**Please get your clickers.**

Algebra

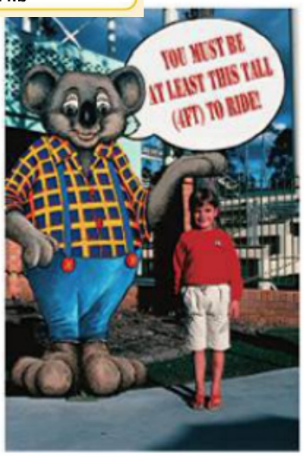
# 3-1 Graphing and Writing Inequalities

CONTENT STANDARDS
7.EE.4.b

## What You'll Learn

To graph and write algebraic inequalities

**New Vocabulary** inequality, solution of an inequality




## Why Learn This?

When you use an expression such as *at least* or *at most*, you are talking about an inequality. You can use inequalities to represent situations that involve minimum or maximum amounts.

## Check Your Readiness

### Adding and Subtracting Rational Numbers

**Find each sum or difference. Write your answer in simplest form.**

1. $-6.75 + 3.68$
2. $\frac{7}{12} + \frac{11}{12}$
3. $6 - 4.2$
4. $\frac{5}{8} - \frac{3}{4}$

### Multiplying Rational Numbers

**Find each product. Write your answer in simplest form.**

5. $1\frac{1}{2} \cdot (-7)$
6. $0.4 \cdot 0.6$
7. $(-1.8)(-4)$

### Dividing Rational Numbers

**Find each quotient. Write your answer in simplest form.**

8. $-6.4 \div 1.6$
9. $-\frac{3}{8} \div \frac{1}{2}$
10. $2.75 \div 0.5$

### Solving Equations

**Solve each equation. Write your answer in simplest form.**

11. $x + 2 = 7$
12. $-8.4 + b = -3.1$
13. $t + \frac{2}{3} = \frac{3}{4}$
14. $7.2 = -3h$
15. $\frac{w}{2} = -10$
16. $-\frac{3}{4}a = \frac{5}{6}$
17. $3 + 4g = 23$
18. $1.5k - 2.4 = 2.1$
19. $\frac{1}{2} + \frac{m}{5} = \frac{3}{10}$

A mathematical sentence that contains $<$, $>$, $\leq$, $\geq$, or $\neq$ is an **inequality**. Sometimes an inequality contains a variable, as in $x \geq 2$.

A **solution of an inequality** is any value that makes the inequality true. For example, 6, 8, and 15 are solutions of $x \geq 6$ because $6 \geq 6$, $8 \geq 6$, and $15 \geq 6$.

## EXAMPLE 1 Identifying Solutions of an Inequality

Find whether each number is a solution of $x \leq 2$; $-3$, 0, 2, 4.5.

Test each value by replacing the variable and evaluating the sentence.

$-3 \leq 2$ ← $-3$ is less than or equal to 2: true. ✔

$0 \leq 2$ ← 0 is less than or equal to 2: true. ✔

$2 \leq 2$ ← 2 is less than or equal to 2: true. ✔

$4.5 \leq 2$ ← 4.5 is less than or equal to 2: false. ✘

The numbers $-3$, 0, and 2 are solutions of $x \leq 2$. The number 4.5 is not a solution of $x \leq 2$.

**1 EXAMPLE** Tell whether each number is a solution of $k > -6$:
$-8, -6, 0, 3, 7$.

$-8 > -6$ $-6 > -6$ $0 > -6$ $3 > -6$ $7 > -6$ ← Replace $k$ with each number.

false false true true true

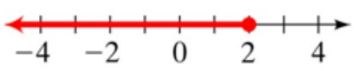
The numbers 0, 3, and 7 are solutions of $k > -6$.

The numbers –8 and –6 are not.

A graph can show all the numbers in a solution. You use closed circles and open circles to show whether numbers are included in the solution.

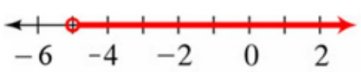
**2 EXAMPLE** Graph the solution of each inequality on a number line.

**a.** $r \leq 2$




Use a closed circle at 2 to show that $r$ can equal 2.

**b.** $m > -5$




Use an open circle at –5 to show that $m$ can't equal –5.

## EXAMPLE Graphing Inequalities

**2** Graph the solution of each inequality.

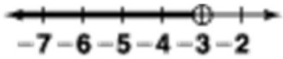
**a.** $n \geq -3$

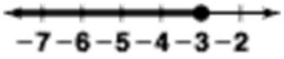

← Use a closed circle at −3 to show that $n$ can equal −3.

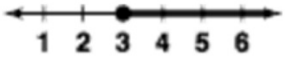
**b.** $h < 7$

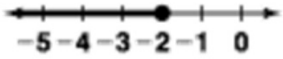

← Use an open circle at 7 to show that $h$ cannot equal 7.

1. Graph the solution of $w < -3$.

A. 


B. 


C. 


D. 

You can write an inequality by analyzing its graph.

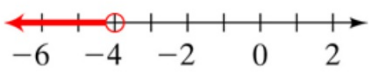
## EXAMPLE 3 Writing Inequalities

Write an inequality for the graph.


← Since the circle at 2 is open, 2 is not a solution.

$x > 2$ ← Since the graph shows values greater than 2, use $>$.

**3 EXAMPLE** Write an inequality.




← Since the circle at –4 is open, use < or >.

$z < -4$ ← Since the graph shows values less than –4, use <.

You can write inequalities to describe real-world situations.

**EXAMPLE** **Application: Nutrition**

**4** To be labeled sugar free, a food product must contain less than 0.5 g of sugar per serving. Write an inequality to describe this requirement.

**Words** amount of sugar is less than 0.5 g of sugar

Let $s$ = the number of grams of sugar in a serving of food.

**Equation** $s \quad < \quad 0.5$

The inequality is $s < 0.5$.

**4 EXAMPLE** You must be at least 18 years of age to vote. Write an inequality for this requirement.

**Words** age is greater than or equal to 18 years

Let $a$ = age in years.

**Inequality** $a \geq 18$

The inequality is $a \geq 18$.

1. Write an inequality for the graph.


A. $x > -3$

B. $x \geq -3$

C. $x \leq -3$

D. $x < -3$

1. Write an inequality for "To qualify for the race, your time can be at most 62 seconds."

A. $t \geq 62$

B. $t > 62$

C. $t < 62$

D. $t \leq 62$

**Extra practice problems**

For more exercises, see Extra Skills and Word Problems.

**Which numbers are solutions of each inequality?**

7. $x < 1; -2, 1, 2$

8. $x > -5; -7, -5, -1$

9. $x \leq -9; -12, -4, 2$

10. $x < -8; -10, -5, 0$

**Extra practice problems**

**Graph the solution of each inequality.**

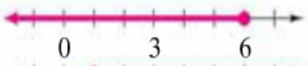
**11.** $x \geq 4$ **12.** $x \leq -2$ **13.** $x < 2$ **14.** $x > -4$

**15.** $x \leq 0$ **16.** $h > -5$ **17.** $t \geq -5$ **18.** $p < -6$

**Extra practice problems**

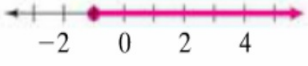
**Write an inequality for each graph.**

**19.**




**20.**


**21.**

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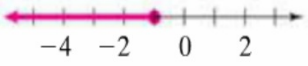
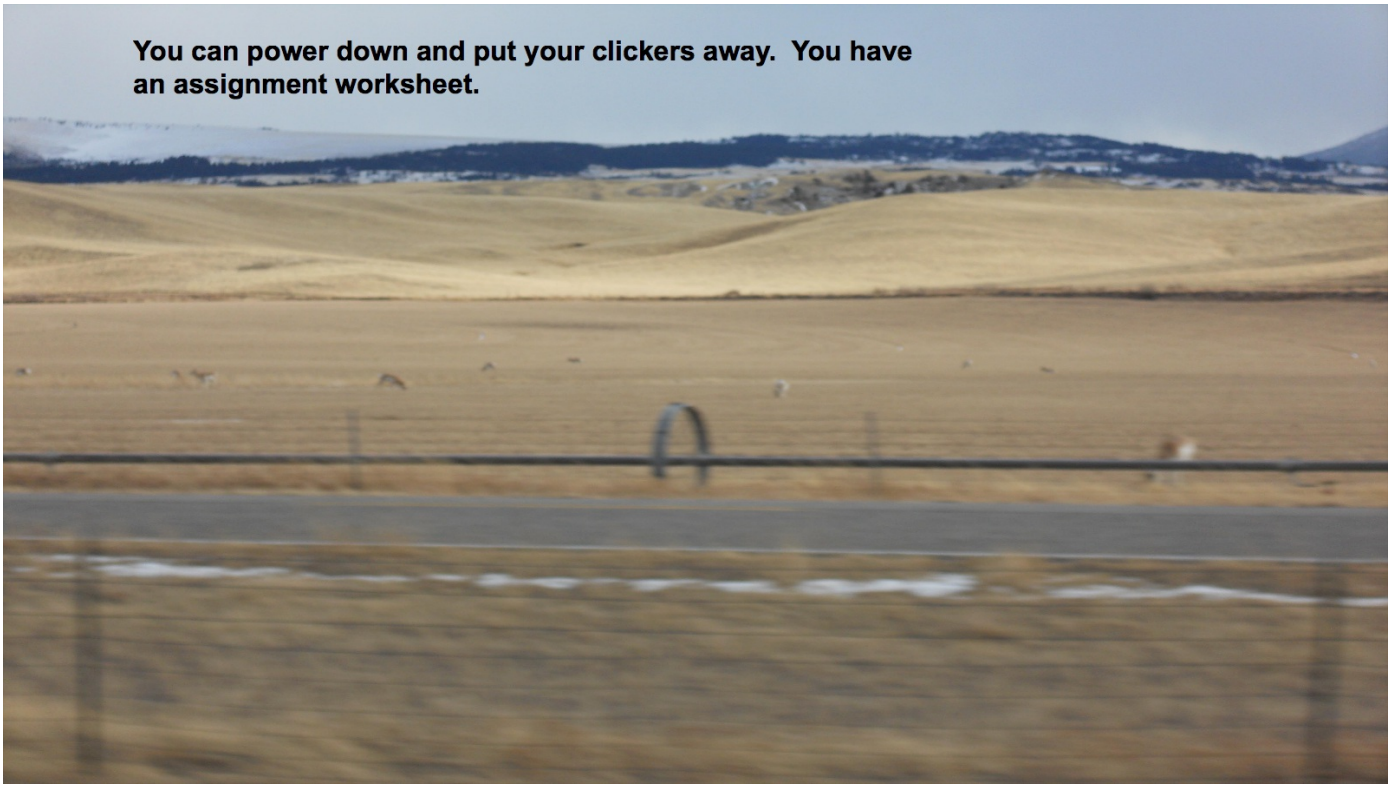



You can power down and put your clickers away. You have
an assignment worksheet.

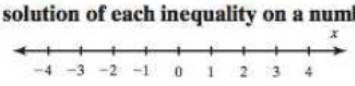
Name _____ Class _____ Date _____

# Practice 3-1

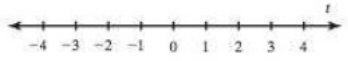
## Graphing and Writing Inequalities

**Graph the solution of each inequality on a number line.**

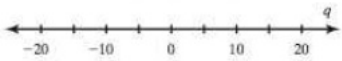
**1.** $x \leq 3$



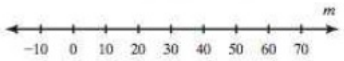

**2.** $t > 1$




**3.** $q \geq -10$




**4.** $m < 50$




**For each inequality, tell whether the number in bold is a solution.**

**5.** $x < 7$; **7** _____

**6.** $p > -3$; **3** _____

**7.** $k \geq 5$; **0** _____

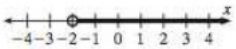
**8.** $3z \leq 12$; **4** _____

**9.** $n - 5 > 3$; **6** _____

**10.** $2g + 8 \geq 3$; **−1** _____

**Write an inequality for each graph.**

**11.** _____




**12.** _____


**Write an inequality for each statement. Graph each solution on the number line shown.**

**13.** You can walk there in 20 minutes or less.

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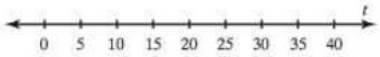
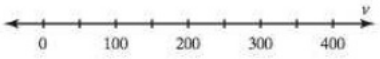



**14.** Each prize is worth over $150.

_____




**15.** A species of catfish, *malapterurus electricus*, can generate up to 350 volts of electricity.

**a.** Write an inequality to represent the amount of electricity generated by the catfish.

_____

**b.** Draw a graph of the inequality you wrote in **a.**