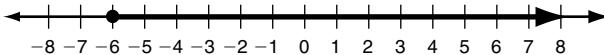


Solve $-4 \leq h + 2$ and graph the solutions.

$$-4 \leq h + 2$$

$$\begin{array}{r} \underline{-2} \quad \underline{-2} \\ -4 \leq h + 2 \\ \hline -6 \leq h \end{array} \quad \text{Subtract 2 from each side.}$$

$$h \geq -6$$



Solve each inequality and graph the solutions.

5. $c + 3 \leq -2$



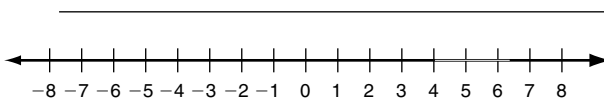
6. $4 + x < 6$



7. $4 < w + 7$



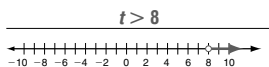
8. $9 \leq 5 + n$



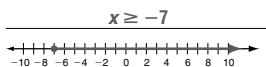
LESSON **Practice A**
3-2 Solving Inequalities by Adding or Subtracting

Solve each inequality and graph the solutions.

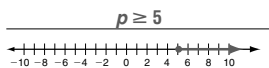
1. $t - 3 > 5$



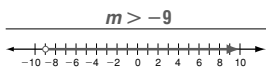
2. $x + 7 \geq 0$



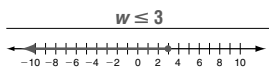
3. $4 \leq p - 1$



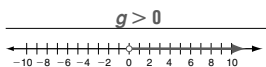
4. $m + 15 > 6$



5. $-8 \geq w - 11$

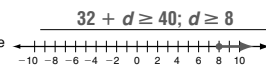


6. $-5 + g > -15$



Answer each question.

7. Joy wants to save at least \$40 for her trip to the amusement park. So far, she has \$32. She plans to save d more dollars. Write, solve, and graph an inequality to show the values of d that will allow Joy to meet her goal.



8. Penelope's MP3 player has 20 megabytes of memory. She has already downloaded 11 megabytes. She will continue to download m more megabytes. Write and solve an inequality that shows all the values of m that Penelope can download to her MP3 player.

$11 + m \leq 20; m \leq 9$

9. Roy works more than 30 hours each week. He has worked 17 hours already. Write and solve an inequality that shows the numbers of hours h that Roy has left to work.

$17 + h > 30; h > 13$

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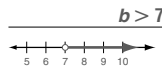
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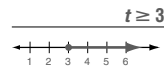
LESSON **Practice B**
3-2 Solving Inequalities by Adding or Subtracting

Solve each inequality and graph the solutions.

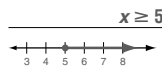
1. $b + 8 > 15$



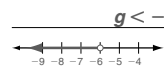
2. $t - 5 \geq -2$



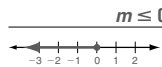
3. $-4 + x \geq 1$



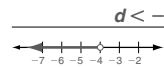
4. $g + 8 < 2$



5. $-9 \geq m - 9$

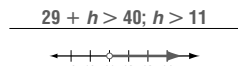


6. $15 > d + 19$



Answer each question.

7. Jessica makes overtime pay when she works more than 40 hours in a week. So far this week she has worked 29 hours. She will continue to work h hours this week. Write, solve, and graph an inequality to show the values of h that will allow Jessica to earn overtime pay.



8. Henry's MP3 player has 512MB of memory. He has already downloaded 287MB and will continue to download m more megabytes. Write and solve an inequality that shows how many more megabytes he can download.

$287 + m \leq 512; m \leq 225$

9. Eleanor needs to read at least 97 pages of a book for homework. She has read 34 pages already. Write and solve an inequality that shows how many more pages p she must read.

$34 + p \geq 97; p \geq 63$

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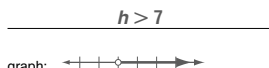
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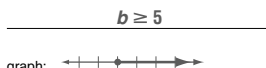
LESSON **Practice C**
3-2 Solving Inequalities by Adding or Subtracting

Solve each inequality and graph the solutions.

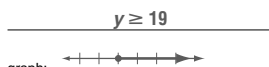
1. $h + 5 > 12$



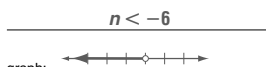
2. $1 \leq b - 4$



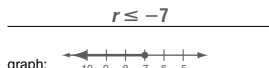
3. $-11 + y \geq 8$



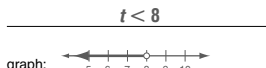
4. $n + 8.2 < 2.2$



5. $r - \frac{1}{2} \leq -7\frac{1}{2}$

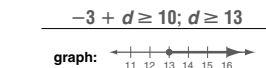


6. $-4 > t - 12$



Answer each question.

7. Leo has an outdoor painting project he wants to complete today. The directions on the paint can indicate that the minimum temperature for proper adherence and drying is 10°C. Early in the morning the thermometer read -3°C. The temperature will rise d degrees throughout the day. Write, solve, and graph an inequality to show the values of d that will allow Leo to paint.



8. Kalista spent \$29.75 at the gift shop of the science museum. She took \$40 to the museum and still needs to buy lunch. Write and solve an inequality that shows how much money m Kalista can spend on her lunch.

$29.75 + m \leq 40; m \leq 10.25$

9. Grace is at least 8 inches taller than her younger sister. Her sister is 4 feet tall. Write and solve an inequality that shows how tall g Grace can be.

$g \geq 48 + 8; g \geq 56$

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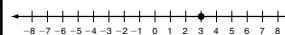
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LESSON **Reteach**
3-2 Solving Inequalities by Adding or Subtracting

The method for solving one-step inequalities by adding is just like the method for solving one-step equations by adding.

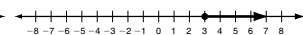
Solve $x - 2 = 1$ and graph the solution.

$x - 2 = 1$
 $\frac{+2}{+2} \quad \frac{+2}{+2} \quad \text{Add 2 to each side.}$
 $x = 3$



Solve $x - 2 \geq 1$ and graph the solutions.

$x - 2 \geq 1$
 $\frac{+2}{+2} \quad \frac{+2}{+2} \quad \text{Add 2 to each side.}$
 $x \geq 3$



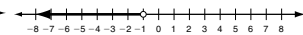
Solve $-4 = a - 3$ and graph the solution.

$-4 = a - 3$
 $\frac{+3}{+3} \quad \frac{+3}{+3} \quad \text{Add 3 to each side.}$
 $-1 = a$



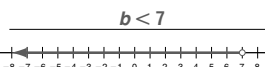
Solve $-4 > a - 3$ and graph the solutions.

$-4 > a - 3$
 $\frac{+3}{+3} \quad \frac{+3}{+3} \quad \text{Add 3 to each side.}$
 $-1 > a$
 $a < -1$

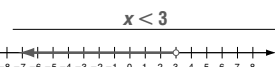


Solve each inequality and graph the solutions.

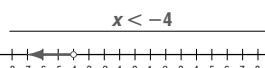
1. $b - 4 < 3$



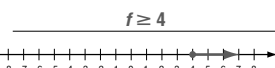
2. $x - 5 < -2$



3. $-10 > -6 + x$



4. $1 \leq f - 3$



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LESSON **Reteach**

3-2 Solving Inequalities by Adding or Subtracting (continued)

The method for solving one-step inequalities by subtracting is just like the method for solving one-step equations by subtracting.

Solve $x + 3 = 7$ and graph the solution.
 $x + 3 = 7$
 $\underline{-3 \quad -3}$ Subtract 3 from each side.
 $x = 4$

Solve $x + 3 < 7$ and graph the solutions.
 $x + 3 < 7$
 $\underline{-3 \quad -3}$ Subtract 3 from each side.
 $x < 4$

Solve $-4 = h + 2$ and graph the solution.
 $-4 = h + 2$
 $\underline{-2 \quad -2}$ Subtract 2 from each side.
 $-6 = h$

Solve $-4 \leq h + 2$ and graph the solutions.
 $-4 \leq h + 2$
 $\underline{-2 \quad -2}$ Subtract 2 from each side.
 $-6 \leq h$
 $h \geq -6$

Solve each inequality and graph the solutions.

5. $c + 3 \leq -2$
 $\underline{-3 \quad -3}$
 $c \leq -5$

6. $4 + x < 6$
 $\underline{-4 \quad -4}$
 $x < 2$

7. $4 < w + 7$
 $\underline{-7 \quad -7}$
 $w > -3$

8. $9 \leq 5 + n$
 $\underline{-5 \quad -5}$
 $n \geq 4$

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LESSON **Challenge**

3-2 Solving One-Step Inequalities by Adding and Subtracting

Susan has 200 feet of fencing and wants to use it to enclose a rectangular garden. She knows that the formula for the perimeter of a rectangle is $P = 2(L + W)$. Susan also knows that the area A of a rectangle is found by using $A = LW$.

Answer the following questions in order to help Susan plan how to use the fencing.

1. Susan can either use some or all of the fencing. Write an inequality that describes how much fencing she could use.
 $0 < P \leq 200$

2. Would a length of 70 feet and a width of 40 feet satisfy the inequality in Exercise 1? Explain.
No; because $2(70 + 40) = 220$ feet is greater than 200 feet

3. a. If Susan decides to use all of the fencing and chooses a length of 20 feet, find the width.
80 feet
 b. What would the length be if she chooses a width of 20 feet?
80 feet
 c. Given these dimensions, find the area of the garden.
1600 square feet

4. a. If Susan decides to use all of the fencing and chooses a length of 40 feet, find the width.
60 feet
 b. What would the length be if she chooses a width of 40 feet?
60 feet
 c. Given these dimensions, find the area of the garden.
2400 square feet

5. What conclusion can you draw from Exercises 3 and 4?
If the dimensions are reversed, the area remains the same.

6. a. If Susan would like the length and the width to be as close to one another as possible and to be whole numbers, what might the dimensions be?
50 feet by 50 feet
 b. Given her intention in part a, what shape is she trying to achieve?
a square
 c. Given your answer to part a, find the area of the garden.
2500 square feet

7. Susan's friend, Jack, has 160 feet of fencing. He wants to use all his fencing to make a garden with the greatest possible area. Without using inequalities, what dimensions should he choose?
40 feet by 40 feet

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LESSON **Problem Solving**

3-2 Solving Inequalities by Adding or Subtracting

Write the correct answer.

1. Sumiko is allowed to watch no more than 10 hours of television each week. She has watched 4 hours of television already. Write and solve an inequality to show how many more hours of television Sumiko can watch.
 $4 + h \leq 10; h \leq 6$

2. A satellite will be released into an orbit of more than 400 miles above the Earth. The rocket carrying it is currently 255 miles above Earth. Write and solve an inequality to show how much higher the rocket must climb before it releases the satellite.
 $m + 255 > 400; m > 145$

3. Wayne's homework is to solve at least 20 questions from his textbook. So far, he has completed 9 of them. Write, solve, and graph an inequality to show how many more problems Wayne must complete.
 $q + 9 \geq 20; q \geq 11$

4. Felix wants to get at least one hour of exercise each day. Today, he has run for 40 minutes. Write, solve, and graph an inequality that shows how much longer Felix needs to exercise to reach his goal.
 $40 + e \geq 60; e \geq 20$

The high school has been raising money for charity and the class that raises the most will be awarded a party at the end of the year. The table below shows how much money each class has raised so far. Use this information to answer questions 5-7.

Class	Amount Raised (\$)
Seniors	870
Juniors	650
Sophomores	675
First-Years	590

5. The school has a goal of raising at least \$3000. Which inequality shows how much more money m they need to raise to reach their goal?
A $m \geq 215$ **C** $m \leq 215$
B $m < 215$ **D** $m > 2785$

6. The juniors would like to raise more money than the seniors. The seniors have completed their fundraising for the year. Which expression shows how much more money j the juniors must raise to overtake the seniors?
F $j \leq 220$ **H** $j \geq 220$
G $j < 220$ **J** $j > 220$

7. A local business has agreed to donate no more than half as much as the senior class raises. Which inequality shows how much money b the business will contribute?
A $\frac{1}{2}(870) \leq b$ **C** $\frac{1}{2}(870) \geq b$
B $870 \leq \frac{1}{2}b$ **D** $870 \geq \frac{1}{2}b$

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LESSON **Reading Strategies**

3-2 Follow a Procedure

There are two parts to checking solutions to inequalities: checking the endpoint and checking the direction of the inequality symbol.

Check that $x > -3$ represents the solutions to $x - 4 > -7$.

Step 1

$x - 4 = -7$	} Write the related equation.	
$-3 - 4 = -7$		} Substitute -3 for x in the related equation.
$-7 = -7 \checkmark$		

If the statement is true, the value is an endpoint.

Step 2

$x - 4 > -7$	} Write the original inequality.	
$10 - 4 > -7$		} Substitute a value greater than -3 in the original inequality.
$6 > -7 \checkmark$		

If the statement is true, the symbol is correct.

Both steps check, so $x > -3$ correctly represents the solutions.

Answer each question.

1. Which Step confirms that the endpoint is correct? **Step 1**

2. What is being checked in Step 2?
the direction of the inequality symbol

3. Describe Step 1 when checking that $8 \leq m$ represents the solutions to $14 \leq m + 6$.
Substitute 8 for m in $14 = m + 6$.

4. Give a value that could be used in Step 2 when checking that $8 \leq m$ represents the solutions to $14 \leq m + 6$.
Possible answer: 9

For each problem, check that the given solutions represent the inequality by using the two-step procedure shown above.

5. $t + 5 < -9$

	Step 1	Step 2	
$t > -14$	$t + 5 = -9$	$t + 5 < -9$	correct?
	$-14 + 5 = -9$	$-13 + 5 < -9$	no
	$-9 = -9$	$-8 < -9$	

6. $b - 6 \geq 2$

	Step 1	Step 2	
$b \geq 8$	$b - 6 = 2$	$b - 6 \geq 2$	correct?
	$8 - 6 = 2$	$9 - 6 \geq 2$	yes
	$2 = 2$	$3 \geq 2$	

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