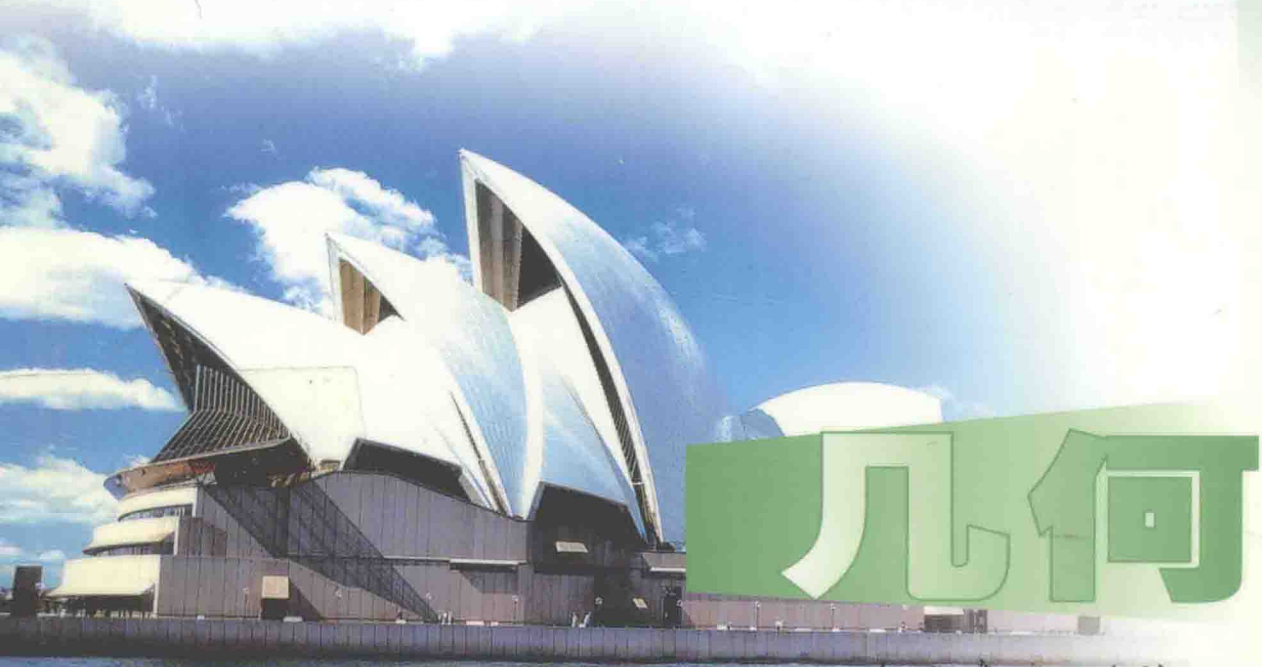
英语版

九年义务教育三年制初级中学教科书

GEOMETRY

第一册

课程教材研究所
双语课程教材研究开发中心 组译



几何

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人民教育出版社出版发行
（北京沙滩后街55号 邮编：100009）
网址：http://www.pep.com.cn
人民教育出版社印刷厂印装 全国新华书店经销
*
开本：787毫米×1 092毫米 1/16 印张：7.75 字数：172 000
2003年6月第1版 2003年8月第1次印刷
印数：0 001～3 000
ISBN 7-107-16656-5
G·9746（课） 定价：6.90元

英语版初级中学教科书

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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：

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人民教育出版社
课程教材研究所

2003年4月

汉语版初级中学《几何》

说　　明

一、《九年义务教育三年制初级中学教科书·几何》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·几何》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、初中几何是初中数学的重要组成部分。通过初中几何的教学，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几何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、良好的个性品质以及初步的辩证唯物主义观点。

三、这套《九年义务教育三年制初级中学教科书·几何》分第一、二、三册，共三册。本书是《几何》第一册，供三年制初中一年级第二学期使用，每周2课时。

这次修订增加了“探究性活动：制作长方体形状的包装纸盒”“读一读：角的度量和六十进制”“读一读：观察与实验”以及一些联系实际的习题，对某些定理安排了探究、猜想的内容。

四、在修订中，本书的体例保持了下列特点：

1. 每章都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. 在课文中适当穿插了“想一想”“读一读”“做一做”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，“做一做”是供学生课外动手操作的一些实例。这些栏目是为扩大学生知识面、增加趣味性和实践性而设计的，这些都不作为教学要求，只供学生课外参考。

3. 每章后面都安排有“小结与复习”，其中的“学习要求”是对学生学完全章后的要求。

4. 每章最后都配有一套“自我测验题”，供学生自己检查学完这一章后，是否达到本章的基本要求。

5. 全书最后附有部分习题的答案或提示，供学生做完习题后进行对照，以便及时了解自己的解答是否正确。

6. 本书的练习题分为练习、习题、复习题三类。练习供课内用；习题供课内或课外作业用；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组属于基本要求范围，B组带有一定的灵活性，仅供学有余力的学生选用。每组习题的第1题，都反映了这一部分知识的基本要求，可以作为预习用，也可作为课后复习用，不要求做出书面答案。

五、教科书原试用本由吕学礼、饶汉昌、蔡上鹤任主编，李慧君任副主编，参加编写的有吕学礼、李慧君，责任编辑为李慧君，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、李慧君、袁明德、颜其鹏、李海东，责任编辑为李海东，饶汉昌、蔡上鹤、李慧君审阅。

本书在编写和修订过程中，吸收了全国各地许多教师和教研人员的意见和建议，在此向他们表示衷心感谢。

人民教育出版社中学数学室

2001年4月

CONTENTS

Introduction

We learned some primary knowledge of geometry in elementary school mathematics. Now we start to learn more systematical knowledge of geometry. What is mainly studied in geometry?

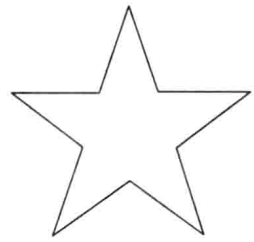


Figure 1

First we observe some examples.

1. Do you know how to draw a five-pointed star in the national flag (Figure 1)?

2. Do you know how to measure the height of an age-old tower (Figure 2)?

Figure 2

3. We know that, when folding a sheet of rectangle paper (Figure 3), a sheet of square paper can be cut out. Why is this? If there is a rectangle wood block, then, how can the largest square wood block be cut out?

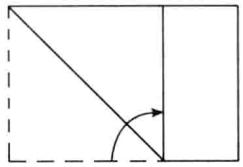


Figure 3

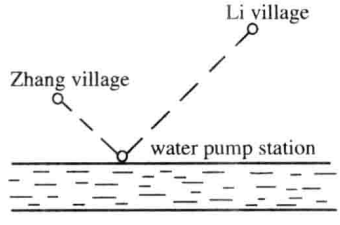


Figure 4

4. To build a water pump station near a river so as to convey water to Zhang village and Li village respectively (Figure 4), where should the water pump station be built so that the needed water pipe is the shortest?

There are many such examples. In daily life and production, we often encounter such problems concerning graphs. These are what geometry studies.

We will mainly study the following contents in geometry:

Recognition of graphs. For example, which kind of a graph is a square? What about a trapezium, and so on?

Properties of graphs. For example, what properties does a triangle have? What about a square, and so on?

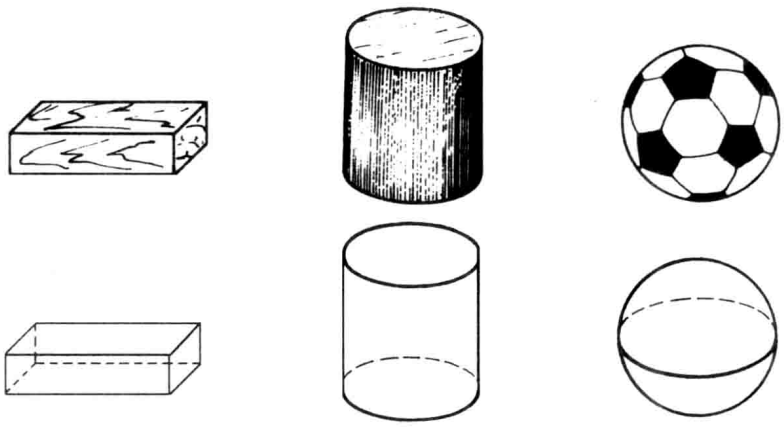
Brushwork of graphs. For example, how should one draw a square, a five-pointed star, and so on?

Computation of graphs. For example, how should one compute the height, the area of objects, and so on?

In the text of geometry, we will also learn how to explain things. For example, why is the sum of three interior angles 180° in a triangle? In figure 3, why is the sheet of paper cut out square? In figure 4, why is the used water pipe the shortest as soon as the water pump station has been built in a certain designated position?

For all kinds of objects, if we do not care about their other properties (e. g. , color, weight, material, etc.), but we only pay our attention to their shapes (e. g. , square, round, etc.), sizes (e. g. , length, area, etc.), positions (e. g. , perpendicular, out of perpendicular, intersection, out of intersection, etc.), then we will get all sorts of geometrical figures (for short, figures). The figures, such as cuboid, sphere, line segment, triangle, rectangle, circle, and so on, that we learned in elementary school mathematics, are all geometrical figures.

In figure 5, a graph obtained from a quadrate brick is a cuboid, a graph obtained from a circular pot is a circular cylinder body (also called circular cylinder), a graph obtained from a football is a spheroid (also called sphere). Cuboid, circular cylinder, spheroid, and so forth, are all geometrical solids, for short, solids.



Cuboid　　Circular cylinder　　Sphere

Figure 5

Observing a quadrate brick, a circular pot and a football, we see that all of them have surfaces. The geometrical solids are surrounded by surfaces. For instance, a cuboid contains six surfaces which are all level. A circular cylinder contains two bases which are level, and a lateral surface which is curved. A ball contains a surface which is curved.

A line is produced when both surfaces intersect. The cuboid in figure 5 contains twelve lines which are straight. Two curved lines are produced when two bases and a lateral surface of a circular cylinder intersect. The borderline between the black color and the white color is a straight line (Figure 6).

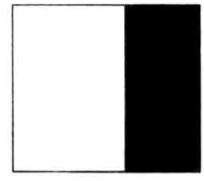


Figure 6

A point is produced when both lines intersect. Observe the cuboid in figure 5, how many points are produced among lines of intersection?

If we regard the tip of a pen as a point, when the tip of a pen is transferred on the paper, a line is drawn (Figure 7), that is, the movement of a point forms a line. A line consists of infinite many points (every position which the tip of a pen passes through). A circular disc is produced when the hand of a watch has finished its revolving process (Figure 8). In this case, we can say that the movement of a line forms a surface. A circular cylinder is produced when a rectangle iron wire is rotated around its one side (Figure 9). In this case, we say that the movement of a surface

forms a solid.

Solid, surface, line and point are all geometrical figures.

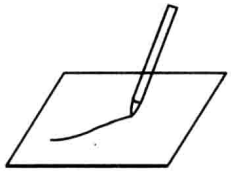


Figure 7

Figure 8

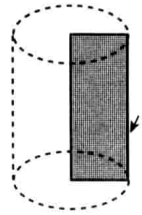
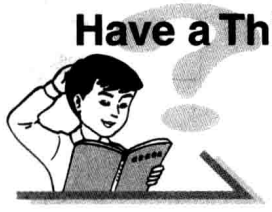


Figure 9

Some geometrical figures lie in the same plane, e. g. , triangle, circle, and so on; the others do not lie in the same plane, e. g. , cuboid, sphere, and so forth. Here, what does the plane that we say mean? The plane is a surface just as a calm water, a smooth blackboard, but the plane extends infinitely towards any direction. A figure lying in the same plane is called a plane figure, while a figure which does not lie in the same plane is called a solid figure.

In junior middle school mathematics, we will mainly study some plane figures.



An iron ball has the following properties:

It is made of iron; hard; grey-black color; sphericity; diameter 5 cm; mass 500 g or so.

What properties mentioned above are studied in geometry?

Have a Read

Pattern

Many beautiful patterns that we usually observe consist of some simple geometrical figures (Figure 1).

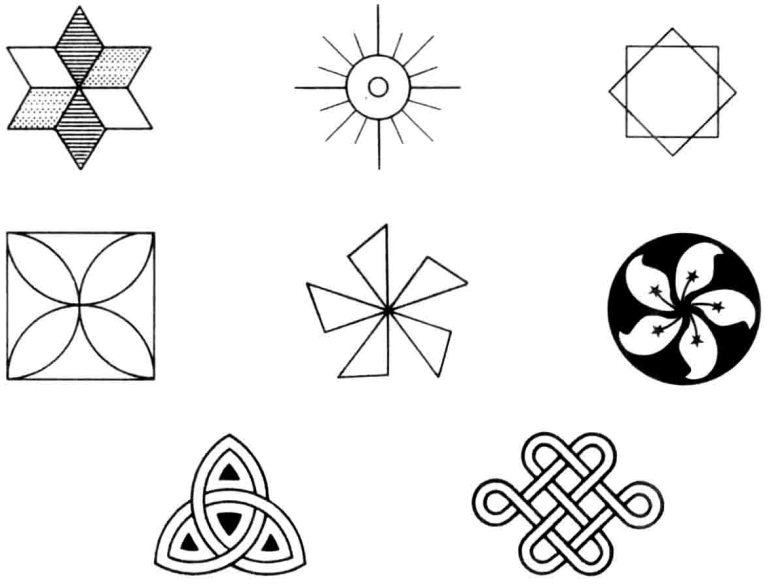
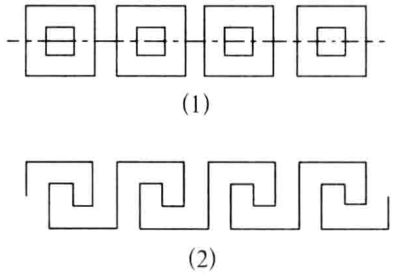


Figure 1

It is regarded that some patterns are formed by a revolved simple graph. In figure 1, the first pattern in the first row is formed by a graph rotated around a point, the badge of the Hong Kong Special Administrative Region of China (the third pattern in the second row) is also formed by a rotated redbut leaf.

It is regarded that some patterns are formed by a graph which is horizontally and continuously transferred a fixed distance in a certain fixed direction. Figure 2 (1) is formed by a Chinese character "hui" (回) which is horizontally and continuously transferred in one direction. A pattern obtained by this way is a strip-shaped one.



(1)

(2)

Figure 2

Cut figure 2(1) out along the central line and move its lower half a lattice in the right direction, then figure 2 (2) achieved. We also regard it to be formed by a graph which is horizontally and continuously transferred in one direction.

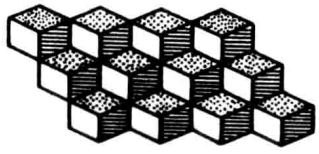
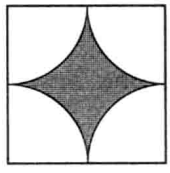
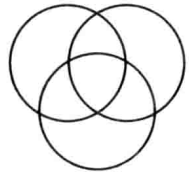


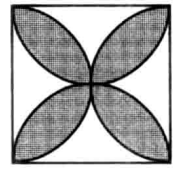
Figure 3

It is regarded that some patterns are formed by a graph which is transferred horizontally and continuously in two directions. For example, figure 3 is formed by a graph which is horizontally and continuously transferred in the left and upwards slanting direction. A pattern obtained by this way is a sheet one.

1. Collect some beautiful patterns (for example, traffic signs, lace, brands, and so on) and hold communion with one another in your class.
2. Draw the following patterns using a set square and a pair of compasses, and color them up. Can you design some patterns by yourself?

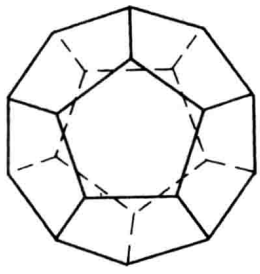


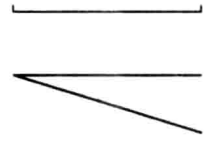




Chapter 1

Segment, Angle





In the above graphs, the right one is simpler and the left one is more complicated. After observing carefully, we will find that more complicated graphs also consist of some simpler graphs.

To understand some of more complicated graphs, we need to begin with studying simpler graphs. This chapter introduces simple graphs which are segments and angles. The right those in the above graphs are a segment and an angle. Based on these, we will learn lines of intersection, parallel lines, triangles, quadrilaterals, and so on.

I Line, Ray, Segment

1.1 Line

A taut string is an example of a straight line. The line extends infinitely in both opposite directions.

The number axis used generally in algebra is a line which prescribes the origin, direction and unit of length. The number axis can extend infinitely in two opposite directions.

We can draw a line with a ruler.

We can usually use letters to represent graphs in geometry. A point is represented by a capital letter. For instance, two points in figure 1-1 are represented by the letters A and B, and written as point A and point B respectively. A line is represented by a lowercase letter. A line in figure 1-1 is written as line l. A line can also be represented by two different points lying on it. Thus a line in figure 1-1 can also be written as line AB.

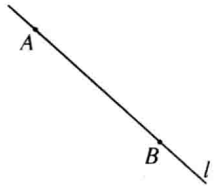


Figure 1-1

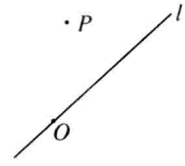


Figure 1-2

When a point lies on a line, we say that the line passes through the point. Point O in figure 1-2 lies on line l, it can also be said that line l passes through point O. If a point lies outside a line, we say that the line doesn't pass through the point. Point P in figure 1-2 lies outside line l, so line l doesn't pass through point P.

When nailing a thin batten in a wall with a nail, the batten can be rotated around the nail (Figure 1-3(1)). If the batten is nailed with two nails, then it is fixed (Figure 1-3(2)).

This fact implies that there are infinitely many lines through a com-