

**LESSON**

**Reteach**

**3-1 Graphing and Writing Inequalities**

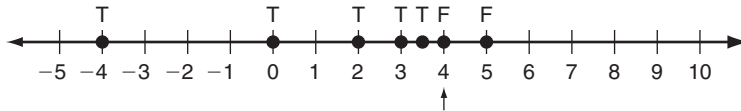
Describe the solutions of  $x + 2 < 6$ .

Choose different values for  $x$ . Be sure to choose positive and negative values as well as zero.

|             | $x = 0$  | $x = 2$  | $x = -4$   | $x = 5$   | $x = 4$   | $x = 3$  | $x = 3.5$  |
|-------------|--|--|--|---|---|--|--|
| $x + 2 < 6$ | $0 + 2 \stackrel{?}{<} 6$<br>$2 \stackrel{?}{<} 6$<br>True | $2 + 2 \stackrel{?}{<} 6$<br>$4 \stackrel{?}{<} 6$<br>True | $-4 + 2 \stackrel{?}{<} 6$<br>$-2 \stackrel{?}{<} 6$<br>True | $5 + 2 \stackrel{?}{<} 6$<br>$7 \stackrel{?}{<} 6$<br>False | $4 + 2 \stackrel{?}{<} 6$<br>$6 \stackrel{?}{<} 6$<br>False | $3 + 2 \stackrel{?}{<} 6$<br>$5 \stackrel{?}{<} 6$<br>True | $3.5 + 2 \stackrel{?}{<} 6$<br>$5.5 \stackrel{?}{<} 6$<br>True |

Plot the points on a number line. Use T to label points that make the inequality true.

Use F to label points that make the inequality false.



Look for the point at which the True statements turn to False statements. Numbers less than 4 make the statement true. The solutions are all real numbers less than 4.

Test the inequalities for the values given. Then describe the solutions of the inequality.

1.  $5x \leq 10$

| $x = 0$ | $x = 1$ | $x = -3$ | $x = -4$ | $x = 2$ | $x = 3$ | $x = 1.5$ |
|---------|---------|----------|----------|---------|---------|-----------|
|         |         |          |          |         |         |           |

2.  $m + 1 < -2$

| $x = 0$ | $x = 3$ | $x = -4$ | $x = -3$ | $x = -2$ | $x = -2.5$ | $x = -5$ |
|---------|---------|----------|----------|----------|------------|----------|
|         |         |          |          |          |            |          |

Describe the solutions of each inequality in words.

3.  $\frac{x}{3} > 4$  \_\_\_\_\_

4.  $g - 4 \leq -3$  \_\_\_\_\_

**LESSON**

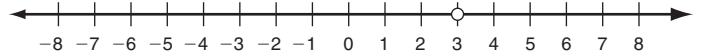
**3-1**

**Reteach**

**Graphing and Writing Inequalities (continued)**

**Graph  $x \leq 3$ .**

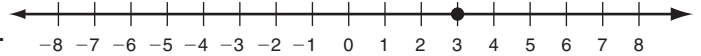
Step 1: Draw a circle on the number.



Step 2: Decide whether to fill in the circle.

*If  $>$  or  $<$ , leave empty.*

*If  $\geq$  or  $\leq$ , fill in.*



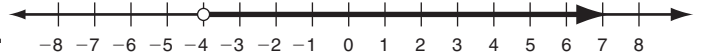
Step 3: Draw an arrow.

*If  $<$  or  $\leq$ , draw arrow to left.*

*If  $>$  or  $\geq$ , draw arrow to the right.*



**Write the inequality shown by the graph.**



Step 1: Write a variable and the number indicated by the circle.

$x ? -4$

Step 2: Look at the direction of the arrow.

*If arrow points left, use  $<$  or  $\leq$ .*

$x >$  or  $\geq -4$

*If arrow points right, use  $>$  or  $\geq$ .*

Step 3: Look at the circle.

*If circle is empty, use  $>$  or  $<$ .*

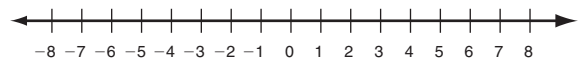
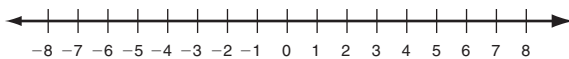
*If circle is filled in use,  $\geq$  or  $\leq$ .*

$x > -4$

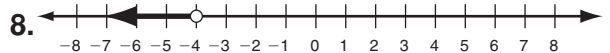
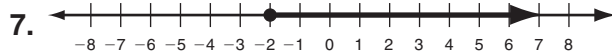
**Graph each inequality.**

5.  $m \geq 8 - 3$

6.  $p < 3.5$



**Write the inequality shown by the graph.**

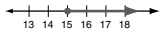
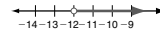




**LESSON 3-1 Practice A**  
**Graphing and Writing Inequalities**

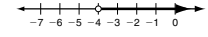
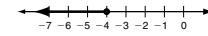
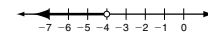
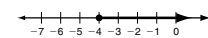
Match each inequality with its description.

- |   |   |
|---|---|
| 1. $a + 2 \leq 6$ _____ <b>c</b>        | a. all real numbers less than 1                 |
| 2. $3n < 3$ _____ <b>a</b>              | b. all real numbers greater than 2              |
| 3. $f - 2 > 0$ _____ <b>b</b>           | c. all real numbers less than or equal to 4     |
| 4. $8 \leq \frac{1}{2}y$ _____ <b>d</b> | d. all real numbers greater than or equal to 16 |

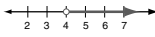
Graph each inequality.

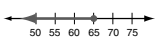
- |   |   |
|---|---|
| 5. $t \geq 15$   | 6. $h > -12$     |
| 7. $b < 3 - 10$  | 8. $3^2 \geq w$  |

Match each inequality with its graph by writing the letter on the line.

- |                                |  |
|--------------------------------|--|
| 9. $x \geq -4$ _____ <b>d</b>  | a.  |
| 10. $x \leq -4$ _____ <b>b</b> | b.  |
| 11. $x > -4$ _____ <b>a</b>    | c.  |
| 12. $x < -4$ _____ <b>c</b>    | d.  |

For each situation: Define a variable. Write an inequality. Graph the solutions.

13. To enter the play area, children must be more than 4 feet tall.  
 $h = \text{height}; h > 4;$  

14. As of July 1988, the speed limit on rural interstates in Virginia is 65 mph.  
 $s = \text{lawful speed}; s \leq 65;$  

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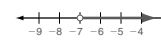


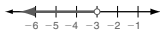
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**LESSON 3-1 Practice B**  
**Graphing and Writing Inequalities**

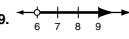
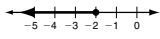
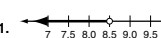
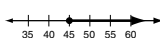
Describe the solutions of each inequality in words.

- |                                  |   |
|----------------------------------|---|
| 1. $2m \geq 6$ _____             | all real numbers greater than or equal to 3 |
| 2. $t + 3 < 8$ _____             | all real numbers less than 5                |
| 3. $1 < x - 5$ _____             | all real numbers greater than 6             |
| 4. $-10 \geq \frac{1}{2}c$ _____ | all real numbers less than or equal to -20  |

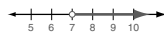
Graph each inequality.


- |  |   |
|--|---|
| 5. $x > -7$      | 6. $p \geq 2^3$          |
| 7. $4.5 \geq r$  | 8. $y < -\sqrt{14} - 5$  |

Write the inequality shown by each graph.

- |  |   |
|--|---|
| 9.  _____ $a > 6$    | 10.  _____ $b \leq -2$ |
| 11.  _____ $c < 8.5$ | 12.  _____ $d \geq 45$ |

Define a variable and write an inequality for each situation. Graph the solutions.

13. Josephine sleeps more than 7 hours each night.  
 $s = \text{hours of sleep}; s > 7;$  

14. In 1955, the minimum wage in the U.S. was \$0.75 per hour.  
 $w = \text{wage}; w \geq 0.75;$  

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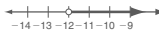
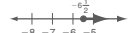


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**LESSON 3-1 Practice C**  
**Graphing and Writing Inequalities**

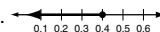
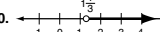
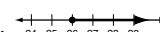
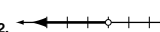
Describe the solutions of each inequality in words.

- |                                |   |
|--------------------------------|---|
| 1. $t - 1 \geq 7$ _____        | all real numbers greater than or equal to 8 |
| 2. $-6 > 2d$ _____             | all real numbers less than -3               |
| 3. $-4 < r + 5$ _____          | all real numbers greater than -9            |
| 4. $\frac{1}{2}x \leq 9$ _____ | all real numbers less than or equal to 18   |

Graph each inequality.

- |  |   |
|--|---|
| 5. $k > -12$<br>graph:          | 6. $-6\frac{1}{2} \leq w$<br>graph:  |
| 7. $b \leq 2^3 - 10$<br>graph:  | 8. $n < -\sqrt{2(5) + 6}$<br>graph:  |

Write the inequality shown by each graph.

- |   |  |
|---|--|
| 9.  _____ $a \leq 0.4$ | 10.  _____ $b > 1\frac{1}{3}$ |
| 11.  _____ $c \geq 26$ | 12.  _____ $d < -12$          |

Define a variable and write an inequality for each situation.

13. To qualify for the job, applicants must have more than 3 years of experience in the field.  
 $y = \text{years of experience}; y > 3$
14. As of Aug. 1996, the speed limit on rural interstates in North Carolina is 70 mph.  
 $s = \text{lawful speed}; s \leq 70$
15. In 2005, the minimum wage in the U.S. was \$5.15 per hour.  
 $w = \text{wage}; w \geq 5.15$

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**LESSON 3-1 Reteach**  
**Graphing and Writing Inequalities**

Describe the solutions of  $x + 2 < 6$ .

Choose different values for  $x$ . Be sure to choose positive and negative values as well as zero.

|             | $x = 0$         | $x = 2$         | $x = -4$         | $x = 5$         | $x = 4$         | $x = 3$         | $x = 3.5$         |
|-------------|-----------------|-----------------|------------------|-----------------|-----------------|-----------------|-------------------|
| $x + 2 < 6$ | $0 + 2 \not< 6$ | $2 + 2 \not< 6$ | $-4 + 2 \not< 6$ | $5 + 2 \not< 6$ | $4 + 2 \not< 6$ | $3 + 2 \not< 6$ | $3.5 + 2 \not< 6$ |
|             | $2 \not< 6$     | $4 \not< 6$     | $-2 \not< 6$     | $7 \not< 6$     | $6 \not< 6$     | $5 \not< 6$     | $5.5 \not< 6$     |
|             | True            | True            | True             | False           | False           | True            | True              |

Plot the points on a number line. Use T to label points that make the inequality true.

Use F to label points that make the inequality false.



Look for the point at which the True statements turn to False statements. Numbers less than 4 make the statement true. The solutions are all real numbers less than 4.

Test the inequalities for the values given. Then describe the solutions of the inequality.

| $x = 0$      | $x = 1$     | $x = -3$      | $x = -4$      | $x = 2$      | $x = 3$      | $x = 1.5$     |
|--------------|-------------|---------------|---------------|--------------|--------------|---------------|
| $5x \leq 10$ | $5 \leq 10$ | $-15 \leq 10$ | $-20 \leq 10$ | $10 \leq 10$ | $15 \leq 10$ | $7.5 \leq 10$ |
|              | T           | T             | T             | T            | F            | T             |

all real numbers less than or equal to 2

| $x = 0$      | $x = 3$  | $x = -4$  | $x = -3$  | $x = -2$  | $x = -2.5$  | $x = -5$  |
|--------------|----------|-----------|-----------|-----------|-------------|-----------|
| $m + 1 < -2$ | $4 < -2$ | $-3 < -2$ | $-2 < -2$ | $-1 < -2$ | $-1.5 < -2$ | $-4 < -2$ |
|              | F        | T         | F         | F         | F           | T         |

all real numbers less than -3

Describe the solutions of each inequality in words.

- |                            |  |
|----------------------------|--|
| 3. $\frac{x}{3} > 4$ _____ | all real numbers greater than 12         |
| 4. $g - 4 \leq -3$ _____   | all real numbers less than or equal to 1 |

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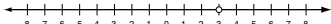
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**LESSON** **Reteach**

**3-1 Graphing and Writing Inequalities (continued)**

Graph  $x \leq 3$ .

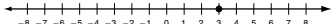
Step 1: Draw a circle on the number.



Step 2: Decide whether to fill in the circle.

If  $>$  or  $<$ , leave empty.

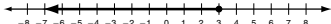
If  $\geq$  or  $\leq$ , fill in.



Step 3: Draw an arrow.

If  $>$  or  $<$ , draw arrow to the left.

If  $\geq$  or  $\leq$ , draw arrow to the right.



Write the inequality shown by the graph.

Step 1: Write a variable and the number indicated by the circle.

$x \leq 3$

Step 2: Look at the direction of the arrow.

If arrow points left, use  $>$  or  $<$ .

If arrow points right, use  $\geq$  or  $\leq$ .

$x$  or  $-4$

Step 3: Look at the circle.

If circle is empty, use  $>$  or  $<$ .

If circle is filled in, use  $\geq$  or  $\leq$ .

$x \leq -4$

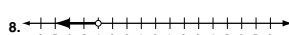
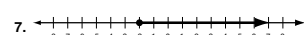
Graph each inequality.

5.  $m \geq 8 - 3$

6.  $p \leq 3.5$



Write the inequality shown by the graph.



$x \geq -2$

$x < -4$

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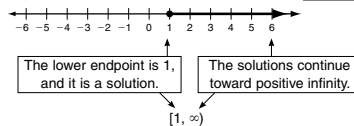
**LESSON** **Challenge**

**3-1 Interval Notation**

When you graph the solutions of an inequality, you use a solid circle to show an endpoint that is a solution and an open circle to show an endpoint that is not. You use an arrow pointing to the right to show when solutions continue toward positive infinity and an arrow pointing to the left to show when solutions continue toward negative infinity.

Interval notation is another way to show solutions of an inequality. In interval notation, the endpoints of the solutions are explicitly written out. Brackets or parentheses indicate whether or not the endpoints themselves are solutions. If the solutions continue toward infinity, an infinity symbol is written instead. The infinity symbol is always used with a parenthesis.

Here are the graph and interval notation for  $x \geq 1$ .



| Interval Notation |   |
|-------------------|---|
| [ or ]            | endpoint is a solution                      |
| ( or )            | endpoint is not a solution                  |
| (-∞               | solutions continue toward negative infinity |
| ∞)                | solutions continue toward positive infinity |

Complete the table. Problems 7–10 preview compound inequalities, which you'll learn more about in Lesson 3-6.

| inequality            | graph | interval notation |
|-----------------------|-------|-------------------|
| 1. $x > 4$            |       | $(4, \infty)$     |
| 2. $x \leq -2$        |       | $(-\infty, -2]$   |
| 3. $x < 3$            |       | $(-\infty, 3)$    |
| 4. $x \geq -5$        |       | $[-5, \infty)$    |
| 5. $x > 0$            |       | $(0, \infty)$     |
| 6. $x \leq -1$        |       | $(-\infty, -1]$   |
| 7. $-3 \leq x \leq 2$ |       | $[-3, 2]$         |
| 8. $0 < x \leq 3$     |       | $(0, 3]$          |
| 9. $-4 \leq x < 5$    |       | $[-4, 5)$         |
| 10. $-1 < x < 1$      |       | $(-1, 1)$         |

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**LESSON** **Problem Solving**

**3-1 Graphing and Writing Inequalities**

Write the correct answer.

1. A citizen must be at least 35 years old in order to run for the Presidency of the United States. Define a variable and write an inequality for this situation.

$a = \text{age of person}; a \geq 35$

2. A certain elevator can hold no more than 2500 pounds. Define a variable and write an inequality for this situation.

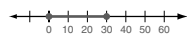
$w = \text{weight}; w \leq 2500$

3. Approximately 30% of the land on Earth is forested, but this percent is decreasing due to construction. Write and graph an inequality for this situation.

$f = \text{percent forested}; f \leq 30$

4. Khalil weighed 125 pounds before he started to gain weight to play football. Write and graph an inequality for this situation.

$w = \text{weight}; w \geq 125$



The Sanchez family is visiting an amusement park. When they enter the park, they receive a brochure which lists several requirements and restrictions. Select the best answer.

5. You must be at least 50 inches tall to ride The Wild Tornado roller coaster. Which of the following inequalities fits this situation?

- A  $h \leq 50$
- B  $h < 50$
- C  $h \geq 50$
- D  $h > 50$

6. Children less than 12 years old must be accompanied by an adult inside The Haunted House. Which of the following inequalities shows the ages of children who require an adult inside the house?

- F  $y \leq 12$
- G  $y < 12$
- H  $y \geq 12$
- J  $y > 12$

7. Totland is an area of the amusement park set aside for children who are 6 years old or younger. Which of the following inequalities represents the ages of children who are allowed in Totland?

- A  $a \leq 6$
- B  $a < 6$
- C  $a \geq 6$
- D  $a > 6$

8. The Bumpy Cars will not be turned on if there are 5 or more empty cars. Which of the following inequalities shows the possible numbers of empty cars if the ride is going to start?

- F  $c \leq 5$
- G  $c < 5$
- H  $c \geq 5$
- J  $c > 5$

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**LESSON** **Reading Strategies**

**3-1 Connecting Words and Symbols**

To write and graph inequalities, you must connect words with symbols. Look at the information in the table below.

| Symbol | Words  | Graph |
|--------|--|-------|
| $<$    | "less than"  |       |
| $\leq$ | "less than or equal to" "no more than" "at most"     |       |
| $>$    | "greater than"                                       |       |
| $\geq$ | "greater than or equal to" "no less than" "at least" |       |

Answer each question.

1. What are three ways to say  $x \geq 5$  in words?

$x$  is greater than or equal to 5;

$x$  is at least 5;

$x$  is no less than 5

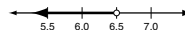
2. Does the graph of  $p > 8$  have an empty circle or a solid circle? Why?

empty; because the value 8 is not a solution

3. Draw the graph of  $m \leq -2$ .



4. Write the inequality that represents the graph, once with symbols and once with words.

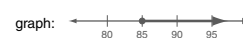


$t < 6.5$

$t$  is less than 6.5

5. Mitchell's goal is to get a grade  $g$  of at least 85% on his next Algebra quiz. Translate these words into symbols. Then graph the inequality.

$g \geq 85$



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Holt Algebra 1