

INDEPENDENT VARIABLE

IDV WORKSHEETS



SOLVING ONE-STEP EQUATIONS

ADDITIVE INVERSE | MULTIPLICATIVE INVERSE | NEGATIVES & FRACTIONS

ANIMATED
POWERPOINT:
DOES THE WORK
FOR YOU!

FULL ANSWER
KEYS
INCLUDED

$$\left(-\frac{5}{3}\right)x = -\frac{4}{3} \cdot \left(-\frac{3}{5}\right)$$

$$x = \frac{12}{15} = \frac{4}{5}$$

$$-\frac{5}{3} \cdot \frac{4}{5} = -\frac{20}{15} = -\frac{4}{3} \checkmark$$

THE GOLDEN RULE
Undo It on Both Sides

ADDITIVE INVERSE

$$\begin{array}{r} 5 + x = 20 \\ -5 \quad -5 \\ \hline x = 15 \end{array}$$

ADDITIVE INVERSE

$$\begin{array}{r} x - 5 = 20 \\ +5 \quad +5 \\ \hline x = 25 \end{array}$$

MULTIPLICATIVE INVERSE

$$\begin{array}{r} 5x = 20 \\ \frac{5}{5} \quad \frac{5}{5} \\ \hline x = \frac{20}{5} = 4 \end{array}$$

MULTIPLICATIVE INVERSE

$$\begin{array}{r} \frac{5}{1} \cdot \frac{1}{5}x = 20 \cdot \frac{1}{5} \\ \hline x = 100 \end{array}$$

GOLDEN RULE: Whatever is done to one side of an equation, you do to the other.

6 EXAMPLE
PROBLEMS
5 PRACTICE
SHEETS

LEVELED
PRACTICE,
FIND THE
MISTAKE +
MAZE

MORE PRACTICE. LESS PREP. BETTER OUTCOMES.

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Inside the Animated Lesson

INDEPENDENT VARIABLE

GRADES 6-8 • PRE-ALGEBRA

SOLVING ONE-STEP EQUATIONS

ADDITIVE INVERSE | MULTIPLICATIVE INVERSE | NEGATIVES & FRACTIONS

Animated PowerPoint lesson

6 animated worked problems • guided notes
Practice A, B, C • Find the Mistake • maze

$$\begin{array}{r}
 x + 5 = 3 \\
 -5 \quad -5 \\
 \hline
 x = -2
 \end{array}$$

MORE PRACTICE. LESS PREP. BETTER OUTCOMES.

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LESSON OVERVIEW

Today's Goals

I CAN...

- 1 Explain the additive inverse and the multiplicative inverse (reciprocal) of a number.
- 2 Solve one-step equations by using the inverse operation on both sides.
- 3 Solve one-step equations with negatives and fractions, then check my answer.

KEY VOCABULARY

Equation two expressions that are equal, joined by =	Variable a letter, like x, that stands for an unknown number
Inverse operation the operation that undoes another: + and -, × and ÷	Additive inverse the opposite: $5 + (-5) = 0$
Multiplicative inverse the reciprocal: $\frac{1}{5} \cdot 5 = 1$	Golden Rule whatever you do to one side, do to the other

STANDARDS

CCSS 6.EE.B.7 CCSS 7.EE.B.4a CCSS 8.EE.C.7b

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WARM-UP

Can You Read My Mind?

Let's see if you can read my mind...

WRITE IT DOWN, SHOW YOUR MATH!

- 1 I'm thinking of a number. It's 5 less than 3. What is it?
 $x = 3 - 5 = -2$
- 2 Now I'm thinking of a number that is 5 more than 3. What is it?
 $x = 3 + 5 = 8$
- 3 Now I'm thinking of a number. If I double it, I get 7. What is it?
 $2x = 7$, so $x = 7 \div 2 = 3.5$
- 4 Now I'm thinking of a number. Half of it is 7. What is it?
 $\frac{1}{2}x = 7$, so $x = 7 \cdot 2 = 14$

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ADDITIVE INVERSE

Make Zero

Additive inverse: what you add or subtract to a number to get zero.

2	-2	= 0
-5	+5	= 0
7	-7	= 0
0	+0	= 0
1	-1	= 0
9	-9	= 0
-4	+4	= 0

YOUR TURN

Write the operation and number to form an equation that equals 0.

NOTICE

The additive inverse is the opposite: same number, other sign. Zero is its own opposite.

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THE GOLDEN RULE

Undo It on Both Sides

ADDITIVE INVERSE

$$\begin{array}{r}
 5 + x = 20 \\
 -5 \quad -5 \\
 \hline
 x = 15
 \end{array}$$

ADDITIVE INVERSE

$$\begin{array}{r}
 x - 5 = 20 \\
 +5 \quad +5 \\
 \hline
 x = 25
 \end{array}$$

MULTIPLICATIVE INVERSE

$$\begin{array}{r}
 5x = 20 \\
 \frac{1}{5} \quad \frac{1}{5} \\
 \hline
 x = \frac{20}{5} = 4
 \end{array}$$

MULTIPLICATIVE INVERSE

$$\begin{array}{r}
 \frac{5}{1} \cdot \frac{1}{5}x = 20 \cdot \frac{1}{5} \\
 \hline
 x = 100
 \end{array}$$

HOW TO UNDO IT

If something is added to x, subtract it.
If something is taken away from x, add it back.
If x is multiplied by a number, divide by it.
If x is multiplied by a fraction, multiply by the reciprocal.

GOLDEN RULE: Whatever is done to one side of an equation, you do to the other.

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HOW THIS LESSON WORKS

Inverse. Rewrite. Check.

Every equation today takes ONE step to solve. Then we rewrite and check, every time.

EXAMPLE

$$\begin{array}{r}
 x - 5 = 3 \\
 +5 \quad +5 \\
 \hline
 x = 8
 \end{array}$$

INVERSE Get rid of the number by the variable with the inverse operation. Do it to BOTH sides.

REWRITE Rewrite the equation as $x = \dots$. Reduce fractions if you can.

CHECK Put your answer back into the original equation. Both sides must match.

CHECK

$$8 - 5 = 3 \checkmark$$

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FOLLOW ALONG • FOLLOW-ALONG SHEET, BOX 4

Solve the One-Step Equation

Solve for x.

CHECK

$$\begin{array}{r}
 -3x = 18 \\
 -3 \quad -3 \\
 \hline
 x = -\frac{18}{3} = -6
 \end{array}$$

INVERSE x is multiplied by -3, so divide both sides by -3, sign and all.

REWRITE Rewrite the equation: $x = -18/3 = -6$. Reduce if you can.

CHECK Substitute -6 for x in the original equation. Both sides match $\checkmark$

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FOLLOW ALONG • FOLLOW-ALONG SHEET, BOX 6 • CHALLENGE

Solve the One-Step Equation

Solve for x.

CHECK

$$\begin{array}{r}
 -\frac{3}{5} \cdot \left(-\frac{5}{3}\right)x = -\frac{4}{3} \cdot \left(-\frac{3}{5}\right) \\
 \hline
 x = \frac{12}{15} = \frac{4}{5}
 \end{array}$$

INVERSE x is multiplied by -5/3, so multiply BOTH sides by its reciprocal, -3/5, negative and all.

REWRITE Rewrite the equation: $x = 12/15 = 4/5$. Reduce if you can.

CHECK Substitute 4/5 for x in the original equation. Both sides match $\checkmark$

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Directions: Copy each equation into its box when your teacher shows it, then solve it. Show the inverse operation on both sides, rewrite, reduce, and check. Use the Notes space for the warm-up.

1.	2.	3.
4.	5.	6. <i>Challenge</i>

Notes

Directions: Getting started. Whole numbers, positive answers. Use the inverse operation on both sides. Write fractions in simplest form. Check your answers.

PRACTICE A • GETTING STARTED

Use the additive inverse to isolate the variable

$$\begin{array}{r} 4 + x = 12 \\ -4 \quad -4 \\ \hline x = 8 \end{array}$$

$$\begin{array}{r} x - 4 = 12 \\ +4 \quad +4 \\ \hline x = 16 \end{array}$$

$$\begin{array}{r} -4 + x = 10 \\ +4 \quad +4 \\ \hline x = 14 \end{array}$$

Use the multiplicative inverse to isolate the variable

$$\begin{array}{r} 4x = 5 \\ \frac{4}{4} \cdot \frac{4}{4} \\ \hline x = \frac{5}{4} \end{array}$$

$$\begin{array}{r} \frac{3}{4} \cdot \frac{4}{3}x = 11 \cdot \frac{3}{4} \\ \hline x = \frac{33}{4} \end{array}$$

$$\begin{array}{r} \frac{3}{4} \cdot \frac{4}{3}x = \frac{11}{4} \cdot \frac{3}{4} \\ \hline x = \frac{33}{16} \end{array}$$

1. $x + 4 = 29$	2. $x + 7 = 27$	3. $x + 8 = 20$
4. $x - 7 = 4$	5. $x - 7 = 12$	6. $x - 3 = 11$
7. $2x = 36$	8. $8x = 32$	9. $3x = 39$
10. $\frac{1}{4}x = 4$	11. $\frac{1}{3}x = 5$	12. $\frac{1}{3}x = 2$

Directions: Each student made ONE mistake. Circle the first wrong line, explain what went wrong, then solve it correctly.

1. *Morgan solved:*

$$x + 8 = 3$$

$$x = 3 + 8$$

$$x = 11$$

What went wrong?

Solve it correctly:

2. *Riley solved:*

$$x - 6 = -10$$

$$x = -10 - 6$$

$$x = -16$$

What went wrong?

Solve it correctly:

3. *Taylor solved:*

$$7x = 42$$

$$x = 42 \cdot 7$$

$$x = 294$$

What went wrong?

Solve it correctly:

4. *Casey solved:*

$$-6x = 48$$

$$x = 8$$

What went wrong?

Solve it correctly:

5. *Avery solved:*

$$6x = 3$$

$$x = 6/3$$

$$x = 2$$

What went wrong?

Solve it correctly:

6. *Jamie solved:*

$$(2/3)x = 8$$

$$x = 8 \cdot 2/3$$

$$x = 16/3$$

What went wrong?

Solve it correctly: