MATH | GRADES 6 TO 8 | STUDENT PACKET

One-Step and Two-Step Equations

Inverse operations, checking by substitution, and writing equations from word problems

IN THIS PACKET YOU WILL LEARN TO

- ✓ Solve a one-step equation using an inverse operation
- ✓ Solve a two-step equation and check the solution
- ✓ Write an equation that matches a word problem
- ✓ Explain inverse operations in your own words

Name _____

Teacher _____

Class _____

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What an Equation Is

LEARN

Read this page with your teacher or a partner, and look at each example before you try the two practice items.

A BALANCE

The equation $x + 5 = 12$ says that both sides have the same value.

1. The left side is a number plus 5.
2. The right side is 12.
3. The value of x that makes both sides equal is the solution.

$x = 7$, because $7 + 5 = 12$

INVERSE OPERATIONS

To undo adding 5, subtract 5 from both sides.

1. Start with $x + 5 = 12$.
2. Subtract 5 from both sides: $x + 5 - 5 = 12 - 5$.
3. You are left with $x = 7$.

$x = 7$

WORDS TO KNOW

equation	A number sentence with an equal sign, such as $3x + 2 = 14$.
variable	A letter that stands for an unknown number, often x.
solution	The value of the variable that makes the equation true.
inverse operation	The operation that undoes another. Addition and subtraction undo each other, and so do multiplication and division.

Try it

1. $x + 9 = 15$ $x =$ _____

2. $x - 4 = 11$ $x =$ _____

Name _____ Date _____

One-Step Equations

LEARN

Each box shows how to undo one operation. Read the steps, then try the four practice equations.

UNDO ADDITION

$x + 8 = 20$

1. Subtract 8 from both sides.
2. $20 - 8 = 12$, so the variable stands alone.
3. The solution is $x = 12$.

$x = 12$

UNDO SUBTRACTION

$x - 7 = 9$

1. Add 7 to both sides.
2. $9 + 7 = 16$, so the variable stands alone.
3. The solution is $x = 16$.

$x = 16$

UNDO MULTIPLICATION

$5x = 45$

1. Divide both sides by 5.
2. $45 \div 5 = 9$, so the variable stands alone.
3. The solution is $x = 9$.

$x = 9$

UNDO DIVISION

$x/4 = 6$

1. Multiply both sides by 4.
2. $6 \times 4 = 24$, so the variable stands alone.
3. The solution is $x = 24$.

$x = 24$

Try it

1. $x + 6 = 19$ $x =$ _____ **2.** $x - 8 = 7$ $x =$ _____ **3.** $3x = 27$ $x =$ _____ **4.**

Name _____ Date _____

Two-Step Equations

GUIDED PRACTICE

Undo the addition or subtraction first, then undo the multiplication or division. Check each solution by substituting it back into the original equation.

A TWO-STEP EXAMPLE

$3x + 5 = 20$

1. Subtract 5 from both sides: $3x = 15$.
2. Divide both sides by 3: $x = 5$.
3. Check: $3(5) + 5 = 15 + 5 = 20$, so the solution works.

$x = 5$

1. $2x + 7 = 19$ $x =$ _____

2. $4x - 3 = 21$ $x =$ _____

3. $5x + 4 = 34$ $x =$ _____

4. $3x - 8 = 16$ $x =$ _____

5. $x/2 + 6 = 11$ $x =$ _____

6. $x/3 - 4 = 2$ $x =$ _____

Name _____ Date _____

One-Step Practice

PRACTICE ★

Solve each equation and write the value of *x* on the line. Check one row by substituting your solutions.

1. $x + 12 = 30$ $x =$ _____ **2.** $x - 9 = 14$ $x =$ _____ **3.** $6x = 42$ $x =$ _____

5. $x + 15 = 28$ $x =$ _____ **6.** $x - 11 = 9$ $x =$ _____ **7.** $8x = 56$ $x =$ _____

9. $x + 7 = 22$ $x =$ _____ **10.** $x - 6 = 18$ $x =$ _____ **11.** $9x = 81$ $x =$ _____

13. $x + 19 = 40$ $x =$ _____ **14.** $x - 13 = 8$ $x =$ _____ **15.** $5x = 65$ $x =$ _____

17. $x + 4 = 21$ $x =$ _____ **18.** $x - 16 = 9$ $x =$ _____ **19.** $7x = 63$ $x =$ _____

21. $x + 8 = 8$ $x =$ _____ **22.** $x - 20 = 5$ $x =$ _____ **23.** $4x = 36$ $x =$ _____

Name _____ Date _____

Two-Step Practice

PRACTICE ★★

Solve each equation, then write <, >, or = between each pair of solutions.

1. $2x + 5 = 17$ $x =$ _____
2. $3x - 4 = 14$ $x =$ _____
3. $5x + 9 = 34$ $x =$ ___
4. $4x - 7 = 21$ $x =$ _____
5. $6x + 2 = 32$ $x =$ _____
6. $7x - 8 = 27$ $x =$ ___
7. $x/2 + 3 = 10$ $x =$ _____
8. $x/4 - 1 = 5$ $x =$ _____
9. $x/5 + 6 = 9$ $x =$ ___

Equations with negative numbers

10. $x + 9 = 4$ $x =$ _____
11. $x - 5 = -3$ $x =$ _____
12. $2x + 8 = 2$ $x =$ _____

Compare the solutions with <, >, or =

13. solution of $2x + 1 = 9$ _____ solution of $3x - 2 = 10$
14. solution of $4x = 20$ _____ solution of $x + 7 = 10$

Name _____ Date _____

Sort the Equations

CUT AND PASTE

Cut out the twelve equation cards at the bottom of the page and solve each one. Glue each card in the column for its solution.

$x = 4$	$x = 8$	$x = 12$

1. Look at the equations whose solution is 8. What do you notice about the inverse operations you used?

$x/4 = 2$	$x/3 = 4$	$2x = 16$	$2x = 8$
$x - 5 = 7$	$3x = 36$	$x - 2 = 6$	$x + 4 = 16$
$x + 3 = 7$	$x + 5 = 13$	$x - 1 = 3$	$x/2 = 2$

Name _____ Date _____

Match the Story to the Equation

MATCH

Read each story on the left and find the equation on the right that matches it. Write the letter of the equation on the line.

STORY		EQUATION
1. A number plus 9 is 20	_____	**A** $x/3 = 8$
2. A number minus 6 is 11	_____	**B** $x + 9 = 20$
3. Five times a number is 45	_____	**C** $5x = 45$
4. A number divided by 3 is 8	_____	**D** $4x + 1 = 21$
5. Twice a number, then plus 4, is 18	_____	**E** $3x - 5 = 16$
6. Three times a number, then minus 5, is 16	_____	**F** $2x + 4 = 18$
7. A number divided by 2, then plus 7, is 12	_____	**G** $x - 6 = 11$
8. Four times a number, then plus 1, is 21	_____	**H** $x/2 + 7 = 12$

9. Write a story that matches the equation $3x + 2 = 17$, then solve it.

Name _____ Date _____

Mystery Picture

COLOR BY SOLUTION

Solve the equation in each square, then color the square with the color from the key that matches that solution. When you finish, a picture will appear.

- ☐ **Light blue**: The solution is 3 or 4.
- ☐ **Cream**: The solution is 8 or 9.
- ☐ **Dark red**: The solution is 6 or 7.
- ☐ **Brown**: The solution is 5.

x + 2 = 5	x − 1 = 3	2x = 6	x/2 = 2	x + 1 = 7	x − 2 = 5	x + 5 = 9	3x = 12	x − 0 = 3	x/4 = 1
x + 2 = 5	x − 1 = 3	2x = 6	2x = 12	x/2 = 3	x + 3 = 10	x − 1 = 6	x/2 = 2	x + 5 = 9	3x = 12
x − 0 = 3	x/4 = 1	3x = 21	x/3 = 2	x + 1 = 7	x − 2 = 5	2x = 12	x/2 = 3	x + 2 = 5	x − 1 = 3
2x = 6	x + 3 = 10	x − 1 = 6	3x = 21	x/3 = 2	x + 1 = 7	x − 2 = 5	2x = 12	x/2 = 3	x/2 = 2
x + 2 = 10	x − 3 = 6	2x = 16	x/2 = 4	x + 1 = 10	x − 1 = 8	3x = 27	x/3 = 3	4x = 32	x + 4 = 12
x + 2 = 10	x − 3 = 6	x + 5 = 9	2x = 16	x/2 = 4	x + 1 = 10	x − 1 = 8	3x = 12	3x = 27	x/3 = 3
4x = 32	x + 4 = 12	x − 0 = 3	x + 2 = 10	x − 3 = 6	2x = 16	x/2 = 4	x/4 = 1	x + 1 = 10	x − 1 = 8
3x = 27	x/3 = 3	4x = 32	x + 4 = 12	x + 2 = 10	x − 3 = 6	2x = 16	x/2 = 4	x + 1 = 10	x − 1 = 8
3x = 27	x/3 = 3	4x = 32	x + 4 = 12	x + 3 = 8	x − 2 = 3	x + 2 = 10	x − 3 = 6	2x = 16	x/2 = 4
x + 1 = 10	x − 1 = 8	3x = 27	x/3 = 3	5x = 25	x/5 = 1	4x = 32	x + 4 = 12	x + 2 = 10	x − 3 = 6

Name _____ Date _____

Equation Riddle

RIDDLE

Solve each equation and find the solution in the code table. Write the letter for that solution on the line with the same number to answer the riddle.

What do you do to both sides of an equation so it stays true?

1	2	3	4	5	6	7	8	9	10	11	12	13	14

CODE TABLE

1	2	3	4	5	6	7
M	P	C	B	E	A	T

8	9	10	11	12	13	14
K	I	N	L	D	Y	W

1. $x/2 = 4 =$ _____
2. $x + 3 = 8 =$ _____
3. $3x = 15 =$ _____
4. $2x = 4$
5. $x + 5 = 14 =$ _____
6. $x - 1 = 6 =$ _____
7. $2x = 8 =$ _____
8. $x - 2 =$
9. $x + 2 = 13 =$ _____
10. $3x = 18 =$ _____
11. $x + 1 = 11 =$ _____
12. $x + 6 =$
13. $x + 2 = 7 =$ _____
14. $4x = 48 =$ _____

Name _____ Date _____

Equation Word Problems

APPLY

Write an equation for each story, then solve it. Show your work in the box and write the answer with the label on the line.

1. A number plus 14 is 31, so what is the number?

SHOW YOUR WORK

Answer: _____

2. Six times a number is 54, so what is the number?

SHOW YOUR WORK

Answer: _____

3. Tickets cost $8 each, and a booking fee of $4 is added, for a total of $36. How many tickets were bought?

SHOW YOUR WORK

Answer: _____ tickets

4. A rectangle is 3 inches longer than it is wide, and the perimeter is 26 inches. What is the width of the rectangle?

SHOW YOUR WORK

Answer: _____ inches

Name _____ Date _____

Find the Mistake

ERROR ANALYSIS ★★

Each box shows work from a student who made a mistake. Read the work carefully, explain what went wrong, and then answer the question below it.

Ava's work

I started with 4x + 6 = 30.

I divided both sides by 4 first.

x + 6 = 7.5, so I think x = 1.5.

1. What mistake did Ava make? Explain it in a complete sentence.

2. Solve 4x + 6 = 30 the right way, and write each step.

YOUR WORK

Ben's work

I solved 2x – 5 = 11.

I added 5 and got 2x = 16.

Then I subtracted 2 and wrote x = 14.

3. What mistake did Ben make? Explain it in a complete sentence.

4. Solve 2x – 5 = 11 the right way, and check by substituting.

YOUR WORK

Name _____ Date _____

Explain Inverse Operations

WRITE ABOUT MATH

Answer each question in complete sentences. Use the sentence starters if they help, and use the words inverse and solution in your writing.

1. Why do you subtract when an equation adds a number to x? Use $x + 9 = 20$ as your example.

I subtract 9 from both sides because _____. After I subtract, the equation says _____.

WRITE EVERY STEP THAT SOLVES $5X - 3 = 22$

2. How do you check that $x = 5$ is the solution of $5x - 3 = 22$?

Name _____ Date _____

Mixed Review

REVIEW

Solve each problem and check your work when you finish. Use any strategy from this packet that helps you.

1. $x + 16 = 25$ $x =$ _____ **2.** $x - 9 = 13$ $x =$ _____ **3.** $7x = 56$ $x =$ _____

5. $3x + 4 = 25$ $x =$ _____ **6.** $5x - 9 = 26$ $x =$ _____ **7.** $x/2 + 7 = 15$ $x =$ _____

8. solution of $x + 3 = 10$ _____ solution of $2x = 12$

9. solution of $4x - 2 = 14$ _____ solution of $x + 1 = 5$

10. Four times a number, plus 6, is 30, so what is the number?

SHOW YOUR WORK

Answer: _____

11. A number divided by 3, then minus 2, is 5, so what is the number?

SHOW YOUR WORK

Answer: _____

Name _____ Date _____

Exit Tickets

CHECK

Your teacher will cut this page on the dotted line so each student gets one ticket. Solve all four problems on your own and show your work.

Equations Exit Ticket

Name _____

1. $x + 8 = 19$ $x =$ _____ 2. $4x = 28$ $x =$ _____ 3. $2x + 5 = 17$ $x =$ _____

4. Five times a number, minus 3, is 22, so what is the number?

SHOW YOUR WORK

Answer: _____

Equations Exit Ticket

Name _____

1. $x + 8 = 19$ $x =$ _____ 2. $4x = 28$ $x =$ _____ 3. $2x + 5 = 17$ $x =$ _____

4. Five times a number, minus 3, is 22, so what is the number?

SHOW YOUR WORK

Answer: _____

Name _____ Date _____

How Did I Do?

SELF-CHECK

Read each skill and put a check in the box that fits you best. Then answer the two questions at the bottom of the page.

Skill	I can do this on my own.	I can do this with a little help.	I am still learning this.
I can solve a one-step equation with any of the four operations.	☐	☐	☐
I can solve a two-step equation.	☐	☐	☐
I can check a solution by substituting it back into the equation.	☐	☐	☐
I can write an equation that matches a word problem.	☐	☐	☐
I can explain which inverse operation to use and why.	☐	☐	☐
I can solve an equation that has a negative number.	☐	☐	☐

1. Which skill do you want to practice more, and why?

2. Which strategy from this packet helps you the most? Show how it works with one equation.