Selected EST Reading

科技英语阅读文选

主编　高永照

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·北京·

内容简介

本书介绍了当代科学技术众多领域的基础知识和最新发展情况，涉及面广，信息量大。其语言规范流畅、通俗易懂，内容新颖，富于现代性、知识性、趣味性和思辨性，有助于拓宽读者的知识面，进一步提高英语阅读水平和翻译能力，完善读者的人文素养和对英语的实际应用，以适应21世纪对复合型外语人才的要求。

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前　言

为了全面贯彻教育部制定的《大学英语课程教学要求》，以适应21世纪对外语人才的要求，我们特编写《科技英语阅读文选》一书，介绍当代科学技术的众多领域以及与人们日常生活密切相关的一些领域的基础知识，帮助学生拓宽知识面，进一步提高英语阅读水平和翻译能力。

本书是《基础科技英语阅读》的修订版。在修订过程中，我们不但对注释和练习进行了修改，还增添了大量的新素材，增加了高温超导、纳米材料、"神舟"六号、基因工程、禽流感、超级杂交稻等方面的新材料。本书还新增了课文的参考译文。

本书包括了众多学科的现代文献资料，涉及面广，信息量大，可以作为高等学校学生大学英语四级后专业英语阅读阶段的通用过渡教材、公选课教材或者自学教材。全书分为24个单元，每个单元围绕一个主题，由4篇文章组成。为了加深阅读理解，每单元均配有阅读理解练习和翻译练习，第一篇的练习设计为多项选择题，第二篇和第三篇为简答题，第四篇为翻译练习。若用于课堂教学，可安排45学时左右，而且内容可以酌情删减。本书也可以成为科技工作者和英语爱好者扩大知识面和进一步提高英语水平的帮手。

本书语言文字规范流畅，通俗易懂，内容新颖，以科普为主，富于现代性、知识性、趣味性和思辨性。

本书所选英文素材皆出自国内外20世纪末和21世纪初出版的书籍、报刊、杂志和网络上的文章，由于渠道繁多，不便一一列举，在此向各位作者致谢。

书稿在编写的过程中还得到数学教授蒋威同志、计算机学教授吴涛同志、物理学教授曹多良同志、生物化学教授张部昌和肖亚中同志等的热情帮助。原来参与《基础科技英语阅读》编著的王蒙、方传余、邓英、李峤、安青平、肖让见、汪扬文、周青、郝玉生、郭娟、管先恒、鞠虹等老师也曾经做过很多工作。在此向他们表示衷心的感谢。

由于我们水平有限，本书的编写肯定存在不少缺点，甚至错误，恳请读者批评指正。

主　编

Contents

Unit 1 Mathematics
数学

Passage A

A Historical Survey of the Fundamental Theorem of Arithmetic

Abstract: The purpose of this article is a comprehensive survey of the history of the Fundamental Theorem of Arithmetic. To this aim we investigate the main steps during the period from Euclid to Gauss.
Key Words: al-Farisi; Euclid; Fundamental Theorem of Arithmetic

1. Introduction

The concept of unique factorization stretches right back to Greek arithmetic and yet it plays an important role in modern commutative ring theory. Basically, unique factorization consists of two properties: existence and uniqueness. Existence means that an element is representable as a finite product of irreducibles, and uniqueness means that this representation is unique in a certain sense. Unique factorization first appeared as a property of natural numbers. This property is called the Fundamental Theorem of Arithmetic (FTA).

The history of the FTA is strangely obscure. We state the FTA as follows. Any natural number greater than 1 can be represented as a product of primes in one and only one way (up to the order). As we have stated it, it does not appear in Euclid's *Elements*①. Nonetheless, Euclid played a significant role in the history of the FTA. Specifically, Books Ⅶ and Ⅸ contain propositions which are related to the FTA.

2. Euclid and the FTA

Euclid's Elements consists of 13 books. The arithmetic Books Ⅶ to Ⅸ contain basic results in the theory of numbers. Although the FTA does not appear in the Elements, there are two very significant propositions, Ⅶ.30 and Ⅶ.31, which have a close connection with it. There is a third proposition, Ⅸ.14, which is a uniqueness theorem. In fact, the FTA follows from the propositions Ⅶ.30 and Ⅶ.31.

In Book Ⅸ we meet Proposition 14 which states that "If a number be the least that is measured by prime numbers, it will not be measured by any other prime number except those originally measuring it."

There are many similarities between the FTA and Ⅸ.14. Proposition Ⅸ.14 is one kind of uniqueness theorem. It is a good partial demonstration of the uniqueness condition for the FTA, but it is clear that Ⅸ. 14 does not cover the case of numbers which possess a square factor.② For this reason some authors have examined Ⅸ. 14, and have correctly asserted that the two results are not technically equivalent.

In addition, we have to note that without implying the existence of a prime decomposition Ⅸ. 14 starts with a collection of primes while the FTA starts with an integer. The starting points of the two theorems are completely different.

Nowadays, textbooks commonly take the FTA as a fundamental theorem. They begin with the definition of prime numbers and prove the uniqueness of factorization into primes. This is followed by the properties of relatively prime integers and greatest common divisors. This approach seems to have originated with Gauss. In Euclid's number theory things are organized just in the reverse order. Euclid begins with the division algorithm to find the greatest common divisor of integers, and then he obtains an operative definition of relatively prime integers.

3. Al-Farisi and the FTA

Kamal al-Din al-Farisi, who died ca. 1320, was a great Persian mathematician, physicist, and astronomer. His work represents perhaps the most significant step toward the FTA made by mathematicians before Gauss. His main concern was amicable numbers, and his aim was to prove by a different method the theorem of Ibn Qurra who had worked only lightly on the decomposition of integers and combinatorial methods.③ Al-Farisi was led to develop new ideas in the theory of numbers, and he investigated the decomposition of integers more thoroughly than Ibn Qurra did. Before he could introduce combinatorial methods it was necessary to consider the existence of the factorization of an integer into prime numbers and to use uniqueness properties to determine the divisors.

In 1994 we produced an English translation of his first nine propositions and provided a commentary on al-Farisi's methods. The main aim of these nine propositions is to know and to find the divisors of a given number and hence is a preparation for the work on amicable numbers. One could say that Euclid takes the first step on the way to the existence of prime factorization, and al-Farisi takes the final step by actually proving the existence of a finite prime factorization in his first proposition.

We see that al-Farisi made an important advance towards the FTA, although he did not state it. He stated and proved the existence part of the FTA, but he did not state and did not intend to prove the uniqueness of prime factorization since the FTA was not important for him. This does not mean he did not know the uniqueness. If al-Farisi had wished to state and prove the uniqueness, he would have been able to do so.④ al-Farisi knew the uniqueness very well as can be seen from both the statement and the proof of his Proposition 9. In fact, he proved Proposition 9 in order to determine all the divisors of a composite number and he used it to give a new proof of Ibn Qurra's theorem on amicable numbers. However, he showed all that is needed to prove the uniqueness. Therefore we can consider Proposition 9 to be equivalent to the uniqueness part of the FTA.

4. Prestet's results

In this section we present some results published by Jean Prestet in his 1689 writings *Nouveaux Elemens de Mathematiques*. They confirm that before modern times a prime factorization was not looked upon as something of interest in its own right, but as a means of finding divisors.

Prestet stated neither the existence nor the uniqueness of the FTA. He was influenced by Euclid and was concerned with divisors. Like al-Farisi and Euler he gave the main results in order to find all the divisors of a given number. In particular his Corollary IX has a significant role. This result makes us believe that Prestet knew the FTA. We think he could have proved it, but he was not concerned with it.

In Chapter 6 of his first volume, we meet the following theorem.

THEOREM. *If two numbers b and c are relatively prime, their product bc is the least number that each of them can divide exactly and without remainder.*

As a corollary of this theorem Prestet stated:

COROLLARY III. *If d measures exactly a product bc of two numbers b & c and if c and d are relatively prime, the number d is a divisor of the other number b.*

The object of the next corollaries was to determine all the divisors of a number expressed as a product of prime factors.

COROLLARY IV. *If two different numbers a & b are simple, every divisor of their plane, or product ab, is I, or a, or b, or ab.*

Prestet continued with Corollaries V and VI using the same argument for a product of three different prime numbers (*solid*) and of four prime numbers (*supersolid*), then five, and so on indefinitely.

It is clear that Prestet does not state the FTA in his work because his aim was to make explicit the relationship between any factorization of a given number into primes and all its possible divisors. However, Prestet's results are very close to the FTA, and in the sense of implying each other his Corollary IX may be considered as equivalent to the uniqueness of the prime factorization.

5. Euler's statements

We observe that Euler was only interested in finding all divisors of a number and he was following the tradition of al-Farisi and Prestet. Euler tells us that all divisors of a number are obtained from the prime factors which appear in the representation of the number as a product of prime numbers and this is the only way to have all the divisors of the number. Therefore this may be considered as the uniqueness of the prime factorization. Euler also gave an example: It follows that 60, or $2 \times 2 \times 3 \times 5$, may be divided not only by these simple numbers, but also by those which are composed of any two of them; that is to say, by 4, 6, 10 and 15; and also by those which are composed of any three of its simple factors; that is to say, by 12, 20, 30, and last also, by 60 itself.

6. Gauss

Gauss gave the unique factorization property for positive integers in his book. He himself did not spell out a proof of the existence part of the FTA. He claimed that it is clear from elementary considerations, which of course is. He began his demonstration by stating that: "It is clear from elementary considerations that any composite number can be resolved into prime factors, but it is tacitly supposed and generally without proof that this cannot be done in many various ways." Then he considered a composite number $A = a^{\alpha}b^{\beta}c^{\gamma}$ etc. with a, b, c, etc. unequal prime numbers and showed that A cannot be resolved into prime factors in another way which has any other primes except a, b, c, etc., or which has some prime numbers which appear in one decomposition more often than in the other.⑤

Thus, the first clear statement and proof of the FTA seem to have been given by Gauss in his book. Since then many different proofs have been given. And we have investigated different proofs of the FTA and classified them.

New Words and Expressions

factorization /ˌfæktəraiˈzeiʃən/ *n*. 【数】因子分解(法)
prime / praim / *n*. 【数】素数;*a*. 主要的,首要的
corollary / kəˈrɔləri/ *n*. 【数】推论,系 ;推断结果;必然结果
divisor /diˈvaizə/ *n*. 【数】因子,除数,(公)约数
measure /ˈmeʒə/ *v*. 【数】测度;测量;衡量
proposition /ˌprɔpəˈziʃən/ *n*. 【数】命题;提议
amicability /ˌæmikəˈbiliti/ *n*. 友善,温和
communitive ring theory 交换环理论
composite number 合数
positive integer 正整数
amicable number 亲和数

Proper nouns

Euclid(人名)欧几里得(约公元前3世纪的古希腊数学家)
Kamal al-Din al-Farisi(人名)坎默尔·奥尔丁·阿尔·法里斯
Ibn Qurra(人名)伊本·奎拉
Euler(人名)欧拉(1707—1783,瑞士数学家)
Gauss(人名)高斯(1777—1855,德国数学家)
Jean Prestet(人名)让·普雷斯泰特
the Fundamental Theorem of Arithmetic (FTA) 算术基本定理
Nouveaux Elemens de Mathematiques 数学新元(素)

Notes

① *Euclid's Elements* 欧几里得的著作《几何原本》,可简称"原本"。

② It is a good partial demonstration of the uniqueness condition for the FTA, but it is clear that Ⅸ.14 does not cover the case of numbers which possess a square factor. 此句是并列复合句。第一分句中的 it 是人称照应,它指的是Ⅸ.14;第二分句中的 it 是形式主语,真正的主语是后面的 that 从句,该主语从句又包含一个限定性定语从句。

③ ... and his aim was to prove by a different method the theorem of Ibn Qurra who had worked only lightly on the decomposition of integers and combinatorial methods. 在这个主从复合句中,虽然 who 引导的是限定性定语从句,但翻译时可以转译成原因状语。

④ If al-Farisi had wished to state and prove the uniqueness, he would have been able to do so. 此句是虚拟语气,表示对过去已发生过的并不存在的情况的假设。

⑤ Then he considered a composite number $A = a^{\alpha}b^{\beta}c^{\gamma}$ etc. with a, b, c, etc. unequal prime numbers and showed that A cannot be resolved into prime factors in another way which has any other primes except a, b, c, etc., or which has some prime numbers which appear in one decomposition more often than in the other. 这个长句是多重复句,在并列谓语动词 showed 的后面是一个宾语从句,其中的一个词 way 带有一个并列的限定性定语从句,而第二个定语从句本身还包含一个限定性定语从句。翻译时,这样的长句可以采用分译法来翻译。

Reading Comprehension

Choose the best answer from the following choices:

1. How many books of Euclid contain relevant statement with FTA according to this article?
   A. 1. B. 2. C. 3. D. 4.
2. Who properly made the first clear statement and proof of the FTA according to this article?
   A. Euclid. B. al-Farisi. C. Jean Prestet. D. Gauss.
3. Who takes the first step on the way to the existence of prime factorization and who makes the final step?
   A. Euclid and Jean Prestet. B. Jean Prestet and al-Farisi.
   C. Gauss and al-Farisi. D. Euclid and al-Farisi.
4. What does the uniqueness of unique factorization mean according to this article?
   A. It is the only deconstruction method of natural numbers.
   B. It is the concept only in the field of mathematics.
   C. The representation of an element is unique in a certain sense.
   D. It is the only method of deconstructing prime.
5. Which of the following corollary is to determine all the divisors of a number expressed as a product of prime factors?
   A. If two different numbers a and b are simple, every divisor of their plane, or product ab, is I, or a or b, or ab.
   B. If two numbers b and c are relatively prime, their product be is the least number that each of them can divide exactly and without remainders.

C. Any composite number is measured by some prime number.

D. If d measures exactly a product be of two numbers b and c and if c and d are relatively prime; the number d and a is a divisor of the other number b.

Passage B

The Circle-measuremens by the Ancient Chinese Mathematicians

We already know that the ancient Chinese employed for π the value 3, or that they counted the circumference of a circle compared with diameter as 3 to 1. ① The value of π was used in China as early at least as in the 12th century B. C. But the Chinese did not in any way remain satisfied with this rough value of π. Ever since then great efforts have been made to improve its accuracy and brilliant achievements obtained. ②

Among the earliest Chinese circle-squarers mention must be made of Zhang Heng in the first place. Zhang was a famous scholar of the Han Dynasty. Zhang's calculation of the circle, however, has been lost, although his value of π is given in a commentary on the "Arithmetic in Nine Sections" in the form that the ratio of the square of the circular circumference to that of the perimeter of the circumscribed square is 5 to 8. ③ This is equivalent to taking π at $\sqrt{10}$.

In the period of the Three Kingdoms there lived another mathematician Liu Hui, in whose commentaries on the "Arithmetic in Nine Sections" we find the particulars of his quadrature of the circle. ④

Liu Hui starts, in his measurement of the circle, with a hexagon inscribed in a circle the diameter of which is taken as two feet. ⑤ Each side of the hexagon is equal to half the circular diameter. On this hexagon Liu Hui describes a dodecagon by doubling the number of its sides, and then doubles again the sides and describes a 24-gon, and so on. In this way the areas of the polygons thus formed gradually approach to the area of the circle, the difference diminishing step by step. ⑥

Two centuries after Liu Hui, there appeared another and more distinguished circle-squarer, Zu Chongzhi. Zu contrived a more effective method of proceeding than his predecessors had followed, and obtained the accurate value for π. It was 355/113. From this it is seen that China had possessed the accurate value for over 1,300 years before Europe, where the same value was obtained in 1855.

Zu Chongzhi died in 500 at the advanced age of 71. His son Zu hengzhi was another distinguished mathematican following his father. It was he who first derived the world formula about the volume of a spherical ball, ⑦ which is equal to $1/6\pi D^3$, where D denotes the diameter.

New Words and Expressions

circumference /sə'kʌmfərəns/ *n*. 圆周

diameter /daiˈæmitə/ *n*. 直径

circle-squarer /ˈsəːkl ˈskwɛərə/ *n*. 积圆家,求圆者

commentary /ˈkɔməntəri/ *n*. 注解

ratio /ˈreiʃiəu/ *n*. 比,比例,比率

square /skwɛə/ *n*. 正方形;平方 *vt*. 自乘

circular /ˈsəːkjulə/ *a*. 圆的

perimeter /pəˈrimitə/ *n*. 周长

circumscribe /ˈsəːkʌmskraib/ *v.t*. 在四周划线;使外切

quadrature /ˈkwɔdrətʃə/ *n*. 积圆法

hexagon /ˈheksəgən/ *n*. 六边形

inscribe /insˈkraib/ *vt*. 使内接

dodecagon /dəuˈdekəgən/ *n*. 十二边形

24-gon = polygon of 24 sides 二十四边形

polygon /ˈpɔligən/ *n*. 多边形

difference /ˈdifərens/ *n*. 差别;差

derive /diˈraiv/ *vt*. 推导

formula /ˈfɔːmjulə/ n 公式

spherical /ˈsferikəl/ *a*. 球的;天体的

Proper nouns

Zhang Heng 张衡(78—139 中国古代科学家,东汉时期人,发明地动仪)

Han Dynasty 汉朝 206 B.C. –220 A.D.

Arithmetic in Nine Section 九章算术(中国古代算术书名)

Three Kingdoms 三国(指汉末蜀魏吴鼎立时期)

Liu Hui 刘徽 (三国时期魏人)

Zu Chongzhi 祖冲之(中国古代科学家,南北朝时期人)

Zu Hengzhi 祖恒之 (祖冲之之子,中国古代科学家)

Notes

① We already know that the ancient Chinese employed for π the value 3, or that they counted the circumference of a circle compared with diameter as 3 to 1. 此句中两个连接词 that 引导两个并列的名词从句,作谓语动词 know 的宾语。其中,as 3 to 1 为 counted 的宾语补足语;分词短语 compared with diameter 作定语,修饰 circumference。

② Ever since then great efforts have been made to improve its accuracy and brilliant achievements obtained. 此句是并列复合句,在并列句第二分句中 obtained 之前省略了 have been。

③ ...in the form that the ratio of the square of the circular circumference to that of the perimeter of the circumscribed square is 5 to 8. 此句中第一个 that 是连接词,引导从句作 the form 的同位语;第二个 that 是指示代词,照应前面的 the square,以避免重复。

④ ...in whose commentaries on the "Arithmetic in Nine Sections" we find the particulars of his quadrature of the circle. 此句是介词加关系代词的所有格引导的非限制性定语从句,修饰 Liu Hui。

⑤ ...in a circle the diameter of which is taken as two feet. 此句中 the diameter of which is taken as two feet 是定语从句修饰 a circle。其中,which 为关系代词,指的是 a circle;介词短语 of which... 作定语修饰 the diameter。

⑥ ...the difference diminishing step by step. 这是分词独立结构作状语,表示伴随情况或结果。

⑦ It was he who first derived the world formula about the volume of a spherical ball, 这是一个强调句型,强调句子的主语 he 。

Reading Comprehension

Short answer questions:

1. How did the ancient Chinese count the circumference of a circle?
2. What is Chang Hung's value of π given in the "Arithmetic in Nine Sections"?
3. How did Liu Hui start his measurement of the circle?
4. When did Tsu Chung-chih obtain the accurate value for π?
5. Who was the first to derive the world formula about the volume of a spherical ball?

Passage C

Probability

The mathematics to which our youngsters are exposed at school is with rare exceptions, based on the classical yes-or-no, right-or-wrong type of logic. It normally doesn't include one word about probability as a mode of reasoning or as a basis for comparing several alternative conclusions. Geometry, for instance, is strictly devoted to the "if-then" type of reasoning and so to the notion that any statement is either correct or incorrect. ①

However, it has been remarked that life is an almost continuous experience of having to draw conclusions from insufficient evidence, and this is what we have to do when we make the trivial decision as to whether or not to carry an umbrella when we leave home for work. This is what a great industry has to do when it decides whether or not to put $50,000,000 into a new plant abroad. In none of these cases — and indeed, in practically no other case that you can suggest — can one proceed by saying, "I know A, B, C, etc. are completely and reliably true, and therefore the inevitable conclusion is..." For there is another mode of reasoning, which does not say: "This statement is correct, and its opposite is completely false." but which says: "There are various alternative possibilities. No one of these is certainly correct and true, and no one certainly incorrect and false. There are varying degrees of plausibility — of probability — for all these alternatives. I can help you understand how these plausibilities compare; I can also tell you how reliable my advice is."

This is the kind of logic which is developed in the theory of probability. This theory deals with not two truth values — correct or false — but with all the intermediate truth values: almost certainly true, very probably true, possibly true, unlikely, very unlikely, etc. Being a precise quantitative theory, it does not use phrases such as those just given, but calculates for any question under study the numerical probability that it is true. If the probability has the value of 1, the answer is an unqualified "yes" or certainty. If it is zero (0), the answer is an unqualified "no", i.e. it is false or impossible. If the probability is a half (0.5), then the chances are even that the question has an affirmative answer. If the probability is a tenth (0.1), then the chances are only 1 in 10 that the answer is "yes".

It is a remarkable fact that one's intuition is often not very good at estimating answers to probability problems. For example, how many persons must there be in a room in order that the odds be favourable — that is, better than even — that there are at least two persons in the room with the same birthday? Remembering that there are 365 separate birthdays possible, some persons estimate that there would have to be 50, or even 100, persons in the room to make the odds better than even. The answer, in fact, is that the odds are better than even when there are 23 persons in the room; with 40 persons, the odds are better than eight to one that at least two will have the same birthday②. Let us consider one more example: everyone is interested in polls, which involve estimating the opinions of a large group (say all those who vote) by determining the opinions of a sample. In statistics the whole group in question is called the "universe" or "population". Now suppose you want to consult a large enough sample to reflect the whole population with at least 98% precision in 99 out of a hundred instances: how large does this very reliable sample have to be? If the population numbers 200 persons, then the sample must include 105 persons, or more than half the whole population. But suppose the population consists of 10,000 persons or 100,000 persons? In the case of 10,000 persons, a sample, to have the stated reliability, would have to consist of 213 persons: the sample increases by only 108 when the population increases by 9,800. And if you add 90,000 more to the population, so that it now numbers 100,000, you have to add only 4 to the sample! The less credible this seems to you, the more strongly I make the point that it is better to depend on the theory of probability rather than on intuition. ③

Although the subject started out in the seventeenth century with games of chance such as dice and cards, it soon became clear that it had important applications to other fields of activity. In the eighteenth century Laplace laid the foundations for a theory of errors, and Gauss later developed this into a real working tool for all experimenters and observers. Any measurement or set of measurements is necessarily inexact; and it is a matter of the highest importance to know how to take a lot of necessarily discordant data, combine them in the best possible way, and produce in addition some useful estimate of the dependability of the results. Other more modern fields of application are: in life insurance; telephone traffic problems; information and communication theory; game theory, with applications to all forms of competition, including business, international politics and war; modern statistical theories, both for the efficient design of experiments and for the interpretation of the results of experiments; decision theories, which aid us in making judgements; probability theories for the process by which we learn; and many more.

New Words and Expressions

probability /ˌprɔbəˈbiliti/ *n*. 【数】概率,概率论;可能性,或然性
geometry /dʒiˈɔmitri/ *n*. 几何学
trivial /ˈtriviəl/ *a*. 琐碎的;不重要的,价值不大的;轻微的
plausibility /ˌplɔːziˈbiliti/ *n*. 似乎可能;似真性
quantitative /ˈkwɔntitətiv/ *a*. 数量的;定量的
unqualified /ʌnˈkwɔlifaid/ *a*. 无限制的;完全的;无资格的,不合格的
affirmative /əˈfəːmətiv/ *a*. 肯定的;赞成的
intuition /ˌintjuːˈiʃən/ *n*. 直觉,直观
odds /ɔdz/ *n*. 可能性;可能的机会
population /ˌpɔpjuˈleiʃən/ *n*. 【统计】全域,总体;人口
dice /dais/ *n*. 骰子
discordant /disˈkɔːdənt/ *a*. 不一致的;不调和的;不和的
in question 在考虑中的;在议论中的
game theory 对策论
decision theory 决策论

Proper nouns

Laplace (人名)拉普拉斯(1749—1827,法国天文学家、数学家、物理学家)

Notes

① Geometry, for instance, is strictly devoted to the "if-then" type of reasoning and so to the notion that any statement is either correct or incorrect.　本句中 so 是从句性替代,其后面的 to 和 devoted 后面的 to 是平行的。译文:例如,几何学仅进行严格的"如果……那么……"类型的推理,因此,就是仅论述某论点是对或是错的概念。

② the odds are better than eight to one that at least two will have the same birthday.　至少有两个生日相同的人的可能性超过 8/9。

③ The less credible this seems to you, the more strongly I make the point that it is better to depend on the theory of probability rather than on intuition.　此句是一个含"越……越……"句型的主从复合句,其中 that 又引导一个同位语从句。译文:这在你看来越不可信,我就越要强调最好依靠概率论,而不是直觉。

Reading Comprehension

Short answer questions:

1. What mode of reasoning is probability based on?

2. Why is life an almost continuous experience of having to draw conclusions from inadequate evidence?
3. What are the chances that the answer is "no" if the probability has the value of 0.4?
4. How many persons would a sample have to consist of in a poll to reflect the opinion of the whole population of 100,000 with at least 98% precision?
5. What are the more modern fields of application of probability theory?

Passage D

The Role of Mathematics and Mathematical Analysis in Natural Sciences and Engineering

In mathematics and, in particular, in mathematical analysis, practical work and observation of nature are, as in other sciences, the main source of scientific discoveries. In their turn, mathematical methods play a very important role in natural sciences and engineering. Mathematical methods lie in the foundation of physics, mechanics, engineering and other natural sciences. For all of them mathematics is a powerful theoretical and practical tool without which no scientific calculation and no engineering and technology are possible. Mathematical analysis which treats of variables and functional relationships between them is particularly important since the laws of physics, mechanics, chemistry, etc. are expressed as such relationships.

An important feature of the application of mathematics to other sciences is that it enables us to make scientific predictions, that is, to draw, on the basis of logic and with the aid of mathematical methods, correct conclusions whose agreement with reality is then confirmed by experience, experiment and practice. Here we confine ourselves to two remarkable examples illustrating what has been said.

As is known, the modern science of aviation was created by the famous Russian scientist Professor N.E. Zhukovsky (1847—1921). He derived by means of mathematical methods certain formulas and laws which enabled him to predict the possibility of aerobatics and, in particular, of looping the loop. Soon the loop was in fact performed by the Russian pilot, Captain P.N. Nesterov. The possibility of looping the loop was thus discovered mathematically before it was realized physically.

Here is another example. J. Leverrier, a French astronomer, studied planetary motion in the solar system. When applying the laws of classical mechanics expressed in the form of some known functional relationships he discovered a discrepancy between the theoretical results and real observation. Then he found that the discrepancy can be eliminated if the existence of an unknown planet possessing a certain mass and moving in a certain orbit is assumed. Soon this new planet (Neptune) was in fact found (in 1846) exactly at the time moment and position predicted by Leverrier who thus discovered a new heavenly body by means of calculations made on a piece of paper at his desk! Nowadays astronomical predictions are taken for granted but they are only possible because the techniques of mathematics and mathematical analysis are based on our knowledge of objective laws of reality.

New Words and Expressions

variable /ˈvɛəriəbl/ *n*.【数】变量;变数; *a*. 易变的;可变的;反复不定的
functional /ˈfʌŋkʃənl/ *a*.【数】函数的;机能的,官能的;在起作用的
aviation /ˌeiviˈeiʃən/ *n*. 航空(学);飞行术
aerobatics /ˌɛərəˈbætiks/ *n*. 飞行特技;航空表演
discrepancy /disˈkrepənsi/ *n*. 差异;不同,不一致;矛盾;不符合
loop the loop (飞机特技表演)翻筋斗

Proper nouns

N. E. Zhukovsky (人名)N. E. 朱可夫斯基
P. N. Nesterov (人名)P. N. 恩斯特罗夫
J. Leverrier (人名)J. 勒威耶(1811—1877,法国天文学家)
Neptune 海王星

Exercise

Translate the above passage into Chinese.