

数学、力学和工程科学

基础专业英语选读

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前 言

目前,大学本科生在学完大学英语课程之后,要想顺利地阅读专业书刊,尚存在不少困难,这主要是由于学生尚未掌握足够多科技书刊中所常用的词汇,词组和语法结构知识所致。编注本书的目的。即在于提供这方面的学习材料,以便学生能在较短时间内迅速提高阅读专业书刊的能力。

本书是在原《力学专业英语讲义》的基础上经过适法加工而成的。该讲义曾在北京大学力学与工程科学系连续使用过不下十余次,中间曾经多次修改,并由不同的教师使用,反映效果良好。1994年,编注者再一次对该讲义作了全面修改与更新,并增加了不少新内容,以便能适用于更多的理、工科专业、如数学、物理、力学和各工程专业等。

本书编选的文章共46篇,分为两大部分,基本上按由浅入深的原则编排。第一部分包括文章30篇,主要是简明、扼要、系统、全面地介绍理、工科中一些专业基础课程的内容。第二部分共16篇。大多数是介绍工科各系的文章。所以,本书不仅是一本基础专业英语教材,也是一本讲述有关学科和学系的中级英语科普读物。

本书是为已通过大学4级英语考试的学生编写的。《大学英语教学大纲通用词汇表(1—4)》(1995年2月、上海外语教育出版社、高等教育出版社)中的一切词汇、词组、除了极少数有特殊含义的以外,一般均不再加注解。此外,每篇文章的注解和注释是完全独立的,互不相干。这样,既便于任意选择教学内容,也有利于通过重复学习以加深对词汇、词组的理解与记忆。

使用本书时,可根据不同专业的需要,要求和授课时数,由教师取书中的若干篇文章作为教材。并建议采用自学——提问——讨论的教学方式,即课前由学生独立自学所指定的内容,课堂上由学生或教师提问并开展讨论。这样,不仅有利于迅速提高学生的阅读能力,而且也可更好地理解 and 掌握教学内容。

本书中的大部分文章摘选自书末所附书目(Bibliography)中的各种书刊。多数文章的末尾均注有撰写该文的著者姓名和刊载该文的书目编号。少数文章的根源及著者不详,或由编注者自己编辑而成的均未加注。在此,仅向文章被摘用的全体著者和出版社表示衷心的感谢。

由于编注者的业余和外语水平有限,在本书的注解与译文中,不妥与谬误之外在所难免,恳请广大读者和专家给予批评指正。

编注者

1995年11月

PART A

1 . THIS IS MATHEMATICS

Why has mathematics become so important in recent years ? Why is our government spending millions of dollars to educate more mathematicians ? Can the new electronic brains solve our mathematical problems faster and eliminate the need for mathematicians ?⁽¹⁾

To answer these questions , we need to know what mathematics is and how it is used . Mathematics is much more than arithmetic, which is the science of numbers and computation . It is more than algebra, which is the language of symbols, operations, and relations . It is much more than geometry, which is the study of shapes, sizes, and spaces . It is more than statistics, which is the science of interpreting data and graphs . It is more than calculus, which is the study of change, limits, and infinity . Mathematics is all of these - - and more .

Mathematics is a way of thinking, a way of reasoning . Mathematics can be used to determine whether or not an idea is true, or, at least, whether it is probably true, or, at least, whether it is probably true . Mathematics is a field of exploration and invention, where new ideas are being discovered every day . It is a way of thinking that is used to solve all kinds of problems in the sciences, government, and industry . It is a language of symbols that is understood in all civilized nations of the world . It has even been suggested that mathematics would be the language that would be understood by the inhabitants of Mars (if there are any) ! It is an art like music, with symmetry, pattern, and rhythm that can be very pleasing .

Mathematics has also been described as the study of patterns, where a pattern is any kind of regularity in form or idea .⁽²⁾ This study of patterns has been very important for science because pattern, regularity and symmetry occur so often in nature . For example, light, sound, magnetism, electric currents, waves of the sea, the flight of a plane, the shape of a snowflake, and the mechanics of the atom all have patterns that can be classified by mathematics .

词 汇

mathematician[m imə ti n]n .数学家

electronk brain[ilek tr nik brein]电脑
 accurately[kjuritli]a .准确地
 computation[k mpju tei n]n .计算
 algebra[ld ibr]n .代数(学)
 statistics[st tistik]n .统计(学)
 calculus[k lkjul s]n .微积分(学)
 limit[limit]n .极限
 infinity[in finiti]n .无限
 thinking[i ki]n .思考
 reasoning[ri z ni]n .推理
 field[fi ld]n .场;领域
 exploration[ekspl rei n]n .(1)探索;(2)研究
 civilized nation[sivilaizd nei n]文明国家
 Mars[ma z]n .火星
 symmetry[simitri]n .对称(性)
 regularity[regju l riti]n .规律性
 magnetism[m gnitiz m]n .磁(学,性)
 electric current[i lektrik k r nt]电流
 snowflake[snoufleik]n .雪花(片)

词 组

to eliminate the need for (or of) 对……不需要
 to need to + 不定式 必须;需要
 to be (much) more than … 比……更多;远非……可比
 to be used to + 不定式 用来
 to be being + 过去分词 正被……;为现在进行时的被动态
 It is suggested that 有人提议,它的理在完成时被动态为 It has been suggested
 that
 to be described as 被描述为;被说成是
 in nature 性质上;事实上

注 释

(1) Can the New electronic brains……for mathematicans ?

此句为一并列句,主语为 the new electronic brains, 谓语为 solve 与 eliminate 二者用 and 连接。全句可译为:

新的电脑能较人更快更准确地解决我们的教学问题吗？它能消除对数学家的需要吗？

(2) Mathematics has also……or idea

此句中的 where……idea 为一定语从句。全句可译为：

数学也被说成是对模式的研究。这里的模式系指任何一种形式或概念上的规律性。

2 . MATHEMATICAL SYMBOLS AND EXPRESSIONS

Below are some of the more common and expressions used in mathematics .

$\frac{1}{2}$	a (or one) half
$\frac{1}{3}$	a (or one) third
$\frac{1}{4}$	a (or one) fourth (or quarter)
$\frac{1}{10}$	a (or one) tenth
$\frac{1}{100}$	a (or one) hundredth
$\frac{1}{1000}$	a (or one) thousandth
$\frac{1}{1234}$	a (or one) over one (or a) thousand two hundred and thirty - four
$\frac{2}{3}$	two thirds or two over three
$\frac{3}{4}$	three fourths (or quarters)
$\frac{4}{5}$	three fourths (or quarters)
$\frac{113}{300}$	one hundred and thirteen over three hundred
$2\frac{1}{2}$	two and a half
$2\frac{7}{8}$	two and seven over eight or two and seven eighths
$3\frac{1}{8}$	three and one eighth
$4\frac{1}{3}$	four and a third

$125\frac{3}{4}$	a (or one) hundred twenty - five and three fourths (or quarters)
0 .1	O point (or <u>decimal</u>) one; zero point (or decimal) one; <u>nought</u> point (or decimal) one
0 25	nought point (or decimal) two five or point (or decimal) two five .
2 35	two point (or decimal) three five
45 .67	fourty - five point (or decimal) sixty - seven
$X + Y = Z$	X plus Y is (or are; equals; <u>is equal to</u>) Z
$X - Y = Z$	X minus Y is (or equals; is equal to)
$X \pm Y = Z$	X plus or minus Y is (or equals; is equal to) Z
$X \times Y = Z$	X times (or <u>multiplied by</u> Y equals (or are; is equal to; make(s)) Z
$\frac{X}{Y} = Z$	X over Y is (or equals; is equal to) Z or X divided by Y is (or equals) Z
$1 \times 1 = 1$	once one is one
$2 \times 2 = 4$	twice two is four
$X:Y$	the ratio of to Y
$a:b = c:d$	the ratio of a to b equals the ratio of c to d or is to b as c is to d .
$X = Y$	X is equal to or equals Y
$X \neq Y$	X is not equal to or does not equal Y
$X \approx Y$	X is <u>approximately</u> equal to Y or X approximately equals Y
$X < Y$	X is <u>less than</u> Y
$X \nless Y$	X is <u>not less than</u> Y
$X \leq Y$	X is less than or is equal to Y
$X > Y$	X is <u>greater (or more) than</u> Y
$X \ngtr Y$	X is <u>not greater</u> (or more) <u>than</u> Y
$X \geq Y$	X is greater (or more) than or is equal to Y
$X < < Y$	X is <u>much less than</u> Y
$X > > Y$	X is <u>much</u> (or far) <u>greater than</u> Y .
$X \propto Y$	X is <u>(directly) proportional</u> to Y Or <u>varies (directly) as</u> Y
$X\%$	X per cent
$ X $	the <u>absolute value</u> of X or <u>modulus</u> of X
X^2	X square; X squared; the square of X; the second power of X; X to the second (power) or to the power two
X^3	X cube; X cubed; the cube of X; the third power of X; X to the third (power) or to the power three
X^4	the fourth power of X; X to the fourth (power) or to the power

	four
X^n	the nth power of X; X to the nth (power) or to the power n
X^{-n}	X to the minus nth (power)
$\sqrt{x}$	the square root of X or root Y
$\sqrt[3]{x}$	the cube root of X
$\sqrt[n]{x}$	the nth root of X
$\sqrt[5]{x^2}$	the fifth root of X square
$n!$	n factorial
$\angle$	angle
$\perp$	<u>right angle</u>
$\triangle$	triangle
∞	<u>infinity</u>
$A \parallel B$	A is <u>parallel to</u> B
$A \perp B$	A is <u>perpendicular to</u> B
$() , [] , \{ \} , \langle \rangle$	<u>brackets</u>
$()$	<u>parentheses; round brackets</u> or curves
$[]$	<u>square</u> (angular) <u>brackets</u>
$\{ \}$	<u>braces</u> or <u>curly brackets</u>
$< >$	angle brackets
$\langle \rangle$	<u>double brackets</u>
$(X + Y)$	bracket X + Y bracket closed
$\bar{X}$	X bar; the mean value of X
X'	X <u>prime</u>
X''	X double prime
X'''	X <u>triple prime</u>
$\dot{X}$	X dot
$\ddot{X}$	X two dots
X_m	<u>sub m</u>
X_m''	X double prime, subm
8^m	8 superm
$\log_{10} X$	logX (or Log of X) to the <u>base 10</u> (<u>common logarithm</u>)
$\ln X$	log X to the base e (natural logarithm)
$\sin^{-1} x$	<u>are sine X</u>
$\sinh x$	the <u>hyperbolic sine X</u>
Σ	<u>sigma</u> ; <u>summation</u> of; the sum of the <u>terms</u> indicated

π	the product of the terms indicated
(x, y, z)	<u>set</u> of elements (or members) x, y, z
(a, b)	<u>open interval</u>
$] a, b [$	<u>open interval</u>
$[a, b]$	<u>closed interval</u>
$[a, b)$	<u>half - open interval</u> (open at the right)
$[a, b [$	<u>half - open interval</u> (open at the right)
$\cap$	<u>intersection</u>
$\cup$	union
$\forall$	there is a or there exists
$p \equiv q$	p is <u>equivalent</u> to or is <u>identical with</u> q ;
$p \setminus q$	p is identically equal to or is
$p \sim q$	<u>identity</u> to q
$p \rightarrow q$	p implies q or if p then q
$A \subset X$	A is a <u>subset</u> of the set X or is contained in the set X
$A \not\subset X$	A is not a subset of the set X or is not contained in the set X
$A \in X$	A is a member (or an element) of the set X ; A belongs to X
$A \notin X$	A is not a member (or an element) of the set X ; A does not belong to X
$f(x)$	function f of X
$y = f(x)$	y is a function of x
$\lim_{x \rightarrow a} f(x) = b$	
$\lim_{x \rightarrow a} f(x) = b$	b is the limit of $f(x)$ as X approaches a
$x = a^-$	limit of $f(x)$ as x approaches a from the left
$f(a^-)$	
$f(x) \nearrow b$	$f(x)$ increase, approaching the limit b
$f(x) \uparrow b$	
$f(x) \searrow b$	$f(x)$ decrease, approaching the limit b
$f(x) \downarrow b$	

$\triangle$	(<u>finite difference</u> or <u>increment</u>) <u>delta</u>
$\triangle x$ or δx	(the increment of x) δx
dx	<u>dee</u> X ; <u>differential</u> X
$\frac{dy}{dx}$	the first derivative of y with respect to x
$\frac{d^2y}{dx^2}$	the second derivative of y with respect to x
$\frac{d^n y}{dx^n}$	the n th derivative of y with respect to x
$\frac{\partial y}{\partial x}$	the first <u>partial derivative</u> of y with respect to x
$\mathbf{F}$	<u>vector</u> F
∇	$i \frac{\partial}{\partial x} + j \frac{\partial}{\partial y} + k \frac{\partial}{\partial z}$ <u>del</u> ; <u>nabla</u> ; vector differential <u>operator</u>
∇^n	n th <u>del</u> (<u>nabla</u>)
∇f	<u>gradient</u> of f
$\nabla \cdot \mathbf{V}$	<u>divergence</u> of $\mathbf{V}$
$\nabla \times \mathbf{V}$	<u>curl</u> of $\mathbf{V}$
∇^2	<u>laplacian</u>
$\int_a^b$	<u>integral</u> between limits a and b
$\int_E f(x) dV(x)$	the integral of function f over set E with respect to measure V

词 汇

decimal[desiml] a .十进(小数)的; n 小数
 nought[n t] n .零
 approximately[pr ksimitli] ad .近似地
 absolute value[bs lu t v lju] 绝对值
 modulus[m djulas] n 模数
 factorial[t k ri l] a .阶乘的; n .阶乘
 right angle[rait gl] 直角

infinity[in finiti]n .无限
 brackets[br kits]n .括号
 parentheses[p ren ises]n .括号;园括号(复数)
 round brachets 园括号
 square brackets 方括号
 braces[breises]n .大括号
 angle brackets 角括号
 double brackets 双括号
 curly brackets 波形括号
 prime[praim]n .(1)负数;(2)字码右上角的撇号
 triple[tripl]a .三次(倍)的
 sub subscript[s bskript]简写;n .下标
 super superscript[sju paskript]之简写;n .上标
 logarithm[log ri m]n .对数
 base[beis]n .基数
 common logarithm 普通对数
 natural logarithm 自然对数
 arc sine 反正弦
 hyperbolic sine 双曲线正弦
 sigma[sigm]n .希腊字母 Σ 或 δ
 summationn[s mei n] .求和
 term [t m]n .项
 set[set]n .集(合)
 open interval 开区间
 closed interval 闭区间
 half - oper interval 半开区间
 intersectio[int sek n]n .相交
 union[ju nj n]n .(1)结(联)合;(2)并(集)
 identity[ai dentiti]n .(1)恒等式;(2)完全相同
 subset[s bset]n .子集(合)
 limit[limit]n .极限
 finite difference 有限差分
 increment[inkrim nt]n .增量
 delta[delt]n .希腊字母 Δ 或 δ
 dee[di]n .口字
 differentia[dif ren l]a .微分(差别)的;n .微分

derivative[di riv tiv]a .导出的;n .导数;微商
 partial derivative 偏导数
 vector[vekt]n .矢(向)量
 del n .倒三角形è
 nabla[n bl]n .劈形算符
 operator[reti]n .(1)算子;(2)操作人员
 gradient[greidi nt]n .梯度
 divergence[dai v d ns]n .散度
 curl[k l]n .旋度
 laplacian[l plasi n]拉普拉斯算示
 integral[intigr l]a 积分的;n 积分
 measure[me]n .量度,测度

词 组

be equal to 等于
 be multiplied by 乘以
 be divided by 除以
 be less than 小于
 be greater (more) than 大于
 be (directly) proportional to 与……成正比
 be inversely proportional to 与……成反比
 vary(directly) as 与……成正比(变化)
 vary inversely as 与……成反比(变化)
 be parallel to 平行于
 be perpendicular to 垂直于
 be equivalent to 等于,与……等效

3 . SETS: A USEFUL MATHEMATICAL IDEA

One of the greatest new ideas in mathematics developed in the past century is SET THEORY, invented by the German mathematician Georg Cantor (1845 - 1918) . It has been a means of finding new facts and of proving old facts .

The idea of a set is very simple . A set is a collection of objects, numbers, persons, or ideas . You are already familiar with sets such as a set of books, a set of dishes, or a set of tools . You are even a member of a set of people such as your mathemat-

ics class, your scout troop, or your family .

Set ideas are used in many fields of mathematics . In arithmetic, we talk about sets of numbers . For example, the set of prime numbers less than 10 is (2,3,5,7) .

In algebra, we talk about the solution sets for sentences⁽¹⁾ . For example, the solution set for $x - 5 = 7$ is the number 12 .

In geometry, we talk about the set of points that meet certain conditions . The set of points on line AB and also on the boundary of the circle is the points P and Q .

图 1

In statistics, we talk about sets of data . For example, the set of scores on a weekly math quiz was (7,10,5,6,9,7,8,4,6,8,5,7) .

In probability we talk about the set of all possible events . For example, the set of ways three letters, A,B,C, can be arranged is (ABC, BAC, BCA, CAB, CBA) .

In measurement, we talk about a set of units of measure . A set of metric units of length is (kilometer, hectometer, decameter, meter, decimeter, centimeter, millimeter) .

In everyday situations, we talk about sets of persons or objects with certain characteristics . The set of all students in the algebra class and also on the basketball team, for example, might be (John, Bill, Steve) .⁽²⁾

Set theory has been the basis for a new philosophy about mathematics . It has freed mathematics from working with individual numbers, permitting it to consider sets of numbers⁽³⁾ . Set ideas have also made it possible to solve many problems that involve relationships rather than numbers . And sets have been proved useful in setting up problems for electronic computers .

词 汇

- set theory 集(合)论
- scout [skaut] troop 童子军
- prime number 素(质)数
- solution set 解答组
- sentence[sent ns]n .句子,表示一完整思想的一组字,此处指代数方程
- math = mathematics
- quiz[kwiz]n .测验
- measure[me]测度,量度

hectometer[hektoumit]n .百米
decameter[dek mit]n .十米
decimeter[desimit]分米(十分之一米)
basket ball team 篮球队
electronic computer 电子计算机

词 组

a collection of 一批(群,堆)
a set of 一套(组,群,批)
be familiar with 熟悉,精通
talk about 谈论
less than 小于
to free M from N 使 M 摆脱 N
to work with 与……一道工作;同……打交道

注 释

(1) In algebra, …… for sentences .

此句中的 sentence 其原意为语法的句子或逻辑中的命题,这里可解释为代数中的方程式,全句可译为:

在代数学中,我们谈论代数方程的解答组。

(2) The set of all students …… might be (John, Bill, Steve)

此句的主语为 The set of all students, 谓语为 might be, 全句可译为:

例如,既上代数课又参加篮球队的全部学生可能是 John, Bill 和 Steve。

(3) It has freed …… of numbers .

此句中的现在分词短语 permitting…… numbers 为结果状语,而 to consider …… numbers 为宾语 it 的被语。主句 it has …… 中的 it 指集(合)论,而 permitting it …… 中的 it 则指数学,全句可译为:

集(合)论使得数学摆脱了与单个数打交道,而容许它(指数学)考虑数的集(合)。

4 . AXIOMS, DEFINITIONS AND THEOREMS

The claim has been made for mathematica that it is the best and most precise language known for the statement of complicated ideas .⁽¹⁾ We would like now to exam-