

# Day 2

## Writing Equations

Name: \_\_\_\_\_

Score: \_\_\_\_\_

Balancing Equations

1-25!

12h

10mv

79

### Rewriting Algebra Problems

Students can often calculate the answers to algebra problems in their head, even though they've never "learned algebra" before. How is that possible?

Many skills and principles students learn while studying arithmetic can be used to solve algebra problems. **Inverse operations** and other mathematical principles can be used to rewrite algebra problems so that the variable is by itself on one side of the equation and numbers and operations are on the other side. Rewriting algebra problems this way often makes them easier to solve because they look similar to arithmetic problems.

#### Examples of how algebra problems can be rewritten:

Problems:	$c + 8 = 12$	$9 - d = 4$	$m \times 2 = 20$	$18 \div y = 6$
Re-written:	$12 - 8 = c$	$9 - 4 = d$	$20 \div 2 = m$	$18 \div 6 = y$
Answers:	$c = 4$	$d = 5$	$m = 10$	$y = 3$

Problems 1–30: Rewrite each problem so the variable is by itself, then solve the problem.

①  $a + 2 = 5$   
 $a = 5 - 2$   
 $a = 3$

②  $10 + v = 16$   
 $v =$

③  $100 - y = 40$   
 $y =$

④  $h - 4 = 5$   
 $h =$

⑤  $3 \times m = 21$   
 $m =$

⑥  $w \times 5 = 40$   
 $w =$

⑦  $c \div 4 = 5$   
 $c =$

⑧  $24 \div k = 6$   
 $k =$

⑨  $d + 8 = 31$   
 $d =$

⑩  $40 - a = 32$   
 $a =$

⑪  $i \times 6 = 12$   
 $i =$

⑫  $30 \div r = 10$   
 $r =$

⑬  $9 \times k = 45$   
 $k =$

⑭  $n + 18 = 25$   
 $n =$

⑮  $32 \div p = 8$   
 $p =$

⑯  $j - 2 = 61$   
 $j =$

⑰  $11 + u = 26$   
 $u =$

⑱  $m \times 3 = 6$   
 $m =$

⑲  $a - 7 = 9$   
 $a =$

⑳  $y \div 2 = 8$   
 $y =$

㉑  $100 - w = 75$   
 $w =$

㉒  $h + 29 = 36$   
 $h =$

㉓  $48 \div w = 12$   
 $w =$

㉔  $6 \times e = 6$   
 $e =$

㉕  $3 + a = 50$   
 $a =$

㉖  $2 \times y = 60$   
 $x =$

㉗  $r - 20 = 70$   
 $r =$

㉘  $n \div 10 = 90$   
 $n =$

㉙  $9 - v = 1$   
 $v =$

㉚  $1 + c = 17$   
 $c =$

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

Name: \_\_\_\_\_

Score: \_\_\_\_\_

**Writing Multiplication Problems**

What does a multiplication symbol normally look like? An "x". This isn't an issue in arithmetic equations, but in algebra, it can cause confusion. People sometimes confuse the multiplication symbol for the letter "x" and think that it's a variable. Other times, people see a variable labeled with an "x" and mistake it for a multiplication symbol.

That's why many people don't use an "x" as a multiplication symbol. Especially in algebra, people often use a dot to symbolize multiplication. An example of an equation using a dot is  $2 \cdot w = 10$ .

Many times, people don't use a symbol for multiplication. When there is no symbol between variables and numbers, it means they should be multiplied. An example is  $2w = 10$ . The same is true when a number or variable is next to parentheses and there is no operation symbol, such as  $2(w) = 10$ . When no operation is shown, multiplication is implied.

**Different ways to write multiplication equations:**

Using a "x":	Using a dot:	Using no space:	Using parentheses with no space:
$5 \times a = 20$	$5 \cdot a = 20$	$5a = 20$	$5(a) = 20$
$3 \times x = 12$	$3 \cdot x = 12$	$3x = 12$	$3(x) = 12$
$w \times y = 100$	$w \cdot y = 100$	$wy = 100$	$w(y) = 100$

Using an "x" as a multiplication symbol can lead to errors. So, for the rest of this workbook, dots and no spaces will be used instead. Might as well practice and get familiar with them now. Perhaps you'll like them even better.

**Problems 1-12: Solve each problem.**

①  $5 \cdot 7 =$

②  $2(8) =$

③  $4 \cdot 9 =$

④  $10(6) =$

⑤  $4e = 28$

$e =$

⑥  $m(9) = 72$

$m =$

⑦  $6x = 48$

$x =$

⑧  $w \cdot 5 = 15$

$w =$

⑨  $10(x) = 50$

$x =$

⑩  $2a = 22$

$a =$

⑪  $y \cdot 6 = 42$

$y =$

⑫  $7n = 14$

$n =$

**Problems 13-16:**

Rewrite each problem using a dot symbol.

⑬  $10 \times m = 40$  \_\_\_\_\_

⑭  $h \times 5 = 30$  \_\_\_\_\_

⑮  $14 \times x = 28$  \_\_\_\_\_

⑯  $m \times 20 = 60$  \_\_\_\_\_

**Problems 17-20:**

Rewrite each problem using no space between the variable and the number.

⑰  $w \times 8 = 56$  \_\_\_\_\_

⑱  $12 \times e = 36$  \_\_\_\_\_

⑲  $n \times 9 = 54$  \_\_\_\_\_

⑳  $7 \times v = 35$  \_\_\_\_\_

Name: \_\_\_\_\_

Score: \_\_\_\_\_

**Substitution**

A substitute teacher takes the place of a regular teacher. In algebra, a **substitute** number takes the place of a variable. Substitution is the process of putting a number where a variable is.

Examples:	Step 1: Write the Equation	Step 2: Substitute the Number	Step 3: Solve the Problem
What is $20 - w$ , when $w = 8$ ?	$20 - w =$	$20 - 8 =$	$20 - 8 = 12$
What is $7x$ , when $x = 11$ ?	$7x =$	$7 \cdot 11 =$	$7 \cdot 11 = 77$
What is $y + 14$ , when $y = 9$ ?	$y + 14 =$	$9 + 14 =$	$9 + 14 = 23$

**Problems 1-8:** Use substitution to solve each problem.

- ① What is  $24 + n$ , when  $n = 15$ ?
- ② What is  $m \cdot 2$ , when  $m = 25$ ?
- ③ What is  $80 \div x$ , when  $x = 2$ ?
- ④ What is  $b - 6$ , when  $b = 38$ ?
- ⑤ What is  $y \div 5$ , when  $y = 100$ ?
- ⑥ What is  $30 - w$ , when  $w = 12$ ?
- ⑦ What is  $8q$ , when  $q = 11$ ?
- ⑧ What is  $150 + a$ , when  $a = 220$ ?

**Substituting Multiple Variables**

Some problems have more than one variable. Substitution can be used to solve these problems too.

Examples:	Step 1: Write the Equation	Step 2: Substitute the Numbers	Step 3: Solve the Problem
What is $c - m$ , when $c = 90$ and $m = 20$ ?	$c - m =$	$90 - 20 =$	$90 - 20 = 70$
What is $aw$ , when $a = 3$ and $w = 6$ ?	$aw =$	$3 \cdot 6 =$	$3 \cdot 6 = 18$

**Problems 9-16:** Use substitution to solve each problem.

- ⑨ What is  $b - y$ ,  
when  $b = 38$  and  $y = 7$ ?
- ⑩ What is  $dz$ ,  
when  $d = 6$  and  $z = 8$ ?
- ⑪ What is  $e + u$ ,  
when  $e = 25$  and  $u = 13$ ?
- ⑫ What is  $h \div a$ ,  
when  $h = 120$  and  $a = 10$ ?
- ⑬ What is  $j + b$ ,  
when  $j = 52$  and  $b = 7$ ?
- ⑭ What is  $r \div p$ ,  
when  $r = 48$  and  $p = 2$ ?
- ⑮ What is  $k \cdot n$ ,  
when  $k = 4$  and  $n = 9$ ?
- ⑯ What is  $x - i$ ,  
when  $x = 100$  and  $i = 35$ ?

$x \leq 0$  or  $x \geq 4$

$3n^2 + 5n + 6$

Score: \_\_\_\_\_

Name: \_\_\_\_\_

**Balancing Equations**

Another way to get variables by themselves is to **balance equations**. Balancing an equation is a lot like balancing weights on a scale—both sides need to be equal. If you add weight to one side, you'll need to add an equal amount of weight to the other side. Otherwise, the scale will be unbalanced.

Equations are balanced too. One side of the equation is equal to the other side. You can use operations to manipulate the equation, but you have to perform the same operation on each side of the equation to keep it balanced.

**Balancing Addition Equations**

Inverse operations can be used to **cancel** parts of an equation on one side of an equation, as long as the same operation is performed on the other side too.

Canceling an operation undoes the operation. The inverse operation for addition is subtraction. When a variable is being added, subtract on both sides to get the variable by itself. Getting the variable by itself is also called **isolating** the variable.



Original Equation:	$w + 15 = 21$
Subtract on both sides:	$w + 15 - 15 = 21 - 15$
The Answer:	$w = 6$

Example 2:	$83 + x = 125$
	$83 + x = 125$
	$83 - 83 + x = 125 - 83$
	$x = 42$

**Checking Your Answer**

In the first example, 15 was subtracted to isolate the variable. In the second example 83 was subtracted. After the equations are balanced and the value of the variable is found, you can check your answer by substituting the value of your answer into the original equation. If you substitute 6 for  $w$ , is  $w + 15 = 21$  true? Does  $6 + 15 = 21$ ?

**Problems 1–12:** Circle the true equations and draw a line through the false equations, when  $y = 5$ ,  $m = 7$ , and  $h = 10$ .

- ①  $10 + y = 5$
- ②  $m + 9 = 16$
- ③  $13 + h = 20$
- ④  $58 + y = 65$
- ⑤  $m + 20 = 26$
- ⑥  $25 + h = 35$
- ⑦  $m + 41 = 48$
- ⑧  $y + 95 = 100$
- ⑨  $44 + h = 55$
- ⑩  $71 + y = 78$
- ⑪  $h + 0 = 10$
- ⑫  $68 + m = 75$

**Problems 13–28:** Balance the equations to find the value of each variable. Remember to check your answers.

- ⑬  $17 + k = 27$
- ⑭  $d + 9 = 32$
- ⑮  $13 + c = 45$
- ⑯  $58 + v = 77$
- ⑰  $16 + r = 50$
- ⑱  $25 + y = 90$
- ⑲  $m + 5 = 79$
- ⑳  $e + 20 = 110$
- ㉑  $x + 200 = 500$
- ㉒  $40 + y = 180$
- ㉓  $w + 7 = 120$
- ㉔  $30 + a = 250$
- ㉕  $4 + v = 41$
- ㉖  $c + 13 = 60$
- ㉗  $140 + n = 370$
- ㉘  $h + 75 = 125$

# Day 5

Addition

Name: \_\_\_\_\_

Score: \_\_\_\_\_

## Problems 1-20:

Solve each problem. If it helps, you may draw a number line on a separate sheet of paper.

①  $4 + -5 =$

②  $-8 + -3 =$

③  $-5 + 2 =$

④  $4 + 8 =$

⑤  $15 + -7 =$

⑥  $9 + -12 =$

⑦  $-6 + -4 =$

⑧  $-1 + 13 =$

⑨  $-21 + 3 =$

⑩  $-15 + -5 =$

⑪  $0 + 3 =$

⑫  $-6 + -9 =$

⑬  $58 + 1 =$

⑭  $7 + -14 =$

⑮  $70 + -6 =$

⑯  $-9 + -2 =$

⑰  $4 + -69 =$

⑱  $25 + 8 =$

⑲  $-14 + -7 =$

⑳  $0 + -35 =$

# Day 13

## Subtraction

Name: \_\_\_\_\_

Score: \_\_\_\_\_

Problems 1-20:

Solve each problem. If it helps, you may draw a number line on a separate sheet of paper.

①  $4 - -7 =$

②  $6 - 8 =$

③  $-3 - -9 =$

④  $-3 - 7 =$

⑤  $-1 - 11 =$

⑥  $9 - -13 =$

⑦  $-6 - -4 =$

⑧  $16 - -7 =$

⑨  $-9 - -8 =$

⑩  $-3 - 74 =$

⑪  $42 - -6 =$

⑫  $5 - 3 =$

⑬  $26 - 5 =$

⑭  $0 - -19 =$

⑮  $-8 - 3 =$

⑯  $-83 - -5 =$

⑰  $9 - -17 =$

⑱  $0 - -6 =$

⑲  $-2 - -48 =$

⑳  $35 - 9 =$

Name: \_\_\_\_\_

Score: \_\_\_\_\_

# Rectangles and Squares

## Perimeter

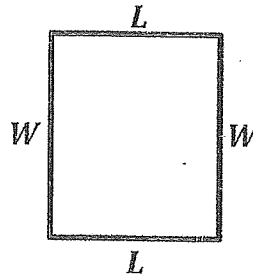
Add all the sides together.

$$\text{Perimeter} = L + L + W + W$$

Or

Length x2 + Width x2

$$\text{Perimeter} = L \times 2 + W \times 2$$

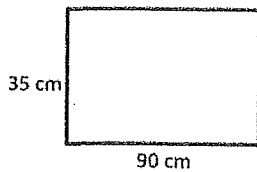


## Area

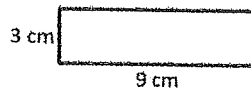
Multiply the length by the width.

$$\text{Area} = L \times W$$

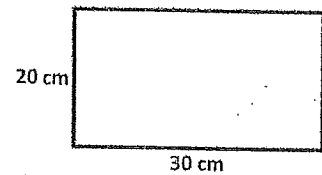
① Area = \_\_\_\_\_  
Perimeter = \_\_\_\_\_



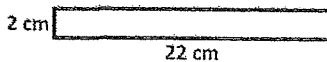
② Area = \_\_\_\_\_  
Perimeter = \_\_\_\_\_



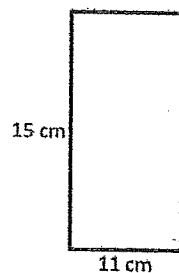
③ Area = \_\_\_\_\_  
Perimeter = \_\_\_\_\_



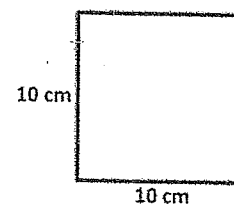
④ Area = \_\_\_\_\_  
Perimeter = \_\_\_\_\_



⑤ Area = \_\_\_\_\_  
Perimeter = \_\_\_\_\_



⑥ Area = \_\_\_\_\_  
Perimeter = \_\_\_\_\_



# Day 3

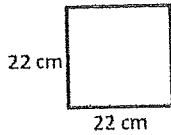
## Rectangles & Squares

Name: \_\_\_\_\_

Score: \_\_\_\_\_

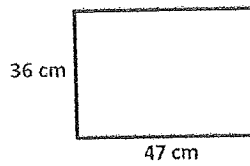
①

Area = \_\_\_\_\_  
Perimeter = \_\_\_\_\_



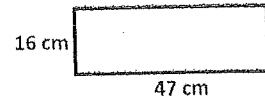
②

Area = \_\_\_\_\_  
Perimeter = \_\_\_\_\_



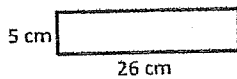
③

Area = \_\_\_\_\_  
Perimeter = \_\_\_\_\_



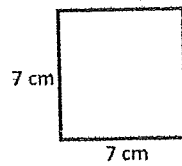
④

Area = \_\_\_\_\_  
Perimeter = \_\_\_\_\_



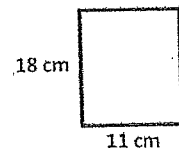
⑤

Area = \_\_\_\_\_  
Perimeter = \_\_\_\_\_



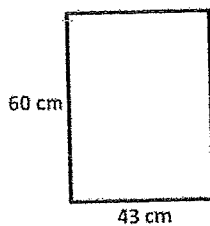
⑥

Area = \_\_\_\_\_  
Perimeter = \_\_\_\_\_



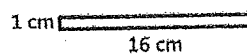
⑦

Area = \_\_\_\_\_  
Perimeter = \_\_\_\_\_



⑧

Area = \_\_\_\_\_  
Perimeter = \_\_\_\_\_



⑨

Area = \_\_\_\_\_  
Perimeter = \_\_\_\_\_

