Name _____ Class _____ Date _____

3-4

Solving One-Step Inequalities

COMMON CORE

CC.7.EE.4b

Essential question: *How do you solve inequalities that involve one operation?*

1 EXPLORE Solving Inequalities

Kate took $3 out of her purse, and she still had at least $8 in it. How much did she have to begin?

The phrases *at least* or *at most* can be confusing. *At least* means that amount or more, so use the greater than or equal to ($\geq$) symbol. *At most* means that amount or less, so use the less than or equal to symbol ($\leq$).

A Write an inequality to represent the amount of money in Kate's purse.

$x - 3 \geq 8$

B Use inverse operations to solve the inequality.

$m - 3 \geq 8$ ADD 3 to each side.

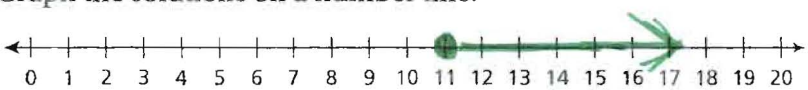
$m - 3 \geq 8$ Simplify.

$+3 \quad +3$

$m \geq 11$

When graphing an inequality on a number line, use a solid circle to show that the variable can equal that value. Use an empty circle to show that the variable cannot be equal to that value. Since money is not just integer values, you can shade a solid arrow, or ray, to the right.

C Graph the solutions on a number line.



D What does the solution tell you?

SHE HAS AT LEAST $11 OR MORE.

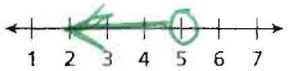
TRY THIS!

Solve. Then graph the solution.

1a. $x + 4 < 9$

$-4 \quad -4$

$x < 5$



REFLECT

1b. Choose a value in the shaded area of the number line from **C**. Substitute it into the original inequality from **A**. Does this value make the inequality true?

$3 + 4 < 9$ $\quad 7 + 4 < 9$

$7 < 9$ $\quad 11 < 9$

1c. Now choose a value outside the shaded area of the number line from **C**. Substitute it in the original inequality. Does this value make the inequality in **A** true?

X=7 $7+4<9$ $11<9$ NOT TRUE

1d. Conjecture What does the shaded part of the inequality show?

IS ALL NUMBERS THAT MAKE THE EQUATION TRUE!

A value that can be substituted for the variable to make the inequality a true statement is part of the **solution set**. Therefore, 12 is part of the solution set, whereas 10 is not part of the solution set. So, Kate could have had $12 in her purse.

2 EXPLORE Inequality Signs

A Complete the tables.

Inequality	Multiply each side by:	New Inequality	New Inequality is True or False?
$3 < 4$	2	$6<8$	TRUE
$2 \geq -3$	3	$6 \geq -9$	TRUE
$-1 \leq 6$	5	$-5 \leq 30$	TRUE
$5 > 2$	-1	$-5 > -2$	FALSE
$1 \leq 7$	-5	$-5 \leq -35$	FALSE
$-8 > -10$	-8	$64 > 80$	FALSE

Inequality	Divide each side by:	New Inequality	New Inequality is True or False?
$4 < 8$	4	$1<2$	TRUE
$12 \geq -15$	3	$4 \geq -5$	TRUE
$-16 \leq 12$	-4	$4 \leq -3$	FALSE
$15 > 5$	-5	$-3 > -1$	FALSE

B When both sides of an inequality are multiplied or divided by a NEGATIVE number, the inequality is no longer true.

C Complete the tables.

Inequality	Multiply each side by:	New Inequality	Reverse the Inequality Symbol	Reversed symbol makes it True or False?
$5 > 2$	-1	$-5 > -2$	$-5 < -2$	T
$1 \leq 7$	-5	$-5 \leq -35$	$-5 \geq -35$	T
$-8 > -10$	-8	$64 > 80$	$64 < 80$	T

Inequality	Divide each side by:	New Inequality	Reverse the Inequality Symbol	Reversed symbol makes it True or False?
$-16 \leq 12$	-4	$4 \leq -3$	$4 \geq -3$	T
$15 > 5$	-5	$-3 > -1$	$-3 < -1$	T

REFLECT

2a. Conjecture When both sides of an inequality are multiplied or divided by a negative number, you must change the symbol to its opposite to make the statement true.

Properties of Inequalities

- You can add or subtract the same number on both sides of an inequality and the statement will still be true.
- You can multiply or divide both sides of an inequality by the same positive number, and the statement will still be true.
- If you multiply or divide both sides of an inequality by the same negative number, you must reverse the inequality symbol for the statement to still be true.

IMPORTANT!!

3 EXAMPLE Solving Real-World Inequalities

Michael bought three cans of paint. The bill was less than $60. How much was each can of paint?

A First, write an inequality to represent the situation. Then solve.

$3c < 60$ *Let c represent the cost of the paint.*

$\frac{3c}{3} \quad \frac{60}{3}$ *Divide each side by* 3.

$c < 20$ *Simplify.*