

The first thing you may want to know as you begin *Understanding Algebra* is, "What can I do with algebra that I can't do with ordinary arithmetic?"

The answer is that knowing algebra allows you to solve much harder mathematical problems than by using ordinary arithmetic.

Consider this short story:

You have saved 15¢ from your allowance and earned another 15¢ by polishing your father's shoes. Then your friend pays you back the 35¢ that he borrowed yesterday.

How much money do you have now? \_\_\_\_\_

65¢

arithmetic

To solve this problem, you need to know only  $\begin{cases} \text{arithmetic.} \\ \text{algebra.} \end{cases}$

Now here's another short story. It will seem equally simple until you try to solve it with arithmetic.

You have some money. Your grandmother comes to visit and gives you twice as much money as you had in the first place. Then you find 25¢ on the sidewalk. Altogether you now have 82¢.

How much money did you have when you started?

Solving this problem with arithmetic is hard and will take much time and thought. Solving the problem with algebra is easy.

When you have mastered the skills in this book, *Understanding Algebra*, you will be able to find quick solutions to such problems by learning what a variable is and knowing how to solve the basic algebra equations for the variable.

Let's begin our study of algebra by defining a few basic terms.

$$\begin{array}{ccc} \text{left side} & | & \text{right side} \\ 4 + 2 & = & 6 \\ & | & \end{array}$$

This is an equation.

An equation has three parts.

1. It has an **equal sign** (=).
2. It has a **left side** (to the left of the equal sign).
3. It has a **right side** (to the right of the equal sign)

$$5 + 3 = 8$$

yes

Is the above an equation?  yes  
 no

5 + 3

What is the left side of the equation?

8

What is the right side of the equation?

no

Does the left side of this equation equal the right side?  yes  
 no

Fill in the blank so the left side of this equation equals the right side.

$$2 + 1 = 3$$

$$2 + 1 = \underline{\quad}$$

In each equation fill in the blanks so that the right side equals the left side:

$4 , 8$

$16 , 13$

$7 , 2$

$6 , 5$

$8 , 30$

$28 , 36$

$8 , 6$

$5 , 7$

$3 + 1 = \underline{\quad}$

$7 + 9 = \underline{\quad}$

$8 - 1 = \underline{\quad}$

$11 - 5 = \underline{\quad}$

$2 \times 4 = \underline{\quad}$

$4 \times 7 = \underline{\quad}$

$24 \div 3 = \underline{\quad}$

$15 \div 3 = \underline{\quad}$

$6 + 2 = \underline{\quad}$

$2 + 11 = \underline{\quad}$

$3 - 1 = \underline{\quad}$

$9 - 4 = \underline{\quad}$

$5 \times 6 = \underline{\quad}$

$12 \times 3 = \underline{\quad}$

$36 \div 6 = \underline{\quad}$

$28 \div 4 = \underline{\quad}$

When you find the number that makes the right side equal the left side, you are **solving** an equation.

Solve each equation:

$7 , 7$

$7 , 24$

$54 , 9$

$3 + 4 = \underline{\quad}$

$49 \div 7 = \underline{\quad}$

$6 \times 9 = \underline{\quad}$

$8 - 1 = \underline{\quad}$

$6 + 18 = \underline{\quad}$

$18 - 9 = \underline{\quad}$

The blank can be either on the right side or the left side.

Solve each equation:

$8, 9$

$2, 1$

$10, 9$

$12, 2$

$9, 2$

$3, 5$

$3, 4$

$9, 7$

$2, 8$

$2, 1$

$8, 6$

$20, 19$

$3 + \underline{\quad} = 11$

$8 + \underline{\quad} = 10$

$9 + \underline{\quad} = 19$

$4 + \underline{\quad} = 16$

$13 - \underline{\quad} = 4$

$21 - \underline{\quad} = 18$

$\underline{\quad} + 1 = 4$

$\underline{\quad} + 6 = 15$

$\underline{\quad} + 19 = 21$

$\underline{\quad} + 16 = 18$

$\underline{\quad} - 4 = 4$

$\underline{\quad} - 5 = 15$

$4 + \underline{\quad} = 13$

$15 + \underline{\quad} = 16$

$11 + \underline{\quad} = 20$

$22 + \underline{\quad} = 24$

$11 - \underline{\quad} = 9$

$25 - \underline{\quad} = 20$

$\underline{\quad} + 8 = 12$

$\underline{\quad} + 2 = 9$

$\underline{\quad} + 15 = 23$

$\underline{\quad} + 10 = 11$

$\underline{\quad} - 2 = 4$

$\underline{\quad} - 9 = 10$