中学数学英语选读

READINGS OF MATHEMATICAL ENGLISH FOR MIDDLE SCHOOL STUDENTS

上海教育出版社

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Readings of Mathematical English For Middle School Students

张　同　编著

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编者的话

为了适应“四化”建设的需要，中学生阅读数学英语原著的要求也越来越迫切。本书是一本指导中学生阅读数学英语原著的入门书。

本书的篇目，有的选自著名数学家的原著，有的选自英美数学教材。

初等数学的内容是极为丰富的，而且涉及的知识面也广。选编的文章虽然力求注意数学词汇的覆盖面，但限于篇幅，不可能处理得十分完满，这里只能是一些代表文章。本书编排的顺序，偏重于数学知识的系统，但对英语语法程度的深浅较难照顾周全。本书共选编了二十四篇文章，并且附有词汇、注释、英汉数学常用词汇表和附录等内容。

本书既为读者提供了一定数量的数学英语词汇，又为读者介绍了阅读数学英语书籍的一般方法和常用数学英语的习惯表达方法，以培养和提高读者的阅读能力，力图成为广大读者所欢迎的学习初等数学专业英语的入门书和工具书。

本书适宜于高中学生和数学、英语爱好者阅读。

本书在编写过程中，承蒙陈锡麟、张人凤等同志的指导，帮助。特此表示感谢。

由于编者的水平有限，难免有不少错漏之处，敬请读者批评、指正。

编　者

1987.10.

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1. Sets (1)

The term set[1] is used to refer to any well-defined collection of discrete "objects." The "objects," or elements of the set, may be tangible things such as books, people, or symbols, or intangibles such as ideas.[2] A set is well defined if it is possible to determine whether or not a particular object is a member of the given set.[3] Sets may be *identified*, or *specified*, by listing their elements, by clearly describing the conditions for set membership, or by using "set-builder" notation.[4]

Examples Describe the elements of the following sets.

(a) The set composed of the first five letters of the English alphabet.

(b) The set of pine trees in California.

(c) The set of integers between 1 and 10.

Solutions (a) $\{a, b, c, d, e\}$ is a listing or roster of the elements.

(b) {pine trees in California} is a description or rule of set membership.

(c) $\{x \mid 1<x<10,\ x \in I\}$ is set-builder notation, which is read: "The set of all x such that 1 is less than x, which is less than 10, and x is an integer."

Here we have assumed that it is sometimes possible to count the elements in a given set. Numbers used for counting are called natural numbers and the set of such numbers is designated by *N*. The number that specifies how many elements there are in a set is called the cardinality of the set[5] and such a number is said to be used in a cardinal sense.

The set of numbers representing the cardinalities of all sets whose elements can be counted is the set of whole numbers *W*.[6] The set that contains no elements (cardinality zero) is the empty set, or the null set,[7] and is represented by the symbol $\emptyset$.

The sets of numbers with which you should be familiar are:

$N=$ {natural numbers}

$W=$ {whole numbers}

$J=$ {integers}

$Q=$ {rational numbers}

$H=$ {irrational numbers}

$R=$ {real numbers}

NEW WORDS

set [set] *n.* 集合

term [tə:m] *n.* 项, 术语

[illegible] *vt.* 把……叫做

refer (to) [ri'fə:] *vi.* 指(的是)

well-defined ['weldi'faind] *a.* 意义明确的

collection [kə'lekʃən] *n.* 群，集
discrete [dis'kri:t] *a.* 离散的，单个的
element ['elimənt] *n.* 元素
tangible ['tændʒəbl] *a.* & *n.* 有形(的)，明确(的)
intangible [in'tændʒəbl] *a.* & *n.* 无形(的)，不明确(的)
symbol ['simbəl] *n.* 符号，记号
idea [ai'diə] *n.* 思想，概念
determine [di'tə:min] *v.* 确定，决定
particular [pə'tikjulə] *a.* 特别的，详细的
identify [ai'dentifai] *v.* 标记，识别
specify ['spesifai] *v.* 规定，说明
list [list] *v.* *n.* 列举，排列
describe [dis'kraib] *vt.* 描写，描述
description [dis'kripʃən] *n.* 叙述，描述
condition [kən'diʃən] *n.* 条件
membership ['membəʃip] *n.* 成员，会员
set-builder ['set-'bildə] *n.* 集合构成
notation [nou'teiʃən] *n.* 符号，标志法，记法，表示法
compose [kəm'pouz] *v.* 组成，构成
integer ['intidʒə] *n.* 整数
solution [sə'lu:ʃən] *n.* 解答
roster ['roustə] *n.* 逐项登记表，花名册
rule [ru:l] *n.* 规定，规则，法则
assume [ə'sju:m] *vt.* 假定
count [kaunt] *v.* 数，计算
given ['givn] *a.* 已知的，给定的
natural ['nætʃ(ə)rəl] *a.* 自然的

- number 自然数

designate ['dezigneit] *vt.* 表示，标明

cardinality [kɑ:di'næliti] *n.* 基数性

- of the set 集合的基数

cardinal ['kɑ:dinl] *a.* 基本的，主要的

sense [sens] *n.* 意义，意思

whole [houl] *a.* 整的

- number 整数

contain [kən'tein] *vt.* 包含，含有

zero ['ziərou] *n.* 零

empty ['empti] *a.* 空的

- set 空集

null [nʌl] *a.* 不存在的，等于零的，零，空

- set 空集，零集

familiar [fə'miljə] *a.* 熟知的

rational ['ræʃənl] *a.* 有理的

- number 有理数

irrational [i'ræʃnl] *a.* 无理的，不尽的

- number 无理数

real [riəl] *a.* 实的，真的

- number 实数

NOTES TO THE TEXT

1. set. 集合。

表示"集合"的概念，只能用 set，而不能用 collection.

试比较：the set of numbers 数的集合，the collection of numbers 这批(堆、群)数。

在个别情况下，set 与 aggregate 互相通用。例如：finite set 有穷集，finite aggregate 有穷集。

2. The "objects," or elements of the set, may be tangible things such as books, people, or symbols, or intangibles such as ideas.

"客体"即集合的元素，可以是具体的事物，如书、人或符号，也可以是无形的事物，如概念。

(1) 表示"集合的元素"，在数学文选中既可用 element of a set，也可用 member of a set，它们的意思是一样的。但表示点、线、面等几何元素，只能用 element. 如，geometrical element 几何元素。

表示方程中等号的一边（或另一边）则用 member. 如，member of an equation 方程的一边。

(2) symbol 在数学上可表示一切符号(包括表示数的字母、表示几何图形的符号、关系符号、运算符号、约定符号、辅助符号等等)。本书第 24 节出现的各种符号就叫做 mathematical symbol. 如，algebraic symbol，指一切代数符号。sign 也解释为符号，但意义比较狭窄，如：algebraic sign 仅指正、负号。我们说 law of sign，是指 $2-(-1)=2+1=3$ 之类的符号法则，而law of symbol 意义就不明确，要根据上、下文的意思才能确定。

3. A set is well defined if it is possible to determine whether or not a particular object is a member of the given set.

如果能确定一个特定的物体是否是已知集合的元素的话，那么这个集合的意义是明确的。

whether or not 是否，究竟。

4. Sets may be identified, or specified, by listing their elements, by clearly describing the conditions for set membership, or by using "set-builder" notation.

用列出(集合的)元素的方法，或清楚地描述集合元素的条件和"集合构成"表示的方法来给集合作出标记，即规定。

这是一句被动语态的句子，由三个by引出的介词短语来并列地表示谓语动词的方法或途径。by 可译为"由"、"用"、"依靠"、"凭"等。

5. The number that specifies how many elements there are in a set is called the cardinality of the set …

确定集合中有多少个元素的数叫集合的基数……

6. The set of numbers representing the cardinalities of all sets whose elements can be counted is the set of whole numbers *W*.

表示可数元素所有集合的基数的数集是（非负）整数集合 *W*。

在数学里，integer 是"整数"的专用词。包括正整数、负整数和零。因而integer part 叫做"整数部分"，integer solution 叫做"整数解"，integer value 叫做"整数值"等等。

whole number 照字面上解释也是"整数"，但实际上仅指非负整数 (nonnegative integer)。上述integer part 等不可用 whole number 代替。因此不少数学书里，已不出现 whole number 这一概念。

7. empty 空的，null 等于零的。

empty set 与 null set 指的是相同的概念，表示集合

中没有任何元素——空集。empty 强调"空"，null 强调"零"。因此，表示"净重"用 empty weight，表示"一只空箱子"用 an empty box. 它们都不能用 null 替代 empty.

null 还表示数量为零、值为零。故表示"点圆"(圆面积为零)只能用 null circle，而不能用 empty circle，否则会产生误解。

一个矩阵的所有元素均为零，称 null matrix 零矩阵。

一个序列的极限为零，称 null sequence 零序列。

表示虚(构的假)设，称 null hypothesis，如用 empty 那就错了。

2. Sets (2)

In any study of algebra we are concerned with the relationship that may or may not exist between two sets or between the elements of one or more sets.[1] These relationships involve such things as equality, equivalence, order, etc.

Two sets are equal, or identical, if and only if they contain the same elements.[2] Two sets are equivalent if they have the same cardinality, that is, if a one-to-one correspondence can be shown to exist between the members of the two sets. Thus, equal sets are equivalent, but equivalent sets are not necessarily equal.

In general, the order in which the elements of a set are listed is not important.[3] If some particular order is specified, then the set is an ordered set. The natural

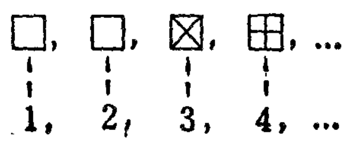

Fig. 2.1

numbers and the whole numbers are ordered sets. One way in which the elements of some sets can be ordered is by placing them in one-to-one correspondence with N as suggested in Fig. 2.1.[4] However, this does not hold for all sets. If there is a last element when the elements of a set are placed in correspondence with the natural numbers, the set is said to be finite. If there is no such last element, then the set is called infinite. In listing the elements of an infinite set, only a few elements are listed. These elements are followed, or preceded, by three dots[5] that represent the words "and so on."

Examples (a) $N = \{1, 2, 3, \ldots\}$

(b) $\{\text{Negative integers}\} = \{\ldots, -3, -2, -1\}$

(c) $J = \{\ldots, -3, -2, -1, 0, 1, 2, 3, \ldots\}$

An important relationship that may exist between two sets is the subset relation. Of two sets A and B, set A is said to be a subset of the set B, or $A \subseteq B$, provided every element of A is also a member of B. Thus, if $A = B$, $A \subseteq B$. Also for every set A, $A \subseteq A$; that is, every set is a subset of itself. If B contains at least one element that is not a member of A, then A is called a proper subset of B or $A \subset B$.[6] The symbol $\nsubseteq$ indicates that one set is not a subset of a second set.

Examples Place the proper symbol $\subseteq$, $\subset$, or $\nsubseteq$ between the two sets in each of the following pairs.

(a) $\{1, 2, 3, 4\}$ $\{1, 2, 3, 4, 5\}$

(b) $\{a, b, c, d, e\}$ $\{a, b, c, d\}$

Solutions (a) $\{1, 2, 3, 4\} \subset \{1, 2, 3, 4, 5\}$ or $\{1, 2, 3, 4\} \subseteq \{1, 2, 3, 4, 5\}$

(b) $\{a, b, c, d, e\} \nsubseteq \{a, b, c, d\}$

Example What is the subset of A that contains all positive integers in A if

$$A = \left\{-5, -\frac{2}{2}, 0, 1, \frac{6}{3}, \sqrt{25}, \frac{17}{2}, \sqrt{30}\right\}?$$

Solution $\left\{1, \frac{6}{3}, \sqrt{25}\right\}$

In general, we shall have little occasion to distinguish between a *subset* and a *proper subset*, and we shall ordinarily use the symbol $\subseteq$.[7] As an example, we can apply the subset relation to the sets of real numbers, so that

$$N \subseteq W \subseteq J \subseteq Q \subseteq R \text{ and } H \subseteq R.$$

NEW WORDS

algebra ['ældʒibrə] *n.* 代数(学)

concern [kən'səːn] *vt.* 涉及，关于

relationship [ri'leiʃənʃip] *n.* 关系

exist [ig'zist] *vi.* (存)在，有

involve [in'vɔlv] *vt.* 包含，含有

equality [i(ː)'kwɔliti] *n.* 相等，等式

equivalence [i'kwivələns] *n.* 等价，等效，等积，等势

equivalent [i'kwivələnt] *a.* 等价的，相等的

order ['ɔːdə] *n.* 序

etc. [拉丁语] = et cetera 等等

equal ['iːkwəl] *a.* 相等的

identical [ai'dentikəl] *a.* 恒等的

one-to-one 一对一的

correspondence [kɔris'pɔndəns] *n.* 对应

one-to-one correspondence 一一对应

shown [ʃoun] show 的过去分词 *v.* 证明