

Chapter 4
Inequalities- a mathematical sentence that compares expressions.

Inequality Symbols				
Symbol	<	>	\leq	\geq
Key Phrases	• is less than	• is greater than	• is less than or equal to	• is greater than or equal to
	• is fewer than	• is more than	• is at most • is no more than	• is at least • is no less than

MAFS.7.EE.2.4

Use variables to represent quantities in a real-world or mathematical problem, and construct simple inequalities to solve problems by reasoning about the quantities.

Essential Question

What are inequalities and how can you represent solutions of an inequality on a number line?

In this lesson, I am *writing and graphing inequalities* so I can *interpret the solutions of inequalities*.

4.1 Writing and Graphing Inequalities
Solution of an inequality- a value or values that make the inequality true.

Solution set- is the set or group of all solutions.

The graph of an inequality shows all the solutions of the inequality on a number line. An open circle is used for less than or greater than symbols which do not include that number. A closed circle is used for less than or equal to and greater than or equal to which do include that number.

Homework 4.1 Practice A #3-6
Write the word sentence as an inequality.

1. A number
- x
- is at most
- -10
- . 2. Twice a number
- y
- is more than
- $-\frac{5}{2}$
- .

$$x \leq -10$$

$$2y > -\frac{5}{2}$$

Homework 4.1 Practice A #7-10 and #14-16
Tell whether -5 is a solution of the inequality.

3. $x + 12 > 7$

$$(-5) + 12 > 7$$

$$7 > 7$$

not a
Solution

4. $1 - 2p \leq -9$

$$1 - 2(-5) \leq -9$$

$$1 + 10 \leq -9$$

$$11 \leq -9$$

not a
Solution

5. $n \div 2.5 \geq -3$

$$(-5) \div 2.5 \geq -3$$

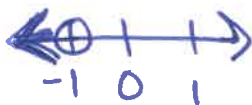
$$-2 \geq -3$$

True!
 -5 is a
Solution

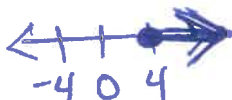
Homework
4.1 Practice A
#11-12

Graph the inequality on a number line.

6. $x < -1$



7. $z \geq 4$

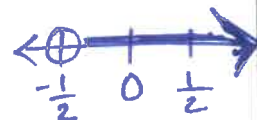


8. $s \leq 1.4$



9. $-\frac{1}{2} < t$

$t > -\frac{1}{2}$



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

$j + 1 > 10; j = 9$

$9 + 1 > 10$

$10 > 10$

not a
solution

$-3 \leq \frac{k}{2}; k = -1$

$-3 \leq -\frac{1}{2}$

True!

-1 is a solution!

Write the word sentence as an inequality.

A number n is no less than -3 .

$n \geq -3$

A number q plus 7 is less than 45.

$q + 7 < 45$

A number x divided by -1 is at least -4 .

$\frac{x}{-1} \geq -4$

The children in the class are more than 10 years old.

$c > 10$

The minimum cost for parking is \$3.

$c \geq 3$

Write an inequality for the graph.



$x > -1$

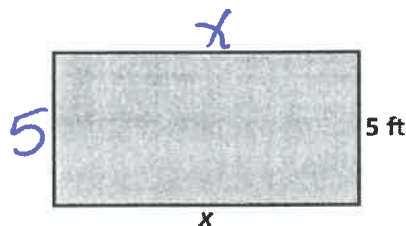


$x \leq -2$

MAFS.7.EE.2.4	Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p , q , and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem
Essential Question	How can you use addition or subtraction to solve an inequality? In this lesson, I will use what I know about solving equations and the addition/subtraction properties of equality so I can solve inequalities.
4.2 Solving Inequalities using Addition or Subtraction	<p><u>The Addition Property of Equality</u>: when you add the same number to both sides of an inequality, the inequality remains true.</p> <p><u>The Subtraction Property of Equality</u>: when you subtract the same number to both sides of an inequality, the inequality remains true.</p>
Homework 4.2 Practice A #1-8	<p>Solve the inequality. Graph the solution.</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>1. $y - 6 > -7$</p> $\begin{array}{r} y - 6 > -7 \\ +6 \quad +6 \\ \hline y > -1 \end{array}$ </div> <div style="text-align: center;"> <p>2. $b - 3.8 \leq 1.7$</p> $\begin{array}{r} b - 3.8 \leq 1.7 \\ +3.8 \quad +3.8 \\ \hline b \leq 5.5 \end{array}$ </div> <div style="text-align: center;"> <p>3. $3\frac{3}{4} - \frac{1}{2} > z - \frac{1}{4}$</p> $\begin{array}{r} 3\frac{3}{4} - \frac{1}{2} > z - \frac{1}{4} \\ +\frac{1}{4} \quad +\frac{1}{4} \\ \hline -\frac{1}{4} > z \\ z < -\frac{1}{4} \end{array}$ </div> </div>
Homework 4.2 Practice A #1-8	<p>Solve the inequality. Graph the solution.</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>4. $w - 7 \leq -10$</p> $\begin{array}{r} w - 7 \leq -10 \\ +7 \quad +7 \\ \hline w \leq -3 \end{array}$ </div> <div style="text-align: center;"> <p>5. $-7.5 \geq d - 10$</p> $\begin{array}{r} -7.5 \geq d - 10 \\ +10 \quad +10 \\ \hline 2.5 \geq d \\ d \leq 2.5 \end{array}$ </div> <div style="text-align: center;"> <p>6. $x + \frac{3}{4} > 1\frac{1}{2} = \frac{3}{2} = \frac{6}{4}$</p> $\begin{array}{r} x + \frac{3}{4} > \frac{6}{4} \\ -\frac{3}{4} \quad -\frac{3}{4} \\ \hline x > \frac{3}{4} \end{array}$ </div> </div>

Write and solve an inequality that represents the value of x.

The perimeter is more than 15 feet.



$$\begin{array}{rcl} 2x + 10 & > & 15 \\ -10 & & -10 \\ \hline 2x & > & 5 \\ \frac{2x}{2} & > & \frac{5}{2} \\ x & = & 2.5 \end{array}$$

An elevator can carry 800 pounds of weight.

- a. A student weighing 95 pounds gets on the elevator. Write and solve an inequality to represent the remaining weight that can be added.

$$\begin{array}{rcl} 95 + x & \leq & 800 \\ -95 & & -95 \\ \hline x & \leq & 705 \end{array}$$

- b. A football player weighing 280 pounds gets on the elevator with the student. Write and solve an inequality representing the remaining weight that can be added.

$$\begin{array}{rcl} 280 + x & \leq & 800 \\ -280 & & -280 \\ \hline x & \leq & 520 \end{array}$$

- c. Two more football players weighing a total of 470 pounds come to the elevator. Can they get on safely? Explain.

yes, 470 is ≤ 520

MAFS.7.EE.2.4	Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p , q , and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem
Essential Question	How can you use multiplication or division to solve an inequality? In this lesson, <i>I will use what I know about solving equations and the multiplication/division properties of equality so I can solve inequalities.</i>
4.3 Solving Equations using Multiplication and Division	<p><u>The Multiplication Property of Equality</u>: when you multiply the same number to both sides of an inequality, the inequality remains true.</p> <p><u>The Division Property of Equality</u>: when you divide the same number to both sides of an inequality, the inequality remains true.</p> <p>***When you <u>multiply or divide both sides</u> of an inequality by a <u>negative number</u>, the inequality sign must be reversed or <u>flipped</u> for the inequality to remain true.</p>
Homework 4.3 Practice A #1-6	<p>Solve the inequality. Graph the solution.</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>1. $n \div 3 < 1$</p> $\begin{array}{c} \times 3 \quad \times 3 \\ \hline n < 3 \end{array}$ </div> <div style="text-align: center;"> <p>2. $-0.5 \leq \frac{m}{10}$</p> $\begin{array}{c} \times 10 \\ \hline -5 \leq m \\ m \geq -5 \end{array}$ </div> <div style="text-align: center;"> <p>3. $\frac{-3}{\frac{1}{2}} > \frac{2}{3}p$</p> $\begin{array}{c} \times \frac{2}{3} \\ \hline -\frac{9}{2} > p \\ p < -\frac{9}{2} \end{array}$ </div> </div>
Homework 4.3 Practice A #10-15	<p>Solve the inequality. Graph the solution.</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>4. $\frac{4b}{4} \geq \frac{2}{4}$</p> $\begin{array}{c} \times 4 \\ \hline b \geq \frac{2}{4} \\ b \geq \frac{1}{2} \end{array}$ </div> <div style="text-align: center;"> <p>5. $\frac{12k}{12} \leq \frac{-24}{12}$</p> $\begin{array}{c} \times 12 \\ \hline k \leq -2 \end{array}$ </div> <div style="text-align: center;"> <p>6. $\frac{-15}{2.5} < \frac{2.5q}{2.5}$</p> $\begin{array}{c} \times 2.5 \\ \hline -6 < q \\ q > -6 \end{array}$ </div> </div>

Solve the inequality. Graph the solution.

7. $\frac{(-3)x}{-3} > -4$ (-3)

$$x < 12$$



8. $0.5 \leq -\frac{y}{2}$ (-2)

$$-1 \geq y$$

$$y \leq -1$$



9. $\frac{(-5)}{6} \cdot \frac{-12}{1} \geq \frac{6}{5}m$ $(\frac{5}{6})$

$$\frac{-60}{6} \geq m$$

$$-10 \geq m$$

$$m \leq -10$$



10. $(\frac{-5}{2}) \cdot \frac{-2}{5}h \leq -8$ $(\frac{-5}{2})$

$$h \geq \frac{40}{2}$$

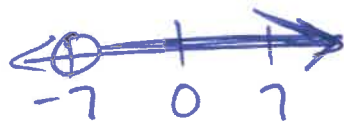
$$h \geq 20$$



11. $-5z < 35$

$$\frac{-5z}{-5} < \frac{35}{-5}$$

$$z > -7$$



12. $-2a > -9$

$$\frac{-2a}{-2} > \frac{-9}{-2}$$

$$a < \frac{9}{2}$$



13. $-1.5 < 3n$

$$\frac{-1.5}{3} < \frac{3n}{3}$$

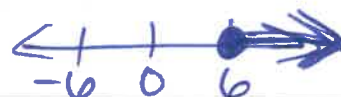
$$n > -0.5$$



14. $-4.2 \geq -0.7w$

$$\frac{-4.2}{-0.7} \geq \frac{-0.7w}{-0.7}$$

$$w \geq 6$$



MAFS.7.EE.2.4	Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p , q , and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem
Essential Question	How can you solve a two-step inequality using what you have already learned? In this lesson, I will use properties of equality so I can solve two-step inequalities.
<p>4.4 Solving Two-step Inequalities</p> <p>Homework 3.4 Practice A #1-4</p>	<p>Solve the inequality. Graph the solution.</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>1. $6y - 7 > 5$</p> $\begin{array}{r} \cancel{-7} \quad +7 \\ \hline 6y > 12 \\ \cancel{6} \quad \quad \cancel{6} \\ y > 2 \end{array}$ </div> <div style="text-align: center;"> <p>2. $4 - 3d \geq 19$</p> $\begin{array}{r} \cancel{-4} \quad -4 \\ \hline -3d \geq 15 \\ \cancel{-3} \quad \quad \cancel{-3} \\ d \leq -5 \end{array}$ </div> <div style="text-align: center;"> <p>3. $\frac{w}{-4} + 8 > 9$</p> $\begin{array}{r} \cancel{-8} \quad -8 \\ \hline \cancel{(-4)} \frac{w}{-4} > 1 \cdot (-4) \\ w < -4 \end{array}$ </div> </div>
<p>Homework 4.4 Practice A #6-9</p>	<p>Solve the inequality. Graph the solution.</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>4. $2(k - 5) < 6$</p> $\begin{array}{r} \cancel{-10} \quad +10 \\ \hline 2k < 16 \\ \cancel{2} \quad \quad \cancel{2} \\ k < 8 \end{array}$ </div> <div style="text-align: center;"> <p>5. $-4(n - 10) < 32$</p> $\begin{array}{r} \cancel{-40} \quad +40 \\ \hline -4n < -8 \\ \cancel{-4} \quad \quad \cancel{-4} \\ n > 2 \end{array}$ </div> <div style="text-align: center;"> <p>6. $-3 \leq 0.5(8 + y)$</p> $\begin{array}{r} \cancel{-4} \quad +4 \\ \hline -3 \leq 4 + .5y \\ \cancel{-4} \quad \quad \cancel{-4} \\ -7 \leq .5y \\ \cancel{.5} \quad \quad \cancel{.5} \\ -14 \leq y \\ y \geq -14 \end{array}$ </div> </div>
	<p>Solve the inequality.</p> <div style="display: flex; flex-wrap: wrap;"> <div style="width: 33%; text-align: center;"> <p>7. $x - 3 > 7$</p> $\begin{array}{r} \cancel{+3} \quad +3 \\ \hline x > 10 \end{array}$ </div> <div style="width: 33%; text-align: center;"> <p>8. $m + 2 \leq -4$</p> $\begin{array}{r} \cancel{-2} \quad -2 \\ \hline m \leq -6 \end{array}$ </div> <div style="width: 33%; text-align: center;"> <p>9. $\frac{6y}{6} > \frac{8}{6}$</p> $y > \frac{4}{3}$ </div> <div style="width: 33%; text-align: center;"> <p>10. $p \div 5 < -3$</p> $\begin{array}{r} \cancel{\times 5} \quad \times 5 \\ \hline p < -15 \end{array}$ </div> <div style="width: 33%; text-align: center;"> <p>11. $4z - 3 \geq -1$</p> $\begin{array}{r} \cancel{+3} \quad +3 \\ \hline 4z \geq 2 \\ \cancel{4} \quad \quad \cancel{4} \\ z \geq \frac{1}{2} \end{array}$ </div> <div style="width: 33%; text-align: center;"> <p>12. $6 > 3(t + 2)$</p> $\begin{array}{r} \cancel{-6} \quad -6 \\ \hline 0 > 3t \\ \cancel{3} \quad \quad \cancel{3} \\ 0 > t \\ t < 0 \end{array}$ </div> </div>

Solve the inequality. Graph the solution.

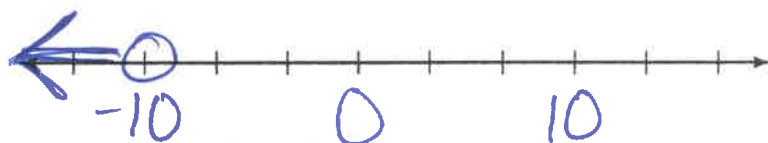
13. $-4 + x \leq 1$

$$\begin{array}{r} -4 + x \leq 1 \\ +4 \quad +4 \\ \hline x \leq 5 \end{array}$$



14. $2 < -\frac{y}{5}$

$$\begin{array}{l} (-5) \quad (-5) \\ 2 < -\frac{y}{5} \\ \hline -10 > y \\ y < -10 \end{array}$$



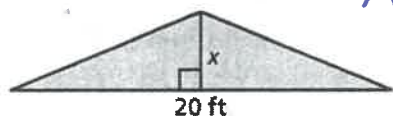
15. $3(x + 4) \geq 12$

$$\begin{array}{r} 3x + 12 \geq 12 \\ -12 \quad -12 \\ \hline 3x \geq 0 \\ \frac{3x}{3} \geq \frac{0}{3} \\ x \geq 0 \end{array}$$



Write and solve an inequality that represents the value of x .

16. The area is no more than 40 square feet.



$$A = \frac{bh}{2}$$

$$\begin{array}{l} \frac{20x}{2} \leq 40 \\ 10x \leq 40 \\ x \leq 4 \end{array}$$

17. A freezer is set to turn on and start cooling if the temperature rises above -10° Celsius. The cooling turns off when the freezer has reached a temperature of -16° Celsius.

Write two inequalities to model the situation.

$$x > -10$$

$$x \leq -16$$

Give a sample value at which the cooling would turn on, and a sample value at which the cooling would be off.

$$-9, -17$$

At her job, Jessie earns \$9.50 per hour. She also earns a \$60 bonus every month.

Jessie needs to earn at least \$460 every month.

Create an inequality that represents this situation, where h represents the number of hours that Jessie works in a month in order to earn at least \$460.

$$9.50h + 60 \geq 460$$