英语版

九年义务教育三年制初级中学教科书

ALGEBRA

第一册（上）

课程教材研究所
双语课程教材研究开发中心 组译

代数

人民教育出版社
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英语版初级中学教科书

说　明

随着改革开放的不断扩大，中国在经济和教育、科学、文化等诸多方面与各国间的交往日益增强，中国人学习英语的热情也日趋高涨. 在当今社会，是否熟练掌握英语，已成为衡量一个人的知识结构甚至综合素质的一个重要方面. 在这样的形势下，多角度、多渠道提高人们的英语水平，特别是提高基础教育阶段在校学生的英语水平，已经成为社会的迫切需要.

为了适应这种新的形势和需要，从2001年起，作为教育部直属单位的课程教材研究所着手研究开发英语版普通高中教科书（包括数学、物理、化学、生物、历史、地理六门必修课程），已由人民教育出版社出版. 随后，又继续开发这套英语版初级中学教科书，将包括初中三个年段的几何、代数、物理、化学、生物、历史、地理和信息技术等.

这套英语版初级中学教科书，根据经全国中小学教材审定委员会2001年审查通过、人民教育出版社出版的《九年义务教育三年制初级中学教科书》编译而成，主要供实行双语教学的学校或班级使用，也可以作为中学生的课外读物，其他有兴趣的读者也可以作为参考书使用，使学科知识的掌握与英语能力的提高形成一种双赢的局面.

为了使这套英语版教科书具有较高的编译质量，课程教材研究所双语课程教材研究开发中心依托所内各学科教材研究开发中心，在国内外特聘学科专家和英语专家联袂翻译，且全部译稿均由中外知名专家共同审校.

我们的宗旨是：以前瞻意识迎接时代挑战，以国际水平奉献中华学子.

人民教育出版社英语版初级中学教科书，愿与广大师生和家长结伴同行，共同打造新世纪的一流英才.

热诚欢迎广大师生和读者将使用中的意见和建议反馈给我们，使这套教材日臻完善.

联系方式：

电话：64016633 转 6753

传真：64010370

地址：北京沙滩后街55号

课程教材研究所双语课程教材研究开发中心

邮编：100009

Email：dwhy@pep.com.cn

人民教育出版社
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汉语版初级中学教科书《代数》

说　明

一、《九年义务教育三年制初级中学教科书·代数》是根据教育部2000年颁发的《九年义务教育全日制初级中学数学教学大纲（试用修订版）》，在原《九年义务教育三年制初级中学教科书·代数》基础上修订的，并经全国中小学教材审定委员会2001年审查通过. 这次修订，旨在更加有利于贯彻党和国家的教育方针，更加有利于对青少年进行素质教育，更加有利于初中学生的全面发展，培养学生的创新精神和实践能力.

二、初中代数是初中数学的重要组成部分，通过初中代数的教学，要使学生学会适应日常生活、参加生产和进一步学习所必需的代数基础知识与基本技能，进一步培养运算能力、思维能力和空间观念，能够运用所学知识解决简单的实际问题，培养学生的数学创新意识、良好个性品质以及初步的辩证唯物主义的观点.

三、这套九年义务教育三年制初级中学教科书《代数》分第一、二、三册共3册（其中第一册分上、下两册）. 本书是《代数》第一册（上），供三年制初中一年级第一学期使用，每周5课时.

这次修订把原《代数》（第二册）的“用计算器进行数的简单计算”充实到本册中，把“平方表与立方表”移入附录中，删去有理数的混合运算中较繁复的计算问题，并对部分应用题的内容和数据进行了修订.

四、在修订中本书的体例保持了下列特点：

1. 每章均有一段配有插图的引言，可供学生预习用，也可作为教师导入新课的材料.

2. 每小节前均有一方框，对学生概要地提出了学习本小节的基本要求.

3. 在课文中适当穿插了“想一想”与“读一读”等栏目，其中“想一想”是供学生思考的一些问题，“读一读”是供学生阅读的一些短文. 这两个栏目是为扩大知识面、增加趣味性而设的，其中的内容不作为教学要求，只供学生课外参考.

4. 每章后面均安排有“小结与复习”，其中的学习要求是对学生学完全章后的要求，它略高于小节前的要求.

5. 每章最后均配有一套“自我测验题”，用作学生自己检查学完这一章后，能否达到这一章的基本要求.

6. 全书最后附有部分习题的答案，供学生在做习题后，能及时进行对照，大致了解

自己解题正确与否.

7. 本书的习题分为练习、习题、复习题三类. 练习供课内巩固用；习题供课内或课外作业选用；复习题供复习每章时选用. 其中习题、复习题的题目分为 A，B 两组，A 组是属于基本要求范围的，B 组带有一定的灵活性，仅供学有余力的学生选用.

五、教科书原试用本由吕学礼、饶汉昌、蔡上鹤任主编，袁明德任副主编，参加编写的有袁明德、李琳、蔡上鹤，责任编辑为袁明德. 丁石孙、丁尔升、梅向明、张玺恩、张孝达任顾问.

参加本次修订的有饶汉昌、蔡上鹤、袁明德、薛彬、俞求是、左怀玲. 责任编辑为袁明德、俞求是. 刘意竹、饶汉昌、蔡上鹤审阅.

本书在编写和修订过程中征求了全国各地部分教师和教研人员的意见，在此表示衷心感谢.

人民教育出版社中学数学室

2001 年 3 月

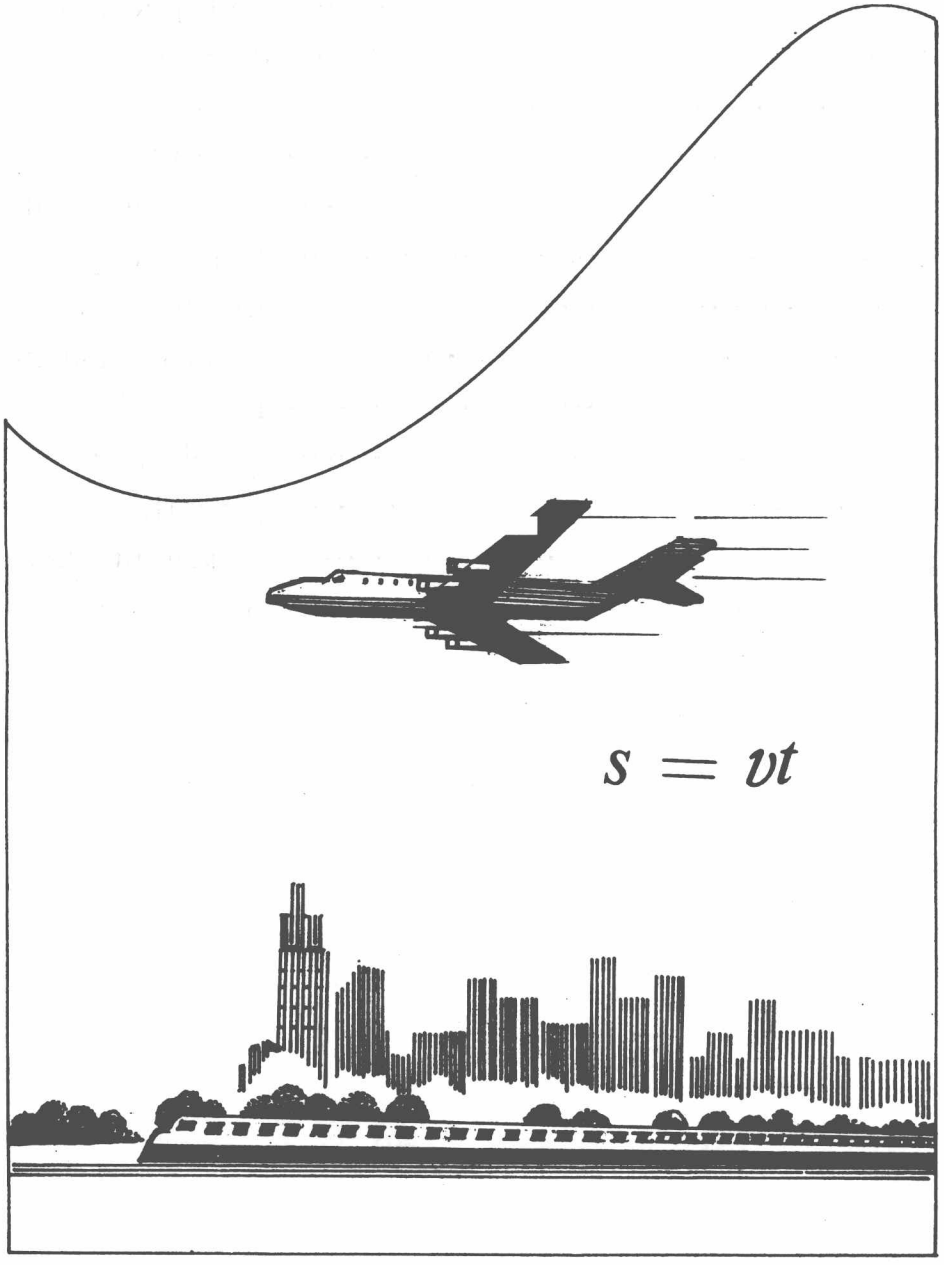
CONTENTS

Some Common Symbols in the Book

$+$	addition; plus
$-$	subtraction; minus
$\times$ or $\cdot$	multiplication
$\div$	division
$:$	ratio
$\%$	percent
$=$	equals or equal to
$<$	less than
$>$	greater than
$\approx$	almost equal to
$\neq$	not equal to
$\lvert\ \rvert$	absolute value
$(\ )$	parenthesis
$[\ ]$	squave bracket
$\{\ \}$	brace

Chapter 1

Primary Knowledge of Algebra



It is learning algebra with which the junior mathematic course begins. What will we study in algebra class? What is the relationship between pre-algebra and primary mathematics? First, let us look at the following example.

A train goes at a certain speed—90 kilometers an hour. The distance and time it takes are shown in the following table:

Time (hour)	1	2	3	4	5	···
Distance (kilometer)	90	180	270	360	450	···

If the variable t expresses the number of the hours it goes, then the number of kilometers it goes at this time is exactly

$$90t(\text{or } 90\times t).$$

That is to say, it takes the train t hours to travel $90t$ kilometers. In this way, the relationship between the distance and time the train goes can be expressed in brief. Given that the train travels 7 hours, or $t=7$, then the distance it travels is exactly

$$90t=90\times 7=630 \text{ (kilometer)}.$$

From the example above it can be seen that expressing numbers in terms of variables can be more helpful. Using variables to express numbers is an important characteristic of algebra. In primary school we learned a little about it. By expressing numbers in terms of variables we begin learning pre-algebra.

1.1 Algebraic Expressions

1. Understand what expressing numbers in terms of variables is.
2. Be able to tell the quantity relationship of an algebraic expression.

First we will look at several examples of expressing numbers in terms of variables.

For addition, we have:

$$3+5=5+3;$$

$$\frac{1}{2}+\frac{1}{3}=\frac{1}{3}+\frac{1}{2};$$

.....

That is to say, **when adding two numbers and reversing the order of the terms, the sum does not change.** This is called the **addition law of commutation.** The addition law of commutation can be expressed as:

$$a+b=b+a.$$

where a and b are any two numbers.

For multiplication, we have:

$$7\times 9=9\times 7;$$

$$\frac{2}{3}\times\frac{5}{6}=\frac{5}{6}\times\frac{2}{3};$$

.....

That is to say, **when multiplying two numbers and reversing the order of the factors, the product does not change.** This is called the **multiplication law of commutation.** It can also be expressed in terms of variables as:

$$ab=ba.$$

We have already learned the addition law of association, the multiplication laws of association and distribution, which are expressed in terms of variables.

Again, let us look at more examples of expressing numbers in terms of variables.

(1) The distance from point A to point B is 15 kilometers, which takes 3 hours walking, 1 hour by bike and 0.25 hours by car. What are the speeds for walking, riding and driving?

Speed for walking: $15\div3=5$ (km/h[1]).

Speed for riding: $15\div1=15$ (km/h).

Speed for driving: $15\div0.25=60$ (km/h).

The s expresses distance (unit: km), t is time (unit: h) and v is the speed (unit: km/h), we have:

$$v=\frac{s}{t}.$$

(2) The side of a square is a cm[2]. What is its perimeter? And what is its area?

The l expresses perimeter in cm, then

$$l=4a.$$

The S expresses area in cm^2, therefor the area of the square is:

$$S=a^2.$$

From the examples above, it is clear that using variables to express numbers and their relationship makes mathematical expressions simple and clear. In formulas and equations, variables are used to express numbers, which can also be more helpful in calculations.

The expressions such as a, $4a$, ab, $a+b$, $\frac{s}{t}$, a^2 appear in the examples above, all of these are called **algebraic expressions.**

Notice (1) The multiplication sign in algebraic expressions is usually written as " $\cdot$ " in the simplified form or dropped altogether. For example, $4\times a$ can be written as $4\cdot a$ or $4a$ (the number goes in front of the

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[1] Km/h is a unit of speed read as "kilometer per hour". Such as 5 km/h is read "5 kilometer per hour", that is to say move 5 kilometers per hour. Another common unit of speed is: m/s (meter/second).

[2] The commonly used units for length and their symbols are meter(m), centimeter(cm), millimeter (mm) and kilometer(km). The corresponding units for area and volume are square meter (m^2) and cubic meter (m^3).

variable), $2\times(a+b)$ can be written as $2\cdot(a+b)$ or $2(a+b)$. When multiplying numbers the "$\times$" sign is still used generally.

(2) When division appears in algebraic expressions, it is usually written as a fraction. Such as $s\div t$ is written as $\frac{s}{t}$, $ah\div 2$ as $\frac{ah}{2}$.

Example 1 Fill in the blanks:

(1) There are 12 books per bag, then there are ____ books in n bags;

(2) The temperature dropped 2 ℃ from t℃ is ____℃;

(3) The volume of cube whose side is a cm is ____ cm^3;

(4) The production increased by 10% from m kilograms to ____ kilograms.

Solution (1) $12n$; (2) $(t-2)$;

(3) a^3; (4) $(1+10\%)m$.

Notice In problem (2), because there is the unit at the end of the expression, the parentheses should be added to the $t-2$. It's wrong to write $t-2$ ℃.

Example 2 Give the meanings of the following algebraic expressions:

(1) $2a+3$; (2) $2(a+3)$;

(3) $\frac{c}{ab}$; (4) $a-\frac{c}{b}$;

(5) a^2+b^2; (6) $(a+b)^2$.

Solution

(1) The meaning of $2a+3$ is the sum of $2a$ and 3;

(2) The meaning of $2(a+3)$ is the product of 2 and $a+3$;

(3) The meaning of $\frac{c}{ab}$ is the quotient of c divided by ab or c to ab;

(4) The meaning of $a-\frac{c}{b}$ is the difference of a and $\frac{c}{b}$;

(5) The meaning of a^2+b^2 is the sum of the square of a and the square of b;

(6) The meaning of $(a+b)^2$ is the square of the sum of a and b.

Training Exercises

1. Fill in the blanks:

   (1) n boxes of apples weigh P kg(kilograms), then each box of apples weighs _____ kg;

   (2) Mr. A is a cm and B is shorter than A by b cm, then Mr. B is _____ cm;

   (3) The area of a triangle whose base is a and height h is _____;

   (4) The total number of students in a school is x, where girls make up 48% of the students, then the number of girls is _____.

2. Give the meanings of the following algebraic expressions:

   (1) $2a-3c$; (2) $\frac{3a}{5b}$; (3) $ab+1$; (4) a^2-b^2.

Exercise 1.1

Group A

1. Three sides of a triangle are respectively a, b, c. Find the perimeter of it.
2. Zhang Qiang is older than Wang Hua by 3 years. When Zhang Qiang is a years old, how old is Wang Hua?
3. The speed of a plane is 40 times that of a car, and the speed of a bike is $\frac{1}{3}$ of the same car. If the car goes at the speed of v km/h, then what are the speeds of the plane and bike?
4. a kg of rice cost 6 *yuan*. How much is one kg of rice?
5. The radius of a circle is R cm, calculate its area.
6. Express the following in terms of variables:
   (1) **The addition law of commutation—three numbers added and the first two numbers or the last two numbers added first, the sum of them does not change.**
   (2) **The multiplication law of commutation —three numbers multiplied and the first two numbers or the last two numbers multiplied first, the product of them does not change.**
   (3) **The distributive law—multiply a number by the sum of two numbers, which equals the number multiplied by the two numbers respectively then add the products.**
7. Give the meanings of the following algebraic expressions:
   (1) $3x+6$; (2) $5(x-2)$; (3) $\frac{n+1}{n-1}$; (4) a^3+b^3.

Group B[1]

1. Express the following in terms of algebraic expressions:
   (1) The perimeter of a rectangle with a length of a m and a width of b m;
   (2) The perimeter of a rectangle whose width is b m and length is 2 times its width;

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[1] The problems of group B in this book are provided to students who have spare time after studying, so if you have no time you do not have to complete it.