

Chapter 4

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Chapter
4 **Inequalities**

Dear Family,

Gardeners are familiar with uncertainty. Will there be enough sun? Will there be enough rain? Did I use too much fertilizer? Planning a garden can be a challenge, whether in a small container or over several acres.

You might work with your student to plan and create a small potted garden. Make sure you plant more seeds than you need—some will not germinate and some will produce weak plants. Make sure the plants get enough sun but not too much heat. Have your student write an *inequality* to represent each of these situations.

As your garden grows, ask your student to keep track of the growing conditions. Track your garden's basic needs and have your student write an inequality to represent these situations:

- How tall are the plants likely to get?
- Research how much water the plants need. Check the soil's moisture content every day—plants need water to survive. However, too much water can be just as bad as too little.
- Make sure the recommended amount of sunshine is available. The seed packet will usually tell you the minimum amount required.
- In a potted garden, your plants will probably need some fertilizer to stay healthy. Keep an eye out for signs of overfeeding, however.

Not all problems in mathematics involve a single answer. Many problems have answers that fall into a range. Your plants need at least enough fertilizer to grow, but you must limit the amount of fertilizer to what the plant can safely use. You must make sure the water stays in the right range.

It's hard to beat the satisfaction of growing a successful garden—and the fruits of your labor are beautiful to behold!

Capítulo**4****Desigualdades**

Estimada Familia:

Los jardineros están familiarizados con la incertidumbre. ¿Habrá suficiente sol? ¿Habrá suficiente lluvia? ¿Usé demasiado fertilizante? Planear un jardín puede ser un desafío, ya sea en un contenedor pequeño o a lo largo de muchos acres.

Puede trabajar con su estudiante para planear y crear un pequeño jardín en maceta. Asegúrese de plantar más semillas de las que necesita—algunas no germinarán y otras producirán plantas débiles. Asegúrese que las plantas tengan suficiente sol, pero no demasiado calor. Haga que su estudiante escriba una *desigualdad* para representar cada una de estas situaciones.

A medida que su jardín crece, pida a su estudiante que registre las condiciones de crecimiento. Registre las necesidades básicas de su jardín y haga que su estudiante escriba una desigualdad para representar estas situaciones:

- ¿Qué tan altas van a crecer las plantas?
- Investiguen la cantidad de agua que necesitan las plantas. Revisen la humedad del suelo todos los días—las plantas necesitan agua para sobrevivir. sin embargo, demasiada agua puede ser tan malo como demasiado poco.
- Asegúrese que la cantidad de luz solar recomendada esté disponible. Normalmente, el paquete de semillas indicará la cantidad mínima requerida.
- En un jardín en maceta, probablemente sus plantas necesitarán algo de fertilizante para estar sanas. No obstante, revise que no esté sobrealimentándolas.

No todos los problemas en matemáticas implican una respuesta única. Muchos problemas tienen respuestas que caen dentro de un rango. Sus plantas necesitan al menos fertilizante para crecer, pero debe limitar la cantidad de fertilizante que la planta puede usar con seguridad. Debe asegurarse que el agua se mantenga dentro del rango correcto.

Es difícil tener una mayor satisfacción que la de hacer crecer un jardín exitoso—y el fruto de su labor es algo bello para contemplar!

Activity
4.1**Start Thinking!**

For use before Activity 4.1

How are inequalities related to height or age restrictions on amusement park rides?

Research the ride restrictions at an amusement park and write inequalities to describe them.

Activity
4.1**Warm Up**

For use before Activity 4.1

Plot and label each number on the same number line.

1. 8

2. -2

3. $2\frac{1}{2}$

4. $-3\frac{1}{2}$

5. 0

6. -4

Lesson**4.1****Start Thinking!**

For use before Lesson 4.1

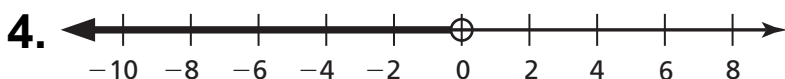
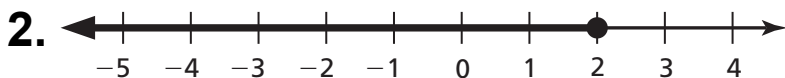
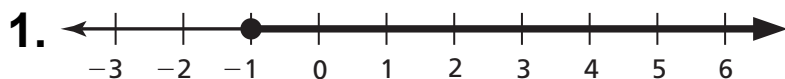
Write a sentence involving a real-life situation that can be modeled using an inequality.

Which inequality symbol applies: $<$, \leq , $>$, or \geq ?

Lesson**4.1****Warm Up**

For use before Lesson 4.1

Write an inequality for the graph. Then, in words, describe all the values of x that make the inequality true.



4.1 Practice A

Write an inequality for the graph. Then, in words, describe all the values of x that make the inequality true.



Write the word sentence as an inequality.

3. A number x is at most 3.
4. A number y added to 2 is greater than 7.
5. A number c multiplied by 3 is less than -12 .
6. A number m minus 1.5 is no less than 2.

Tell whether the given value is a solution of the inequality.

7. $t - 3 \geq 2$; $t = 10$
8. $6w < -2$; $w = 1$
9. $p + 1.6 \leq 4$; $p = 5$
10. $\frac{1}{2}d > -3$; $d = 0$

Graph the inequality on a number line.

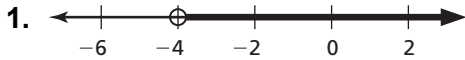
11. $k > 1$
12. $n \leq -2.5$
13. In order to try out for one of the parts in a play at the local theater, you must be at most 12 years old. Write an inequality that represents this situation.

Tell whether the given value is a solution of the inequality.

14. $3h - 7 < h$; $h = 2$
15. $q + 8 \geq \frac{q}{4}$; $q = -12$
16. Consider the inequalities $-2x < 10$ and $-6 < -2x$.
 - a. Is $x = 0$ a solution to both inequalities?
 - b. Is $x = 4$ a solution to both inequalities?
 - c. Find another value of x that is a solution to both inequalities.

4.1 Practice B

Write an inequality for the graph. Then, in words, describe all the values of x that make the inequality true.



Write the word sentence as an inequality.

3. A number x is at least 15.
4. A number r added to 3.7 is less than 1.2.
5. A number h divided by 2 is more than -5 .
6. A number a minus 8.2 is no greater than 12.

Tell whether the given value is a solution of the inequality.

7. $p + 1.7 \geq -4$; $p = -9$
8. $-3y < -5$; $y = 1$
9. $1.5g \leq 6$; $g = 0$
10. $\frac{3}{4} - d > \frac{1}{3}$; $d = \frac{1}{2}$

Graph the inequality on a number line.

11. $\ell \leq 3.5$
12. $m > -15$
13. To get a job at the local restaurant, you must be at least 16 years old. Write an inequality that represents this situation.

Tell whether the given value is a solution of the inequality.

14. $5t < 4 - t$; $t = -3$
15. $\frac{q}{5} < q - 20$; $q = 15$
16. In order to qualify for a college scholarship, you must have acceptable scores in either the SAT or the ACT along with the following requirements: a minimum GPA of 3.5; at least 12 credits of college preparatory academic courses; and at least 75 hours of community service.
 - a. Write and graph three inequalities that represent the requirements.
 - b. Your cousin has a GPA of 3.6, 15 credits of college preparatory class, and 65 hours of community service. Other than the test scores, does your cousin satisfy the requirements? Explain.

4.1 Enrichment and Extension

Compound Inequalities

Little League is a commercially sponsored baseball league for boys and girls.

A *compound inequality* is a special type of inequality that places both an upper and lower boundary on a variable. Write a compound inequality that describes the Little League rule.

Example: The maximum number of innings in a Little League game is 6. Each player must play at least 2 innings. Write a compound inequality that represents the number of innings a player plays.

Let n represent the number of innings a player plays. Because 2 is the minimum number of innings and 6 is the maximum number of innings, the compound inequality that represents the number of innings a player plays is $2 \leq n \leq 6$.

1. To be eligible to play Little League, a player must be at least 9 years old and at most 12 years old. Let a represent the player's age.
 - a. Write an inequality that represents the minimum age a player must be to participate in Little League.
 - b. Write an inequality that represents the maximum age a player can be to participate in Little League.
 - c. Use the inequalities from parts (a) and (b) to write a compound inequality that represents the age restrictions of Little League players.
2. For health and safety reasons, the number of pitches p a player can make per game is limited based on his or her age. A 12-year-old may pitch a maximum of 85 pitches in a game day.
 - a. Write an inequality that represents the minimum number of pitches a player could make during a game.
 - b. Write an inequality that represents the maximum number of pitches a player could make during a game.
 - c. Use the inequalities from parts (a) and (b) to write a compound inequality that represents the number of pitches that a player can throw per game.
3. A Little League game lasts for at least 3.5 innings and at most 6 innings. Write a compound inequality that represents the number of innings n that a Little League game lasts.

4.1 Puzzle Time

What Do You Call A Bull That's Sleeping?

Write the letter of each answer in the box containing the exercise number.

Write the word sentence as an inequality.

- A number x is greater than 25.8.
- Twice a number x is at most $-\frac{3}{5}$.
- A number x minus 9.3 is more than 4.6.
- A number x added to 11.7 is less than 14.

Tell whether the given value is a solution of the inequality.

- $x - 3.6 \leq 2.8$; $x = 6.7$
- $\frac{5}{6}x > -10$; $x = -6$

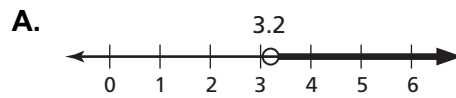
Match each inequality with its graph.

- $x \leq -7$
- $x > 3.2$
- $x < 3\frac{1}{4}$
- $x \geq -11$

Answers

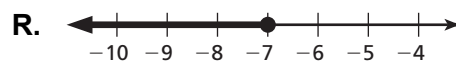
U. $11.7 + x < 14$

L. $x > 25.8$

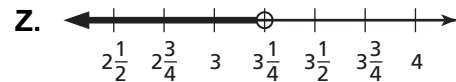


D. yes

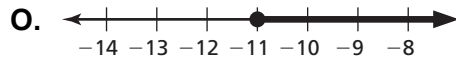
E. $2x \leq -\frac{3}{5}$



L. $x - 9.3 > 4.6$



B. no



8		5	4	1	3	6	10	9	2	7
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**Activity
4.2****Start Thinking!**

For use before Activity 4.2

An elevator can carry at most 15 people. Write an inequality that models this statement.

Explain to a friend what the inequality means.

**Activity
4.2****Warm Up**

For use before Activity 4.2

Graph the inequality on a number line.

1. $x \leq 13$

2. $x \geq -4$

3. $x < -15$

4. $x > 6$

5. $x \leq -1$

6. $x \geq 0$

Lesson
4.2**Start Thinking!**

For use before Lesson 4.2

Describe a real-life situation that can be represented by the inequality $x + 5 \leq 20$.

Lesson
4.2**Warm Up**

For use before Lesson 4.2

Solve the inequality. Graph the solution.

1. $x - 9 < 8$

2. $6 + h > 9$

3. $10 \geq y - 3$

4. $y - 2 \geq 14$

5. $t - 4 > -2$

6. $x + 7 \leq 10$

4.2 Practice A

Solve the inequality. Graph the solution.

1. $p - 4 < 2$

2. $s + 1 \geq -5$

3. $k - 14 \leq -10$

4. $2 < n + \frac{3}{2}$

5. $z - \frac{2}{3} \geq \frac{1}{3}$

6. $-\frac{1}{2} > -\frac{1}{6} + t$

7. $d - 2.4 \leq -5.1$

8. $-4.5 + q > 2.5$

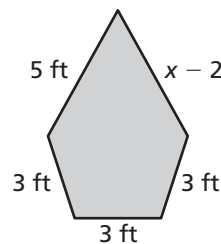
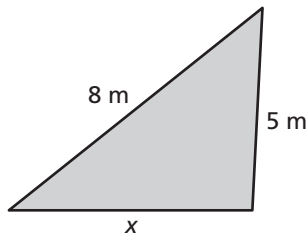
9. To stay within your budget, the area of the house and the garage combined is at most 3000 square feet. The area of the garage is 528 square feet. Write and solve an inequality that represents the area of the house.

10. You have \$137.26 in a bank account. The bank requires you to have at least \$50 in your account or else you are charged a fee. Write and solve an inequality that represents the amount you can write your next check for without being charged a fee.

Write and solve an inequality that represents x .

11. The perimeter is less than 20 meters.

12. The perimeter is at least 18 feet.



13. You need at least 5000 points to earn a gift card from your bank. You currently have 2700 points.

- Write and solve an inequality that represents the number of points you need to earn a gift card.
- You deposit money in your savings account and earn an additional 400 points. How does this change the inequality?

4.2 Practice B

Solve the inequality. Graph the solution.

1. $-12 \leq y - 17$

2. $w - 1.8 < 2.5$

3. $v + \frac{1}{3} > 8$

4. $\frac{2}{5} < \frac{4}{5} + k$

5. $q + \frac{3}{4} \geq -\frac{1}{4}$

6. $-\frac{3}{2} + r < \frac{1}{2}$

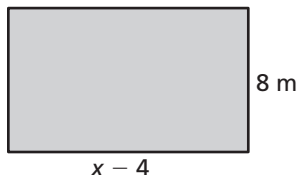
7. $7.4 > c + 3.9$

8. $p - 10.2 > 3.5$

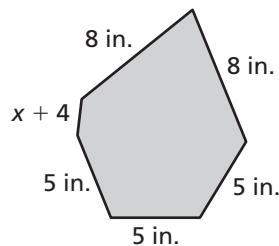
9. You and two friends are diving for lobster. The maximum number of lobsters you may have on your boat is 18. You currently have 7 lobsters.
- Write and solve an inequality that represents the additional lobsters that you may catch.
 - Another friend comes on your boat and he has 3 lobsters. You may now have 24 lobsters on your boat. Write and solve an inequality that represents the additional lobsters that you may catch.
 - How many lobsters is each person allowed to catch?

Write and solve an inequality that represents x .

10. The length is greater than the width.



11. The perimeter is less than or equal to 50 inches.



12. The solution of $w - c > -3.4$ is $w > -1.4$. What is the value of c ?
13. Describe all numbers that are solutions to $|x| < 5$.
14. The *triangle inequality theorem* states that the sum of the lengths of any two sides of a triangle is greater than the length of the third side. A triangle has side lengths of 6 inches and 17 inches. What are the possible values for the length of the third side? Explain how you found your answer.

4.2 Enrichment and Extension

Airplanes

The cabin (interior) of an airplane is partitioned into 3 distinct sections, or classes. The cost of a seat in each of the classes is different and the amenities in each class vary.

Seats	Width of Seat	Pitch of Seat
First class	51 cm	p cm
Business class	x cm	140 cm
Economy class	43 cm	81 cm

- The width of a seat in business class is the average of the widths of the seats in first class and economy class. Find the width of a seat in business class.
- The cabin has a minimum width requirement so that each passenger on the plane has comfortable accommodations.
 - The width of four business class seats and an aisle y must be at least 304.75 centimeters. Write an inequality that represents this situation.
 - What is the width of the aisle?
 - An airplane row contains 8 business class seats and 2 aisles. What is the minimum width w of the cabin?
- The pitch of an airplane seat refers to the distance between the backs of two consecutive seats.
 - Thirty-eight less than the pitch p between first class seats is at least as big as 2 times the pitch between economy class seats. Write an inequality that models the pitch between seats in first class.
 - What is the pitch between seats in first class?
- Which class contains the greatest number of seats? the least number of seats? Explain your reasoning.



Puzzle Time

Did You Hear About The...

A	B	C	D	E	F
G	H	I	J	K	L
M	N				

Complete each exercise. Find the answer in the answer column. Write the word under the answer in the box containing the exercise letter.

$x \geq -3$ GAME
$x \leq \frac{2}{3}$ IN
$x \leq -6$ AND
$x \leq 16$ TIE
$x \geq 15$ THE
$x < -5$ CATCHER
$x < 3$ COLLARS
$x > 2.8$ THAT
$x \leq \frac{2}{5}$ SHIRTS

Solve the inequality.

- | | |
|---------------------------------------|---|
| A. $x + 5 \geq 20$ | B. $x - 4 > 6$ |
| C. $6 \leq 9 + x$ | D. $3 + x \leq -2$ |
| E. $-17 \leq x - 8$ | F. $x - 1 < 2$ |
| G. $x - 10 \leq -16$ | H. $x + \frac{1}{3} \geq 3$ |
| I. $\frac{3}{5} \geq x + \frac{1}{5}$ | J. $-4.4 < x - 7.2$ |
| K. $\frac{11}{4} > x + \frac{9}{4}$ | L. $-\frac{5}{12} \geq x - \frac{13}{12}$ |
| M. $x + 0.4 < -0.8$ | |
- O. To play on the football team, a seventh grader must weigh no more than 110 pounds. Your neighbor is in seventh grade and weighs 94 pounds. Write and solve an inequality that represents how much weight your neighbor can gain and still meet the requirement.

$x \geq 2\frac{2}{3}$ THE
$x > 10$ BASEBALL
$x < \frac{1}{2}$ ENDED
$x \geq 1.1$ WHICH
$x > 1$ MITT
$x \geq -9$ THE
$x \leq 2$ SOCKS
$x < -1.2$ A
$x \leq -5$ BETWEEN

Activity
4.3 **Start Thinking!**
For use before Activity 4.3

Explain to a partner how to solve the following inequalities. Then graph the inequalities.

$$x + 7 \leq -4$$

$$x - 6 > 8$$

Activity
4.3 **Warm Up**
For use before Activity 4.3

Complete the statement with $<$ or $>$.

1. -7 ? -5

2. 2 ? -2

3. 7 ? -10

4. -13 ? -11

5. -1 ? -2

6. -8 ? 8

Lesson
4.3**Start Thinking!**

For use before Lesson 4.3

Are the solutions to the following inequalities the same? Explain why or why not.

$$2x < -12$$

$$-2x < 12$$

Lesson
4.3**Warm Up**

For use before Lesson 4.3

Use a table to solve the inequality.

1. $-2x > 4$

2. $-4x < -8$

3. $-2x \leq -12$

4. $-3x \geq 18$

5. $\frac{x}{-3} < 21$

6. $\frac{x}{-5} > \frac{1}{2}$

4.3 Practice A

Solve the inequality. Graph the solution.

1. $8x > 8$

2. $\frac{r}{5} \leq 2$

3. $-32 > 1.6h$

4. $\frac{u}{8} \geq 2.1$

5. $1.5j < -6.6$

6. $-\frac{3}{2} < 3x$

Write the word sentence as an inequality. Then solve the inequality.

7. Five times a number is not less than 15.

8. The quotient of a number and 4 is less than -1 .

9. An SUV averages 16.5 miles per gallon. The maximum average number of miles that can be driven on a full tank of gas is 363 miles. Write and solve an inequality that represents the number of gallons in a tank.

Solve the inequality. Graph the solution.

10. $-2p \geq 10$

11. $-2 > \frac{v}{-3}$

12. $\frac{g}{-3.2} > 4$

13. $-\frac{y}{3} \leq 1.4$

14. $-12 > -9h$

15. $\frac{a}{-3.5} \leq -1.7$

16. You are creating a decorative rope that is at least 20 feet long.

- To create the rope you are using beads that are 6 inches long. Write and solve an inequality that represents the number of beads that you can use.
- You do not have enough 6-inch beads to make the rope, so you will use 10-inch beads instead. Write and solve an inequality that represents the number of 10-inch beads that you can use.

4.3 Practice B

Solve the inequality. Graph the solution.

1. $3y \leq \frac{3}{4}$

2. $-3.2 < \frac{p}{10}$

3. $1.6g \geq 0.48$

4. $2.5k < -100$

5. $\frac{s}{3.1} \geq 4.5$

6. $-\frac{4}{5} < 2x$

Write the word sentence as an inequality. Then solve the inequality.

7. A number divided by 5 is at least 4.
8. The product of 2 and a number is at most -6 .
9. The solution of $cx \geq -4$ is $x \geq -8$. What is the value of c ?

Solve the inequality. Graph the solution.

10. $-6t < 24$

11. $-\frac{2}{5} \leq \frac{u}{-1}$

12. $\frac{q}{-0.4} \leq 1.9$

13. $-\frac{d}{2} > \frac{3}{8}$

14. $-1.2 \leq -0.8r$

15. $\frac{j}{-5.2} \leq -1.5$

16. The height of a room is 10 feet. You are building shelving from the floor to the ceiling.
 - a. Each shelf requires 8 inches. Write and solve an inequality that represents the number of shelves that can be made.
 - b. You forgot to include the thickness of each shelf in your measurements. The amount of space needed for each shelf is actually 10 inches. Write and solve an inequality that represents the number of shelves that can be made.

Describe all numbers that satisfy *both* inequalities. Include a graph with your description.

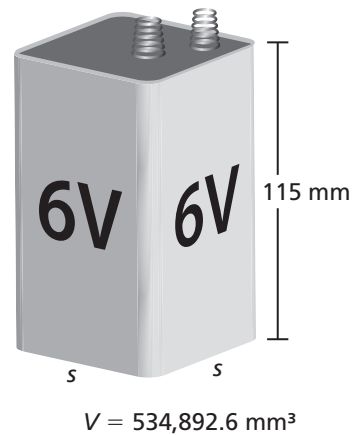
17. $3x < 12$ and $-3x < -3$

18. $\frac{y}{5} \leq -2$ and $-\frac{y}{4} \geq 1$

4.3 Enrichment and Extension

Margin of Error

A 6-volt lantern battery has the given dimensions. Any company that manufactures the batteries must make sure their product meets the specifications. The batteries are made using machines. No machine is perfect and so there will always be a slight variation of the size of the batteries.



The allowable difference between the required dimensions of the battery and its actual dimensions is called the *margin of error*.

1. What is the ideal side length of the base of a 6-volt lantern battery?
2. The side length of the base of the battery has a margin of error of 0.002 millimeter. Write an inequality that models the margin of error e of the base's side length.
3. A margin of error in the side length will produce a margin of error in the volume of the battery.
 - a. What is the smallest side length allowed by the margin of error? What is the volume of a battery with this side length? Round your answer to the nearest thousandth.
 - b. What is the greatest side length allowed by the margin of error? What is the volume of a battery with this side length? Round your answer to the nearest thousandth.
 - c. Write an inequality that models the range of acceptable side lengths s of a battery.
 - d. Write an inequality that models the range of acceptable volumes V of a battery.
4. The side length of a battery is the value you calculated in Exercise 1 and the height is 115.002 millimeters.
 - a. Find the volume of the battery. Round your answer to the nearest thousandth.
 - b. Which margin of error has a greater impact on the volume, the side length or the height? Why? Explain your reasoning.



Puzzle Time

What Do You Do When Your Smoke Alarm Goes Off?

Write the letter of each answer in the box containing the exercise number.

Solve the inequality.

1. $4x < 24$

2. $\frac{x}{6} \geq -3$

3. $-2.3x > 23$

4. $-15 \geq \frac{x}{3}$

5. $\frac{x}{4} > -4.1$

6. $9 \leq -1.5x$

7. $-6x > -\frac{1}{4}$

8. $4.2x \geq -12.6$

9. Three times a number x is at least -18 .

10. The quotient of -7 and a number x is less than 8 .

Answers

N. $x < -10$

U. $x \leq -6$

R. $x < \frac{1}{24}$

A. $x > -16.4$

I. $x \geq -6$

T. $x < 6$

F. $x \geq -3$

E. $x > -56$

T. $x \leq -45$

R. $x \geq -18$

7	6	3		5	8	1	10	2		9	4
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Activity
4.4**Start Thinking!**

For use before Activity 4.4

Write a word problem involving using a gift card to make an online purchase. The situation must be able to be solved using a one-step inequality. Exchange problems with a classmate and solve your classmate's problem.

Activity
4.4**Warm Up**

For use before Activity 4.4

Solve the inequality.

1. $x + 9 < 12$

2. $x - 3 \geq 1$

3. $x - 2 > -5$

4. $-3x > 5$

5. $4x > -16$

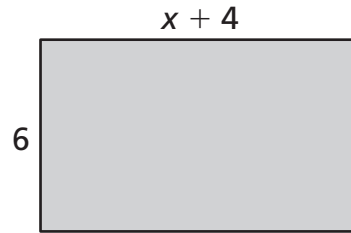
6. $-5x \leq -21$

Lesson
4.4

Start Thinking!

For use before Lesson 4.4

Explain to a partner how to find the value of x so that the area of the rectangle is more than 36 square units. Justify your answer.



List two values of the variable that satisfy the inequality you wrote above.

Lesson
4.4

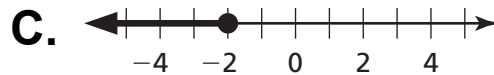
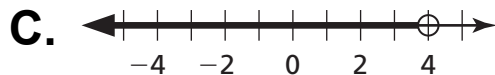
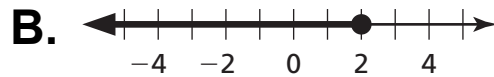
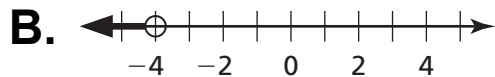
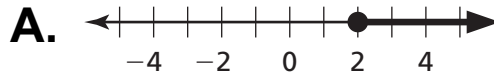
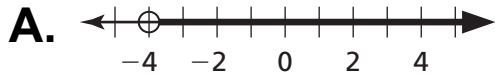
Warm Up

For use before Lesson 4.4

Match the inequality with its graph.

1. $\frac{x}{4} + 2 < 1$

2. $2x - 3 \geq 1$



4.4 Practice A**Solve the inequality. Graph the solution.**

1. $3m - 7 < 2$

2. $-13 \leq -5r + 2$

3. $2k + \frac{1}{3} > 1$

4. $4.3 - 1.5c \leq 10$

5. You are renting a moving truck for a day. There is a daily fee of \$20 and a charge of \$0.75 per mile. Your budget allows a maximum total cost of \$65. Write and solve an inequality that represents the number of miles you can drive the truck.

Solve the inequality. Graph the solution.

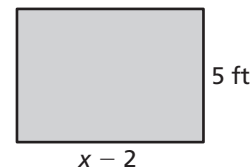
6. $2(b - 4) > -6$

7. $-8(p + 3) \leq 16$

8. $15 \geq \frac{5}{3}(d - 6)$

9. $3.4 < 0.4(a + 12)$

10. Write and solve an inequality that represents the values of x for which the area of the rectangle will be at least 35 square feet.

**Solve the inequality. Graph the solution.**

11. $3x - 7x + 2 < 10 - 12$

12. $14w - 8w - 5.4 \geq 7.3 - 10$

13. Your weekly base salary is \$150. You earn \$20 for each cell phone that you sell.

- What is the minimum amount you can earn in a week?
- Write and solve an inequality that represents the number of cell phones you must sell to make at least \$630 a week.
- Write and solve an inequality that represents the number of cell phones you must sell to make at least \$750 a week.
- The company policy is that as a part-time employee, the maximum you can earn each week is \$950. Write and solve an inequality that represents the number of cell phones you can sell each week.

4.4 Practice B**Solve the inequality. Graph the solution.**

1. $2 - \frac{q}{3} > 6$

2. $7 \leq 0.5v + 10$

3. $-\frac{1}{4} \leq 4k + \frac{7}{4}$

4. $3.6 - 0.24n < 1.2$

5. An RV park receives \$300 per month from each residential site that is occupied as well as \$2000 per month from their overnight sites. Write and solve an inequality to find the number of residential sites that must be occupied to make at least \$14,000 in revenue each month.

Solve the inequality. Graph the solution.

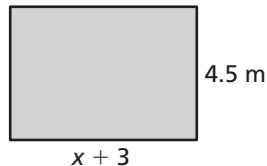
6. $-5(m - 2) > 30$

7. $-\frac{3}{2}(f + 6) \leq -6$

8. $10.5 < 1.5(p - 3)$

9. $30 \geq -7.5(w - 4.2)$

10. Write and solve an inequality that represents the values of x for which the area of the rectangle will be at most 45 square meters.

**Solve the inequality. Graph the solution.**

11. $12x - 5x - 4 \geq 60 - 8$

12. $4v + 6v + 3.2 < 6.8 - 9.2$

13. An animal shelter has fixed weekly expenses of \$750. Each animal in the shelter costs an additional \$6 a week.
- During the summer months, the weekly expenses are at least \$1170. Write and solve an inequality that represents the number of animals at the shelter for expenses to be at least \$1170 a week.
 - During the winter months, the weekly expenses are at most \$900. Write and solve an inequality that represents the number of animals at the shelter for expenses to be at most \$900 a week.
 - The cost for each animal has increased by \$2. What will be the maximum weekly expenses during the winter months?

4.4 Enrichment and Extension**Solving Multi-Step Inequalities**

Solve the inequality. Graph the solution.

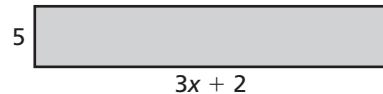
1. $4(x + 1) < -6$ 2. $2(x - 3) \geq 10$ 3. $\frac{1}{2}(x + 28) \leq 11$
4. $\frac{x + 5}{6} > 2$ 5. $\frac{2x - 1}{4} \geq 1$ 6. $\frac{3x + 2.3}{5} \leq 7$
7. $8.5 < \frac{4 + 10 + x}{2}$ 8. $-5(2x + 6) \geq 40$ 9. $3(7 - 10x) < 21$

10. You get scores of 85 and 91 on two history tests. Write and solve an inequality to find the scores you can get on your next history test to have an average of at least 90.

11. You and a group of friends wait $\frac{1}{2}$ hour to ride an amusement park ride.

You go on the ride a second time and wait $\frac{1}{3}$ hour. You want to go on a third time. Write and solve an inequality to find how many minutes you can wait for your average waiting time to be at most $\frac{1}{3}$ hour. (*Hint: Convert the waiting times to minutes.*)

12. Write and solve an inequality to find the possible values of x so that the rectangle has an area of more than 130 square units.





Puzzle Time

What Did Ernie Say When Bert Asked Him If He Wanted Ice Cream?

Write the letter of each answer in the box containing the exercise number.

Solve the inequality.

1. $8x - 11 < 13$

2. $3x - 5 \geq 16$

3. $2 - \frac{x}{4} \geq 4$

4. $\frac{6}{7} > -2x - \frac{8}{7}$

5. $4.6 > 1.2 + 1.7x$

6. $8(x - 4) \geq 40$

7. $-30 \leq -\frac{3}{4}(x + 4)$

8. $-6.8 \geq 0.8(x + 1)$

Answers

R. $x < 2$

T. $x \leq 36$

E. $x \geq 7$

S. $x \leq -9.5$

B. $x > -1$

U. $x < 3$

R. $x \leq -8$

E. $x \geq 9$

8	1	3	6		4	2	5	7
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Chapter 4

Technology Connection

For use after Section 4.4

Using Logical Tests in a Spreadsheet

Expressions involving “greater than,” “less than,” and “equal to” are called **logical tests** because they can be either True or False. For example, the logical test “10 > 15” returns an answer of “False.” The logical test functions of a spreadsheet can be used to compare and categorize numbers.

ACTIVITY Use logical tests to solve the following problem:

A soccer team is in a tournament where each win earns 3 points, a tie earns 1 point, and a loss earns 0 points. Finish the spreadsheet to tally the points for the home team after five games.

	Home Team	Away Team	Win	Loss	Tie
	4	2			
	7	5			
	2	3			
	1	1			
	5	0			
			Total Points		

SOLUTION

Step 1 Copy the chart above into a spreadsheet.

Step 2 In cell C2, enter: `=IF(A2>B2, 3, "")`. The “IF” function performs the logical test that asks if the number in cell A2 is greater than the number in cell B2. If it is true, then the cell will display a “3.” If it is false, the double quotation marks will keep that cell blank. Next, copy and paste the formula from cell C2 to cells C3, C4, C5, and C6. Your spreadsheet should change the formulas to correspond with the correct row.

Step 3 In cell D2, enter: `=IF(A2<B2, 0, "")`. This formula puts a zero in the loss column if the score in cell A2 is less than the score in cell B2. Copy and paste the formula down the column.

Step 4 In cell E2, enter: `=IF(A2=B2, 1, "")`. This formula will find and award a single point for a tie. Copy and paste the formula down the column.

Step 5 Lastly, to find the sum of all your points, in cell D7 enter: `=SUM(C2:E6)`.

So, the home team earned _____ points.