英语版

九年义务教育三年制初级中学教科书

ALGEBRA

第一册（下）

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
People's Education Press

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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代数、几何、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.

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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、三册共三册（其中第一册分上、下两册）. 本书是《代数》第一册（下），供三年制初中一年级第二学期使用，每周3课时.

根据2000年颁布的《九年义务教育全日制初级中学数学教学大纲（试用修订版）》，这次修订删去了原《代数》第一册（下）中的“立方和与立方差公式”，删去了“多项式的乘法”和“乘法公式”中含有二次及高于二次的项相乘的有关内容，删去了一些已经过时的、超纲的及应用价值不大的题目，增加了一些符合社会需要的、与其他学科联系较紧密以及与学生生活经验有关的题目；此外，在正文和例题的叙述过程中，适当地注意可读性、探索性，以启发学生的思维.

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. 每小节前均有一小框，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、薛彬、贾云山，责任编辑为薛彬. 丁石孙、丁尔升、梅向明、张奎恩、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、颜其鹏、李海东，责任编辑是颜其鹏.

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 4 月

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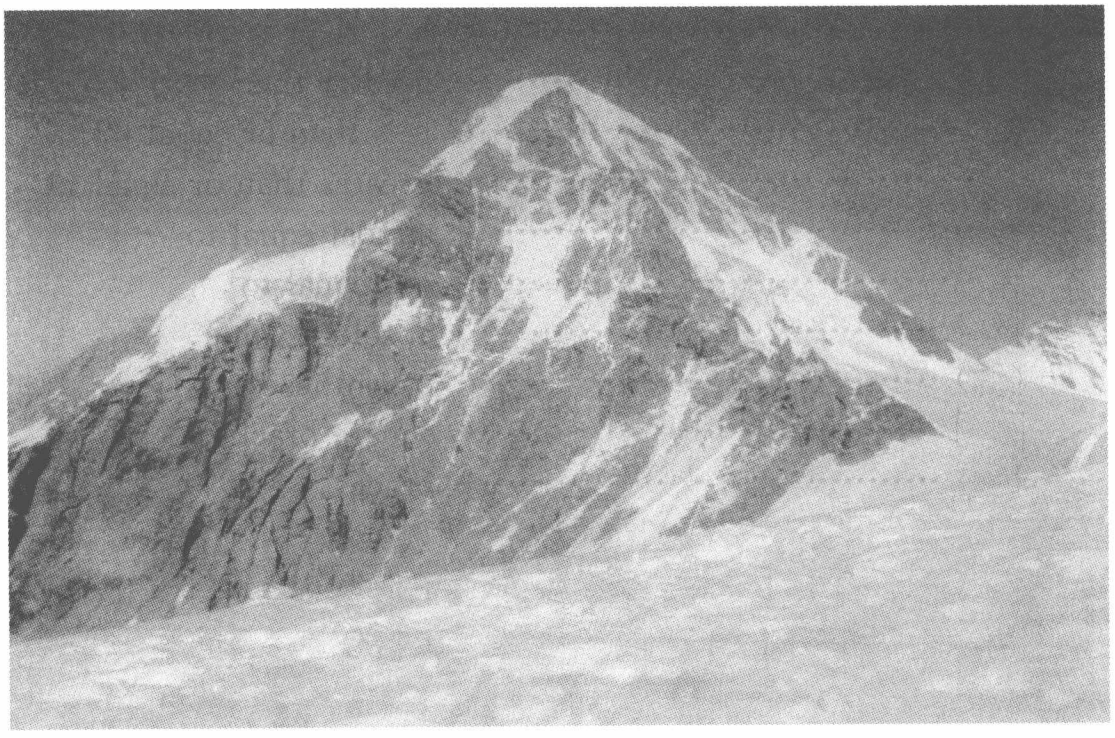
Some Common Symbols in the Book

$+$	plus
$-$	minus
$\times$ or $\cdot$	multiplication
$\div$	division
$:$	ratio
$\%$	percent
$=$	equals, or equal to
$<$	less than
$>$	greater than
$\leqslant$	less than or equal to
$\geqslant$	greater than or equal to
$\approx$	almost equal to
$\neq$	not equal to
$\lvert\ \rvert$	absolute value
$(\ )$	parentheses
$[\ ]$	square brackets
$\{\ \}$	braces

Chapter 5

System of Linear Equations in Two Unknowns



Two teams of climbers A and B start to climb a mountain peak at the same time. The starting point of team A is at encampment No. 1 of 1 km apart from the base camp. Team A marches with 1.5 km per hour. The starting point of team B is at encampment No. 2 of 4 km from the base camp. Team B marches with 0.5 km per hour. What is the relation between each of their distances from the base camp and the time required to the destination?

The relation between the distance of team A from the base camp and the time required is shown in the following table:

time (h)	0	1	2	3	4	5	...
distance (km)	1	2.5	4	5.5	7	8.5	...

Suppose x h is for the distance y km. This can also be written as

$$y=1.5x+1.$$

The relation between the distance of team B from the base camp and the time required is shown in the following table:

time (h)	0	1	2	3	4	5	...
distance (km)	4	4.5	5	5.5	6	6.5	...

Suppose x h is for the distance y km. This can also be written as

$$y=0.5x+4.$$

Think:

1. How many hours are required for their distances from the same base camp? And how far is their distance from the base camp at this time?

2. Can you find the result of item 1 by solving the following system of linear questions?

$$\begin{cases} y=1.5x+1, \\ y=0.5x+4. \end{cases}$$

5.1 System of Linear Equations in Two Unknowns

1. Understand a linear equation in two unknowns, a system of linear equations in two unknowns and the meaning of its solution.
2. Know how to check whether a pair of numbers is a solution to a system of linear equations in two unknowns or not.

Let us look at the following question:

The price of bananas is 5 *yuan*/kg and the price of apples is 3 *yuan*/kg. If Xiaohua bought 9 kg of bananas and apples in total and paid 33 *yuan*. How many kg bananas and apples did Xiaohua buy?

This question can be solved using a linear equation in one unknown. Suppose x kg of bananas were bought, then $9-x$ kg represents the amount of apples bought. According to the known condition, we have:

$$5x+3(9-x)=33.$$

By solving this equation, we have:

$$x=3,$$

$$9-x=6.$$

That is to say, Xiaohua bought 3 kg of bananas and 6 kg of apples.

If it is assumed that x kg of apples was bought, then the solution can also be obtained as well.

In what is just mentioned above, is it valid to assume there are two unknowns? Let us have a try. Suppose Xiaohua bought x kg of bananas and y kg of apples, then according to the condition of the problem, we have the following two equations:

$$x+y=9,$$

$$5x+3y=33.$$

In the two equations, each of them has two unknowns and the power of each unknown is 1. Such an equation is called a **linear equation in two unknowns.**

The above problem includes two requirements which have to be satisfied simultaneously: one is that the total quantity of these two kinds of

fruits is 9 kg, the other is that 33 *yuan* should be paid for these fruits in all, i.e., the two unknowns x and y must satisfy the two linear equations at the same time as:

$$\begin{cases} x+y=9, & ① \\ 5x+3y=33. & ② \end{cases}$$

By combining the two linear equations in two unknowns, a **system of linear equations in two unknowns** is formulated.

According to the solution to the linear equation in one unknown above, we know that Xiaohua bought 3 kg of bananas and 6 kg of apples, i.e., $x=3$ and $y=6$.

Here, $x=3$ and $y=6$ satisfy not only the linear equation ①

$$3+6=9$$

but also the linear equation ②

$$5\times 3+3\times 6=33.$$

Hence, $x=3$ and $y=6$ is said to be the solution to the system of linear equations

$$\begin{cases} x+y=9, \\ 5x+3y=33. \end{cases}$$

This solution can be written as

$$\begin{cases} x=3, \\ y=6. \end{cases}$$

In general, the values of two unknowns which equalize both the left and right sides of the two linear equations in the system of linear equations in two unknowns are called the **solution to the system of equations in two unknowns.**

For example,

$$\begin{cases} x=3, \\ y=5.5 \end{cases}$$

is the solution to the system of linear equations in two unknowns.

$$\begin{cases} y=1.5x+1, \\ y=0.5x+4. \end{cases}$$

Training Exercises

1. The following three pairs of numbers are known:

$$\begin{cases} x=0, \\ y=-2, \end{cases} \quad \begin{cases} x=2, \\ y=-3, \end{cases} \quad \begin{cases} x=1, \\ y=-5. \end{cases}$$

(1) Which pairs of numbers equalize the left and right sides of the linear equation $2x-y=7$?

(2) Which pairs of numbers equalize the left and right sides of the linear equation $x+2y=-4$?

2. The following three pairs of numbers are known:

$$\begin{cases} x=1, \\ y=-1, \end{cases} \quad \begin{cases} x=2, \\ y=1, \end{cases} \quad \begin{cases} x=4, \\ y=5. \end{cases}$$

Which pair is the solution to the following two systems of linear equations in two unknowns?

(1) $\begin{cases} 2x-y=3, \\ 3x+4y=10; \end{cases}$ (2) $\begin{cases} y=2x-3, \\ 4x-3y=1. \end{cases}$

Exercise 5. 1

Group A

1. A pair of values x and y is given behind each linear equation in two unknowns below. Justify if the pair of values satisfies the corresponding linear equation in its front.

(1) $2x-3y=6$; $(x=0,\ y=4)$

(2) $5x+2y=8$; $(x=2,\ y=-1)$

(3) $x-5y=2$; $(x=7,\ y=1)$

(4) $2x-y=4$; $(x=2,\ y=2)$

(5) $3x-y=5$; $(x=1,\ y=-2)$

(6) $4x-3y=9$. $(x=4,\ y=2)$

2. Fill in the following table such that the values of x and y in each column satisfy the equation $3x+y=5$.

x	-2	0	0.4	2				
y					-0.5	-1	0	3

3. A pair of values x and y is given behind each of the following systems of linear equations in two unknowns. Justify if each pair of the values is the solution to the system of linear equations in its front.

(1) $\begin{cases}5x-y=32,\\ x-2y=19;\end{cases}$ $\left(\begin{cases}x=6,\\ y=-2\end{cases}\right)$

(2) $\begin{cases}4x-3y-6=0,\\ 2x+5y-16=0;\end{cases}$ $\left(\begin{cases}x=3,\\ y=2\end{cases}\right)$

(3) $\begin{cases}x+\frac{1}{2}y=4,\\ \frac{1}{3}x+\frac{1}{2}y=\frac{4}{3};\end{cases}$ $\left(\begin{cases}x=4,\\ y=0\end{cases}\right)$

(4) $\begin{cases}0.2x+0.5y=0.2,\\ 0.4x+0.1y=0.4.\end{cases}$ $\left(\begin{cases}x=2,\\ y=-4\end{cases}\right)$

4. (1) Given that $x=-1$ is the solution to the system of linear equations in two

unknowns

$$\begin{cases} x-y=5, \\ 2x+3y=-20, \end{cases}$$

find the solution to the system of equations.

(2) Given that $y=-\frac{1}{2}$ is the solution to the system of linear equations in two unknowns

$$\begin{cases} 5x+2y=4, \\ 3x-2y=4 \end{cases}$$

find the solution to the system of equations.

Group B

1. According to each of the following statements, build up linear equations in two unknowns:
   (1) The difference of number B from number A is 5;
   (2) 3 times of number A is 11 greater than 2 times of number B;
   (3) 4 times of the sum of number A and number B is 28;
   (4) The sum of half of number A and one third of number B is 13.
2. Solve the following system of linear equations in two unknowns

$$\begin{cases} y=2x-1, \\ y=-x+2 \end{cases}$$

by employing the following linear equation in one unknown

$$2x-1=-x+2.$$

5.2 Solving a System of Linear Equations in Two Unknowns by Substitution

Be able to solve a system of linear equations in two unknowns by substitution method.

How to find a solution to a system of linear equations in two unknown? Let us still take the problem encountered in the last section for finding the qualities of bananas and apples as an example to seek a method of solving a system of linear equations in two unknowns.

Suppose x kg of bananas and y kg of apples were bought. According to the given condition, we have

$$\begin{cases} x+y=9, & ① \\ 5x+3y=33. & ② \end{cases}$$

Find the solution to the system of linear equations[1] i. e., seek the values of two unknowns which equalize both the left and right sides of each of the equations in the system.

If one unknown x is assumed, e. g., x kg of bananas, then the quantity of apples is $9-x$ kg according to the condition, and hence we have:

$$5x+3(9-x)=33.$$

We are able to solve this linear equation in one unknown, by comparing the system of linear equations in two unknowns above with this linear equation in one unknown. It is not hard to see that from the linear equation ① in the system of equations we have:

$$y=9-x. \qquad ③$$

By substituting $9-x$ for y in equation ② into $9-x$, i. e., by substituting equation ③ into equation ②, we have:

$$5x+3(9-x)=33.$$

By solving the linear equation, we have:

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[1] The procedure of finding a solution to a system of linear equations is called solving the system of equations.