

$$3n^2 + 5n + 6$$

Name: _____

Score: _____

Balancing Multiplication Equations

The inverse operation for multiplication is division. Divide each side of the equation to isolate a variable.

	Example 1: $m \cdot 3 = 27$	Example 2: $10x = 70$
Original Equation:	$m \cdot 3 = 27$	$10x = 70$
Divide on both sides:	$m \cdot 3 \div 3 = 27 \div 3$	$10x \div 10 = 70 \div 10$
The Answer:	$m = 9$	$x = 7$

Problems 1–20: Balance the equations to find the value of each variable. Remember to check your answers.

① $11 \cdot k = 44$

② $d \cdot 8 = 56$

③ $2c = 40$

④ $5v = 15$

⑤ $15 \cdot r = 60$

⑥ $m(25) = 100$

⑦ $10y = 90$

⑧ $h(100) = 500$

⑨ $20x = 300$

⑩ $12 \cdot y = 72$

⑪ $4(w) = 120$

⑫ $30 \cdot a = 180$

⑬ $6v = 48$

⑭ $c \cdot 200 = 1,000$

⑮ $(9)n = 99$

⑯ $h \cdot 50 = 300$

⑰ $6 \cdot p = 42$

⑱ $2w = 84$

⑲ $n \cdot 3 = 42$

⑳ $u \cdot 150 = 900$

Review Problems 21–28: Balance the equations to find the value of each variable. Remember to check your answers.

⑳ $y + 56 = 85$

㉑ $x + 12 = 37$

㉒ $65 + a = 150$

㉓ $28 + h = 40$

㉔ $90 - w = 71$

㉕ $200 - v = 58$

㉖ $x - 50 = 200$

㉗ $m - 16 = 28$

Name: _____

Score: _____

Balancing Division Equations (Isolating the Denominator)

A couple of steps can be taken to balance an equation to isolate a denominator. If the variable is the denominator, first multiply both sides by the variable. This turns the equation into a multiplication problem, with the variable on the other side of the equation. You've already learned how to isolate a variable in a multiplication problem. Use division on both sides to get the variable by itself.

Example 1: $30 \div y = 3$

Original Equation: $30 \div y = 3$
 Multiply on both sides: $30 \div y \cdot y = 3 \cdot y$
 $30 = 3 \cdot y$
 Divide on both sides: $30 \div 3 = 3 \div 3 \cdot y$
 The Answer: $10 = y$

Example 2: $\frac{24}{w} = 6$

$\frac{24}{w} = 6$
 $\frac{24}{w} \cdot w = 6 \cdot w$
 $24 = 6 \cdot w$
 $24 \div 6 = 6 \div 6 \cdot w$
 $4 = w$

Problems 1–12: Balance the equations to find the value of each variable. Remember to check your answers.

① $32 \div x = 4$

② $50 \div h = 5$

③ $\frac{36}{c} = 9$

④ $\frac{12}{x} = 6$

⑤ $72 \div y = 8$

⑥ $\frac{12}{u} = 3$

⑦ $16 \div n = 2$

⑧ $\frac{40}{m} = 5$

⑨ $\frac{45}{e} = 15$

⑩ $62 \div x = 2$

⑪ $\frac{300}{w} = 10$

⑫ $800 \div x = 4$

Mixed Review 13–20: Balance the equations to find the value of each variable. Remember to check your answers.

⑬ $\frac{m}{5} = 30$

⑭ $v \div 5 = 12$

⑮ $\frac{70}{y} = 10$

⑯ $\frac{w}{25} = 5$

⑰ $y \div 20 = 10$

⑱ $100 \div h = 4$

⑲ $x \div 15 = 60$

⑳ $100 \div k = 2$

Name: _____

Score: _____

Inequalities

An **inequality** is a lot like an equation. They're both mathematical sentences. With an equation, the two sides are equal and separated by an equal sign. Inequalities do not always have equal sides. One side may be greater than (>), less than (<), greater than or equal to (≥), and less than or equal to (≤) the other side of the inequality.

Graphing Inequalities

Equations and inequalities can be graphed on number lines. Equations are graphed using dots. Inequalities are graphed using dots and arrows.

For inequalities, the type of dot used is significant. A solid dot means it can be equal to that value. An empty dot can't be equal to that value. The direction that the arrow points is significant too. An arrow pointing to the left indicates that the value may be less than. An arrow pointing to the right indicates that the value may be greater than.

Pay attention to the variable's location when the inequality is written. $y > 3$ means y is greater than 3, but $3 > y$ means 3 is greater than y . The position of the numbers and variables in relation to the inequality symbol makes a difference.

Also realize that inequalities can be written in different ways. For example, $w > 2$ and $2 < w$ means the same thing. w is greater than 2 is the same as 2 is less than w .

Also, make sure to note when there is a line beneath the inequality symbol. In the case of $x > 8$, the value of x cannot be 8. It has to be greater than 8. In the example $x \geq 8$, the value can be 8 or greater.

Equation Examples:	Inequality Examples:	Word Form:
$5 + 4 = 1 + 8$	$4 > 2$	Four is greater than two.
$18 = 3 \cdot 6$	$20 < 4 \cdot 6$	Twenty is less than four times six.
$40 + x = 60$	$40 + x \geq 60$	Forty plus x is greater than or equal to 60.
$y = 9$	$y \leq 9$	y is less than or equal to nine.

Inequalities:	Graphed
$w > 2$	
$m < 8$	
$x \geq 50$	
$y \leq -7$	
$-4 > h$	
$0 < c$	
$-1 \geq n$	
$16 \leq k$	

Problems 1-21: Graph and label each inequality.

- ① $x > -2$
- ② $a \geq 5$
- ③ $11 \leq h$
- ④ $-6 < m$
- ⑤ $k \leq -10$
- ⑥ $7 > w$
- ⑦ $c \geq 15$
- ⑧ $23 < y$
- ⑨ $v \geq 1$
- ⑩ $n \leq -3$
- ⑪ $-9 > x$
- ⑫ $8 < r$
- ⑬ $u \geq 51$
- ⑭ $-20 > h$
- ⑮ $m < -2$
- ⑯ $-5 < y$
- ⑰ $18 \leq n$
- ⑱ $k \geq 3$
- ⑲ $v > 0$
- ⑳ $-12 < w$
- ㉑ $c \leq 7$

Name: _____

Score: _____

Rewriting Inequalities

When you write an equation, it doesn't matter what side of the equation is written first. You could write $x = 6$ or you could rewrite it as $6 = x$. The order does not change the meaning. x equals six means the same thing as six equals x .

The same is not true with inequalities. With inequalities, the order and way numbers and symbols are written make a difference. $x > 6$ is not the same as $6 > x$. The meaning of each is very different. x is greater than six is not the same as six is greater than x .

Inequalities can still be rewritten though. $x > 6$ can be rewritten as $6 < x$. With inequalities, the order of the numbers can be written differently, but the inequality symbol needs to be changed too. x is greater than six does mean the same thing as six is less than x , but it's more common to state the variable on the left side of the equation instead of the right.

Examples:

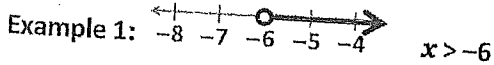
Original Inequalities	$h < 13$	$x > 7$	$a \leq -1$	$20 \geq y$
Rewritten Inequalities	$13 > h$	$7 < x$	$-1 \geq a$	$y \leq 20$

Problems 1-25: Rewrite each inequality.

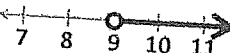

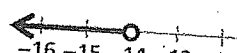


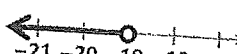

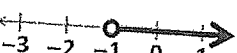

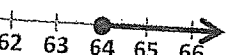
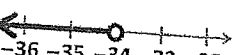
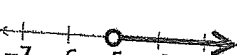
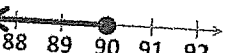
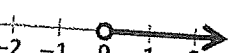
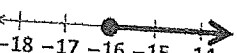

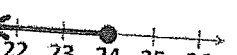
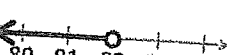
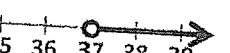


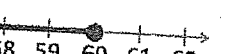
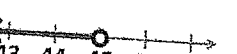
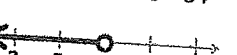
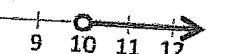
- | | | | | |
|---------------|----------------|---------------|---------------|---------------|
| ① $-5 \leq h$ | ② $12 > w$ | ③ $v \geq 1$ | ④ $m < 2$ | ⑤ $21 < r$ |
| ⑥ $k \leq 50$ | ⑦ $37 < y$ | ⑧ $11 > x$ | ⑨ $-9 \leq n$ | ⑩ $10 > h$ |
| ⑪ $-3 \leq h$ | ⑫ $c \geq -19$ | ⑬ $n \leq -3$ | ⑭ $-5 < y$ | ⑮ $u \geq -5$ |
| ⑯ $v > 7$ | ⑰ $75 < w$ | ⑱ $c \leq 7$ | ⑲ $k \geq 3$ | ⑳ $9 > x$ |
| ㉑ $8 \geq r$ | ㉒ $-6 \leq y$ | ㉓ $45 > k$ | ㉔ $8 \leq h$ | ㉕ $n \leq -3$ |

Writing Inequalities

In the previous day, the focus was on graphing inequalities. This section will focus on interpreting graphs and writing the inequalities that are shown. Pay attention to the dot and arrow on each graph. Is the dot shaded or open? Also, look at the direction the arrow is pointing. Is the arrow pointing in the direction of larger numbers or smaller numbers?



Problems 26-50: Write an inequality for each graph. When writing the inequality, write it so that the variable is on the left side of the inequality. For all of these practice problems, label the variable x .

- | | | |
|--|--|--|
| ②⑥  | ②⑦  | ②⑧  |
| ②⑨  | ③⑩  | ③①  |
| ③②  | ③③  | ③④  |
| ③⑤  | ③⑥  | ③⑦  |
| ③⑧  | ③⑨  | ④⑩  |
| ④①  | ④②  | ④③  |
| ④④  | ④⑤  | ④⑥  |
| ④⑦  | ④⑧  | ④⑨  |
| ⑤⑩  | | |

Name: _____

Score: _____

Solving Inequalities with Positive Numbers

Solving an inequality with positive numbers is like solving an equation. Use inverse operations to isolate the variable.

Example 1: $15 > x - 3$

Original Equation:	15	$>$	$x - 3$
Add on Both Sides:	$15 + 3$	$>$	$x - 3 + 3$
The Answer:	18	$>$	x
Variable on Left Side:	x	$<$	18

Example 2: $42 \leq 12 + 6y$

Original Equation:	42	\leq	$12 + 6y$
Subtract Both Sides:	$42 - 12$	\leq	$12 - 12 + 6y$
	30	\leq	$6y$
Multiply on Both Sides:	$30 \div 6$	\leq	$6y \div 6$
The Answer:	5	\leq	y
Variable on Left Side:	y	\geq	5

Problems 1–20: Solve each problem and write the inequality so that the variable is on the left side of the inequality.

① $x - 4 > 17$

② $40 \geq 5n$

③ $9y - 3 < 51$

④ $\frac{w}{3} \leq 18$

⑤ $60 \geq 7k + 4$

⑥ $a + 54 > 70$

⑦ $17 \leq m + \frac{16}{2}$

⑧ $6r < 48$

⑨ $u + 3 - 9 \leq 25$

⑩ $75 < 8h + 3$

⑪ $\frac{c}{10} \geq 150$

⑫ $9 + x > 35$

⑬ $4m - 5 \geq 27$

⑭ $\frac{v + 6}{8} \leq 10$

⑮ $20 > y - 14$

⑯ $12 < n - 4 \cdot 6$

⑰ $2 + 7u > 23$

⑱ $\frac{x + 4}{3} \geq 4$

⑲ $92 < m - 11$

⑳ $100 \leq 5h \cdot 2$

Name: _____

Score: _____

Solving Inequalities with Negative Numbers

Solving an inequality with negative numbers is a lot like solving an equation too. There are a few exceptions though. **When using the inverse operation of multiplication or division to isolate the variable, you also have to flip the inequality symbol if the number you are multiplying or dividing is a negative number.**

For example, if the inequality is *greater than* it needs to be changed (*flipped*) to a *less than* symbol, when multiplying or dividing both sides. If multiplication or division are not being used, then the inequality symbol does not need to be flipped. If the number being multiplied or divided is a positive number, then the inequality symbol does not need to be flipped either. The first example below did not need to be flipped. The second example did need to be flipped.

Example (Without a Flip): $13 \leq m - 5$

Original Equation:	13	$\leq m - 5$
Add on Both Sides:	$13 + 5$	$\leq m - 5 + 5$
The Answer:	18	$\leq m$
Variable on Left Side:	m	≥ 18

Example 2 (With a Flip): $h - 7 < 63$

Original Equation:	$-7 \cdot h$	< 63
Multiply on Both Sides:	$-7h \div -7$	$< 63 \div -7$
	h	< -9
Flip the Inequality:	h	> -9
The Answer:	h	> -9

Problems 1–20: Solve each problem and write the inequality so that the variable is on the left side of the inequality.

① $18 \geq -9m$

② $\frac{w}{-2} \leq 14$

③ $k - 7 > 10$

④ $-10u < 200$

⑤ $a + -12 > 35$

⑥ $48 \leq \frac{x}{-6}$

⑦ $-5h < 20$

⑧ $43 \leq n + -8$

⑨ $-24 < -8y$

⑩ $-20 + x > 39$

⑪ $r + -31 \leq 75$

⑫ $\frac{c}{-9} \geq 4$

⑬ $\frac{v}{-3} \leq 5$

⑭ $45 < w - 6$

⑮ $-2k \geq 50$

⑯ $60 > n - -16$

⑰ $48 \leq -4y$

⑱ $65 < x - -15$

⑲ $-8v > 32$

⑳ $\frac{x}{-7} \geq 35 =$

Day 1

Lines, Rays, Line Segments

Name: _____

Score: _____

Lines

A **line** is a straight path that extends forever in two directions. Lines are drawn with an arrow on each side, to represent that the line continues in each direction indefinitely.

Rays

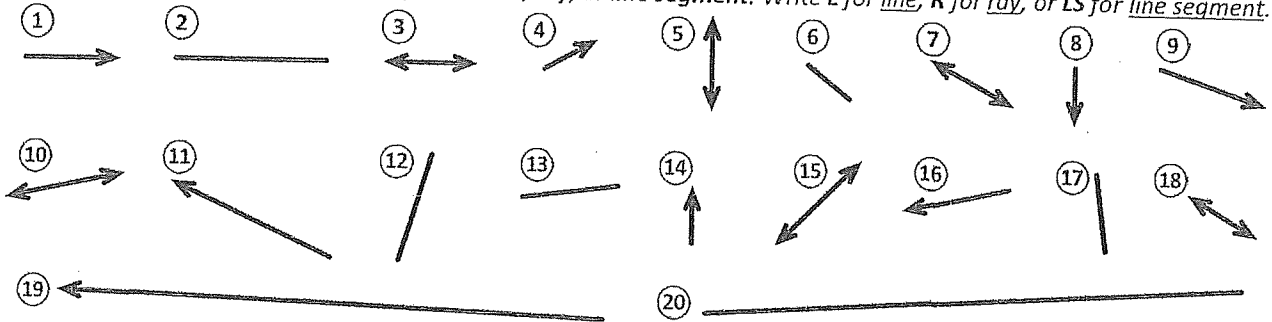
A **ray** is part of a line. It has one endpoint and extends forever in one direction. It's drawn with one arrow to show the direction that it extends.

Line Segments

A **line segment** is also a part of a line. It has two endpoints. It does not extend forever. It starts at one endpoint and ends at the other endpoint. A line segment has a set length.

	Descriptions	Examples
Line	Extends forever in 2 directions.	
Ray	Extends forever in 1 direction. Has 1 endpoint.	
Line Segment	Has 2 endpoints.	

Problems 1–20: State if each example is a **line**, **ray**, or **line segment**. Write **L** for **line**, **R** for **ray**, or **LS** for **line segment**.



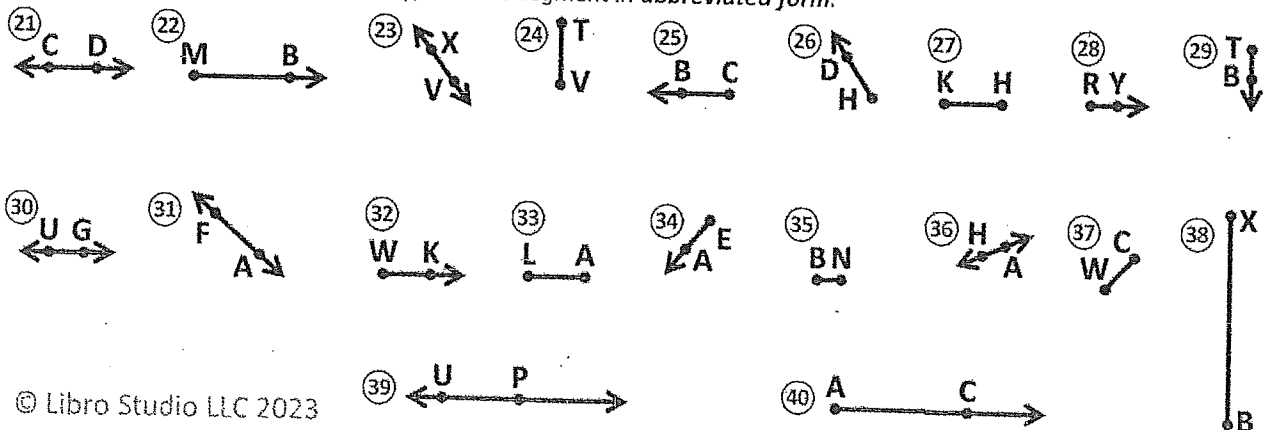
Examples	Word Form	Abbreviations
	Line AB Line BA	\overleftrightarrow{AB} or \overleftrightarrow{BA}
	Ray AB	\overrightarrow{AB} not \overrightarrow{BA}
	Line Segment AB Line Segment BA	\overline{AB} or \overline{BA}

Naming Lines, Rays, and Line Segments

Lines, rays, and line segments can be named when they have labeled points. The order of the points used to name a line or line segment does not matter.

The order of the points used to name a ray does matter. Every ray has one endpoint. This endpoint is the beginning of the ray (how ironic). A ray's beginning must be listed first when naming the ray, to indicate the direction that the ray is extending.

Problems 21–40: Write each line, ray, and line segment in **abbreviated form**.



Day 2

Lines, Rays, & Segments

Name: _____

Score: _____

Problems 1–12: Write each line, ray, and line segment in word form.



Dissecting Lines, Rays, and Line Segments

A line can be dissected into different parts. The example below shows all the different parts of line AB. A line with two points can be dissected into two rays and a line segment.

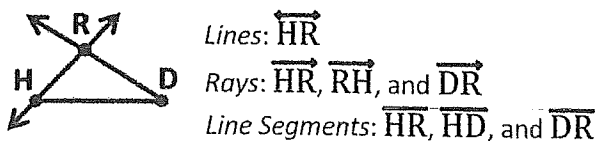


Overlapping Lines, Rays, and Line Segments

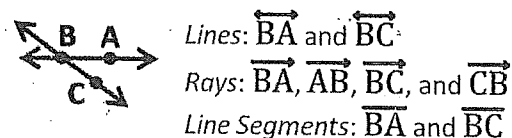
Lines, rays, and line segments often overlap each other. This section will focus on dissecting the various lines, rays, and line segments. Look at the example below. How many different lines, rays, and line segments do you see?

List the different lines, rays, and line segments contained in each figure.

Example 1:



Example 2:



Problems 13–20: List the different lines, rays, and line segments contained in each figure.

