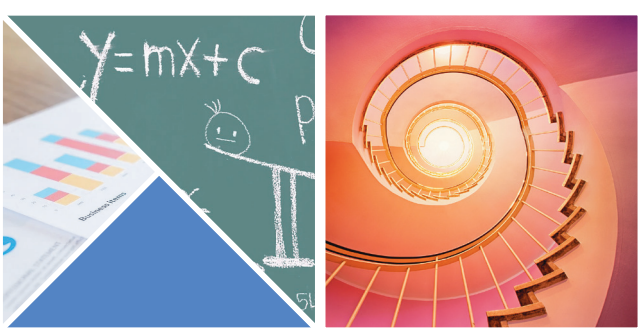
POWER BASICS Algebra



Student Resource

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To the Student

Welcome to *Power Basics® Algebra*. This book will help you learn how to solve basic algebraic equations and inequalities. Each lesson builds on what you have already learned. As you go through the lessons step by step, you will master basic algebra. This knowledge will help you at school, at work, and in other parts of your life.

In **Unit 1, Algebra Basics,** you will learn about negative numbers. You will learn how to add, subtract, multiply, and divide them. You will also learn how to combine terms and solve simple equations.

In **Unit 2, Solving Equations and Inequalities,** you will learn how to work with algebraic terms. You will add, subtract, multiply, divide, and simplify terms. You will also learn about inequalities and how to simplify and solve problems using inequalities.

In **Unit 3, Graphing Linear Equations,** you will learn two ways to graph the equations for lines on the coordinate plane. You will also learn how to find the slope of a line.

In **Unit 4, Polynomial Operations,** you will learn about three different types of algebraic expressions: monomials, binomials, and trinomials. You will also learn how to factor different types of algebraic expressions.

In **Unit 5, Quadratic Equations,** you will learn two ways to solve quadratic equations. You will also learn how to use the quadratic formula to solve word problems.

To the Student, *continued*

Each lesson is made up of short sections that explain important algebra concepts. Each of these sections is followed by a few problems to help you practice what you have learned. Each unit ends with a Unit Review. The Unit Review is followed by Application activities. These activities will let you extend and apply what you have learned in the unit.

Power Basics® Algebra has many special features that make learning easier. "Tips" give you hints on ways to master the ideas and facts in the text. "Think About It" questions ask you to look at geometry in new ways. "In Real Life" sections show you how the skills you are learning are used in the world outside the classroom. The "Words to Know" section at the start of most lessons includes important new terms introduced in the lesson. The first time each word is used, it is defined for you. This first use appears in **bold type.** All the terms in the "Words to Know" section are also defined in the Glossary at the end of the book. If you can't remember what a term means, you can look it up in the Glossary. Station-based activities help you extend concepts introduced in the lessons. Finally, the appendixes at the back of the book include the mathematical rules, formulas, and other important information introduced in the lessons.

As you move through *Power Basics® Algebra*, you will become a more confident and skilled mathematician. We hope that you enjoy this material as you learn.

UNIT 1

Algebra Basics

LESSON 1: Negative and Positive Numbers

GOAL: To Identify negative and positive numbers

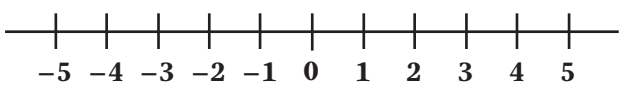
WORDS TO KNOW

absolute value	**negative number**	**signed number**
actual value	**positive number**	

What Are Negative and Positive Numbers?

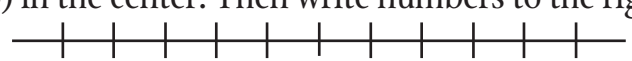
We often think of numbers in positive terms. We say we have 2 dogs, or $10. But if you had no money and owed $20, how would you say what you had? You would need to use numbers in negative terms. You would say you had $–20. The –20 is a **negative number.** Negative numbers are numbers with a value of less than zero. They are the opposite of **positive numbers.**

Look at the number line below.



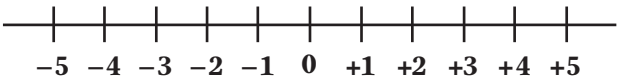
Notice that the numbers on the left of zero have a minus sign (–) in front. Numbers to the left of zero are called negative numbers. Numbers to the right of zero are called positive numbers. The number zero is neutral. It is neither negative nor positive.

Now look at the number line below. This line has no numbers. Put zero (0) in the center. Then write numbers to the right and left.



Does your number line look like the one at the top of the page?

Notice that the negative numbers always have a minus sign (–) in front. But now look at the positive numbers. The positive numbers have no sign in front. You can write positive numbers with or without a plus sign (+) in front. Look at the example below.



The numbers +4 and 4 are the same. They are both positive. Whenever you see a number with no sign in front, it will always be positive.

We can refer to positive and negative numbers as **signed numbers.** The plus sign and minus sign show whether they are positive or negative.

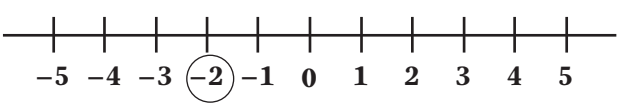
THINK ABOUT IT

Why do you think positive numbers can be written with or without a plus sign in front, but negative numbers must always have a minus sign in front? Which kind of number do you use more often? Write your answer on a separate sheet of paper.

PRACTICE 1: What Are Negative and Positive Numbers?

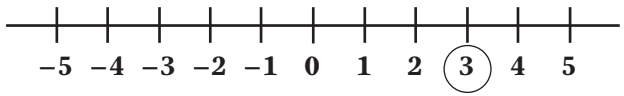
Circle the correct answer for each question.

1. Look at the number line below. Is the circled number positive or negative?



a. positive **b.** negative

2. Look at the number line below. Is the circled number positive or negative?



a. positive **b.** negative

3. Look at this number:

+3

Is this number positive or negative?

a. positive **b.** negative

4. Look at this number:

4

Is this number positive or negative?

a. positive **b.** negative

5. Look at this number:

−4

Is this number positive or negative?

a. positive **b.** negative

6. Look at this number:

5

Which number below is the same as this number?

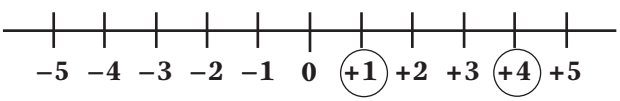
a. +5 **b.** –5

Larger and Smaller Numbers

Now you know that the numbers to the right of 0 are positive numbers. The numbers to the left of 0 are negative numbers. But how can you tell if one number is larger than another number?

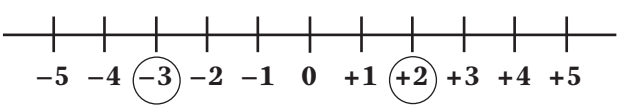
Numbers to the right on a number line are always larger than numbers to the left.

Look at the circled numbers on the number line below.



+1 is to the left of +4 on the number line. This means that +1 is smaller than +4. +4 is to the right of +1 on the number line. This means that +4 is larger than +1.

Look at the circled numbers on the number line below.



In the number line above, –3 is to the left of +2. This means that –3 is smaller than +2. +2 is to the right of –3. This means that +2 is larger than –3.

On a number line, all of the negative numbers are to the left of 0. This means that all negative numbers are smaller than 0. All of

the positive numbers on a number line are to the right of 0. This means that all positive numbers are larger than 0.

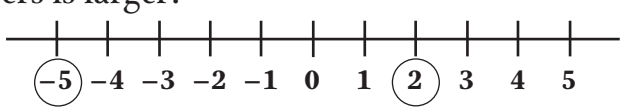
TIP

It is important to remember that negative numbers must always have a minus sign (–) in front. This is easy to remember! You already know that positive numbers do not always have a sign. Think of all the numbers you see every day on receipts, price tags, menus, and so forth. These are all positive numbers. These numbers usually do not have a sign. Since you know that positive numbers do not always have a sign, you can guess that negative numbers must have a sign. If they didn't, we wouldn't be able to tell them apart from positive numbers!

PRACTICE 2: Larger and Smaller Numbers

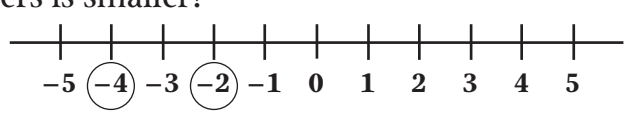
Circle the correct answer for each question.

1. Look at the number line below. Which of the circled numbers is larger?



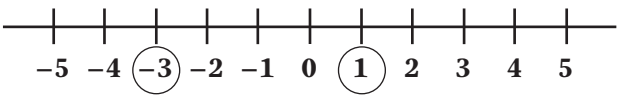
a. 2 **b.** –5

2. Look at the number line below. Which of the circled numbers is smaller?



a. –2 **b.** –4

3. Look at the number line below. Which of the circled numbers is larger?



a. 1 **b.** −3

4. Look at the numbers below. Which number is smaller?

a. 0 **b.** −1

5. Look at the numbers below. Which number is larger?

a. −2 **b.** −5

6. Look at the numbers below. Which number is larger?

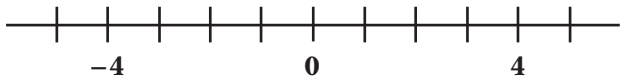
a. 2 **b.** −2

Actual Values and Absolute Values

You have learned that numbers to the right on a number line are larger than numbers to the left. This is called the **actual value** of a number—what the number is really worth. The actual value of 3 is greater than the actual value of −2. The actual value of 4 is greater than the actual value of −4. When you talk about actual values, it is important to know whether a number is positive or negative. Positive numbers always have a greater actual value than negative numbers.

If you ignore (don't look at) the sign in front of a number and only think about how far it is from 0, then you are thinking about the number's absolute value. The **absolute value** of a number tells you how far it is from 0 on a number line. It tells

you the value of the number without its sign. Look at the number line below.



The number 4 is 4 units to the right of 0. The number –4 is 4 units to the left of 0. Both numbers are 4 units away from 0. The absolute value of 4 is 4. The absolute value of –4 is also 4.

Remember that each negative number is the exact opposite of a positive number. They are both exactly the same distance from zero. The absolute value of a number will stay the same whether the number is positive or negative.

For example, look at the numbers 7 and –7. The number 7 is to the right of –7 on a number line. The actual value of 7 is larger than –7. But both 7 and –7 are 7 units away from 0 on a number line. This means that 7 and –7 have the same absolute value: 7.

The absolute value of –7 is 7. The absolute value of –5 is 5. Notice that the actual value of –5 is greater than the actual value of –7. But the absolute value of –5 (5) is less than the absolute value of –7 (7).

PRACTICE 3: Actual Values and Absolute Values

Circle the correct answer for each question.

1. What is the actual value of –5?

a. 5 **b.** –5

2. What is the absolute value of –5?

a. 5 **b.** –5

3. What is the absolute value of 3?

a. 3 **b.** –3

4. What is the absolute value of –3?

a. 3 **b.** –3

Look at each pair of numbers below. Circle the number in each pair that has a larger actual value.

5. –5, +7 **6.** –9, +2 **7.** +8, –3

8. 3, –8 **9.** –7, –2 **10.** 2, +5

11. –1, –3 **12.** +6, 4

Look at each pair of numbers below. Circle the number in each pair that has a larger absolute value.

13. –5, +7 **14.** –9, +2 **15.** +8, –3

16. –7, –2 **17.** 2, +5 **18.** –1, –3

TIP

There is a special symbol for absolute value. The symbol looks like this: |3|. This means "the absolute value of 3." If you wanted to write "the absolute value of 5 equals 5," you would write:

$$|5| = 5$$

If you wanted to write "the absolute value of –25 equals 25," you would write:

$$|-25| = 25$$