Саратовский государственный университет им. Н.Г Чернышевского

Е.В. Двойнина

English in Maths and Maths in English

(grammar, texts, practice)

Part 1

Учебное пособие для студентов-заочников 1 курса
механико-математического факультета
по направлениям «Педагогическое образование» (по профилю
«Математическое образование») и «Прикладная информатика»

Саратовский государственный университет имени Н.Г. Чернышевского

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Двойнина Екатерина Владимировна

English for Maths and Maths for English (grammar, texts, practice) Part 1. Учебное пособие для студентов-заочников 1 курса механико-математического факультета по направлениям «Педагогическое образование» (по профилю «Математическое образование») и «Прикладная информатика».-Саратов, 2012.- 52с.

Учебное пособие **English for Maths and Maths for English (grammar, texts, practice) (Part 1)** для студентов-заочников 1 курса механико-математического факультета по направлениям «Педагогическое образование» (по профилю «Математическое образование») и «Прикладная информатика» представляет собой первую часть учебного пособия для студентов заочной формы обучения механико-математического факультета первого года обучения.

Пособие состоит из 5 уроков и контрольной работы. Грамматический материал первой части содержит правила употребления времен активного залога групп Simple, Continuous, Perfect, Perfect Continuous.

Каждый урок структурно состоит из двух частей. В грамматическую часть входит теоретический материал и упражнения для его повторения и закрепления. Вторая часть состоит из текста и заданий, предназначенных для развития различных видов речевых навыков, отработки и закрепления лексического и грамматического материала урока. В контрольную работу входят текст, задания к тексту и тестовые задания на проверку грамматического материала. В издание включены задания различного типа сложности, что позволяет успешно использовать его в группах студентов с разной языковой подготовкой.

Учебное пособие предназначено для студентов-заочников 1 курса механико-математического факультета по направлениям «Педагогическое образование» (по профилю «Математическое образование») и «Прикладная информатика»

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Саратовского государственного университета им. Н.Г. Чернышевского

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Урок 1.

Simple Tenses

THE PRESENT SIMPLE TENSE

1. Утвердительная форма **The Present Simple Tense** образуется от инфинитива смыслового глагола без частицы to. В третьем лице единственного числа глаголы принимают окончание -s или -es (после свистящих и шипящих -s, -ss, -sh, -ch, -x или гласных:
We study maths. - Мы изучаем математику. He plays football 5 times a week. - Он играет в футбол 5 раз в неделю.
Окончание глаголов третьего лица единственного числа -s читается:
после глухих согласных как [s]: he works [we:ks], she hopes [houps]
после звонких согласных и гласных как [z]: she reads [ri:dz], he plays [pleiz]
после свистящих и шипящих -s, -ss, -sh, -ch, -x как [iz]: she loses ['lu:ziz]/ dresses ['dresiz]/ wishes/watches/mixes ['miksiz]/freezes ['fri:ziz] и т.д.
У глаголов, оканчивающихся в инфинитиве на гласную -y, если она стоит после согласной, в третьем лице единственного числа -y перед окончанием -es меняется на -i: he tries/flies/carries и т.д.
но: he delays/employs/plays и т.д.

2. Вопросительная форма **The Present Simple Tense** образуется при помощи вспомогательных глаголов **do** (для I, you, we, they)и **does** (для he, she, it).
В вопросительной форме вспомогательный глагол стоит перед подлежащим, а смысловой - после него:
Do you study physics? Does he play football?
Do you study physics or maths? Does he play football/tennis?
What do you study? What does he play?

3. Отрицательная форма **The Present Simple Tense** образуется также при помощи вспомогательных глаголов do (для I, you, we, they)и does (для he, she, it) и отрицательной частицы not. (do not (don't); does not (doesn't)). I do not study physics. She does not play football.
Он не играет в футбол.

Утвердительная форма I (you, we, they) play He (she, it) plays	Вопросительная форма Do I (you, we, they) play? Does he (she, it) play?	Отрицательная форма I (you, we, they) do not play He (she, it) does not play

Глагол **to have** в **The Present Simple Tense**
Глагол to have в **The Present Simple Tense** имеет две личные формы: has - для 3-го лица единственного числа и have для всех остальных лиц единственного и множественного числа.
Глагол to have имеет значение иметь, обладать. На русский язык to have как смысловой глагол переводится словом есть:
I have many friends at university.
He has many scientific journals in English.

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The Present Simple Tense используется:

а. Для выражения обычного действия, совершающегося постоянно, регулярно повторяющегося:
He always interferes his lectures and asks irrelevant questions prefer going on foot as it has many advantages.

б. Для выражения общеизвестных положений:
The earth goes round the sun.

в. Для выражения действий, которые следуют одно за другим в настоящем времени:
We get up at six o'clock, do our morning exercises, take a shower, have our breakfast and go to the university.

г. Вместо будущего времени:

1) в придаточных предложениях условия и времени (после союзов when -когда, if -если, after -после того как, before -до того как, as soon as - как только, till/until -до тех пор пока:
I'll have no break till I finish revising.
We shall go abroad as soon as our exams are over.

2) для выражения действия, происходящего по расписанию:
Our classes start at 8.20 tomorrow.

ОБРАТИТЕ ВНИМАНИЕ!
Глаголы состояния всегда используются в формах Simple. К глаголам состояния относятся группы глаголов, выражающие:
чувства (love, like, dislike, hate, respect и др.);
желания (want, wish, desire и др.);
физические свойства предметов (contain, include, consist of и др.)
обладание/владение (have (исключая устойчивые выражения типа: have breakfast), possess и др.)
мыслительные процессы (know, remember, understand и др.)
to be (исключая значение «вести себя»), to see (в значении «видеть, понимать»), to think (в значении «иметь мнение») и др.

THE PAST SIMPLE TENSE

В английском языке в зависимости от способа образования основных форм глагола, т.е. прошедшего неопределенного времени и причастия прошедшего времени глаголы подразделяются на правильные и неправильные.
1. Утвердительная форма **The Past Simple Tense** правильных глаголов образуется путем прибавления суффикса -ed к инфинитиву глагола без частицы to:
Суффикс -ed читается:
После глухих согласных как [t]: talked [to:kt], placed [pleist]
После звонких согласных и гласных как [d]: lived [livd], stayed [steid]
После t, d как [id]: corrected [ke'rektid], translated [tra:ns'leitid], decided [di'saidid].

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Если конечная согласная буква стоит после краткой ударной гласной, то перед суффиксом -ed эта согласная удваивается. Конечная согласная -I перед суффиксом -ed всегда удваивается: stopped, referred, controlled, travelled.
Если конечная буква у стоит после согласной, то перед суффиксом -ed у меняется на i: try- tried, supply- supplied.
Если конечная буква у стоит после гласной, то перед суффиксом -ed она не меняется: play- played, employ -employed
Если инфинитив имеет конечную гласную -e, то перед суффиксом -ed она опускается: decide- decided, recognize- recognized/

2. Утвердительная форма **The Past Simple Tense** неправильных глаголов образуется путем изменения корневой гласной или всей основы глагола:
to run - бегать -ran
to write - писать – wrote
to come- приходить-came
to be - быть -was, were
to have - иметь -had
to go - идти –went

3. Вопросительная форма **The Past Simple Tense** как правильных, так и неправильных глаголов образуется. при помощи вспомогательного глагола did, который ставится перед подлежащим, а после подлежащего ставится смысловой глагол в инфинитиве без частицы to:
Did you attend the lecture yesterday? Did he take exams last year?
What did you attend yesterday? When did you attend the lecture?
What exams did you take last year? When did you take your exams?
Did you pass or fail your exams last year?

4. Отрицательная форма **The Past Simple Tense** как правильных, так и неправильных глаголов образуется при помощи вспомогательного глагола did и отрицательной частицы not:
I did not go to university yesterday. Unfortunately he did not pass his exam.
В разговорной речи вместо did not употребляется сокращенная форма didn't:
I didn't see him there.

Утвердительная форма (правильные глаголы) I (you, we, they, he, she, it) worked/studied/travelled	Вопросительная форма (правильные глаголы) Did I (you, we, they, he, she, it) work/study/travel	Отрицательная форма (правильные глаголы) I (you, we, they, he, she, it) didn’t work/study/travel
Утвердительная форма (неправильные глаголы) I (you, we, they, he, she, it) went/came/had	Вопросительная форма (неправильные глаголы) Did I (you, we, they, he, she, it) go/come/have?	Отрицательная форма (неправильные глаголы) I (you, we, they, he, she, it) didn’t go/come/have

The Past Simple Tense употребляется:
a. Для выражения действия, имевшего место в прошлом, если время действия выражено такими словами, как yesterday -вчера, last week -на прошлой неделе, the other day - на днях, an hour (a week, a month) ago- час (неделю, месяц) назад и др.:
In 1661 Newton entered Cambridge.

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б. Для выражения ряда последовательных действий в прошлом:
He picked up the receiver, dialled the number and waited for an answer.

в. Для выражения общеизвестного факта, имевшего место в прошлом:
The first peace international conference of scientists took place in July 1957 in Pugwash, Canada

THE FUTURE SIMPLE TENSE
1. Утвердительная форма **The Future Simple Tense** образуется при помощи вспомогательных глаголов "**will**" и смыслового глагола без "**to**".
I (you, we, they, he, she,it) **will (‘ll)** work.

2. Вопросительная форма **The Future Simple Tense** образуется. при помощи вспомогательного глагола will, который ставится перед подлежащим, а после подлежащего ставится смысловой глагол в инфинитиве без частицы to:
Will you attend the lecture tomorrow? Will he take exams next year?
When will you attend the lecture? When will you attend the lecture?
What exams will you take next year? When will you take your exams?
Will you pass or fail your exams next year?

3. Отрицательная форма **The Future Simple Tense** образуется при помощи вспомогательного глагола will и отрицательной частицы not (won’t):
I (you, we, they, he, she, it) won't take exams next year.

Утвердительная форма	Вопросительная форма	Отрицательная форма
I (you, we, they, he, she,it) will (‘ll) work.	Will I (you, we, they, he, she,it) work?	I (you, we, they, he, she,it) will not (won’t) work

The Future Simple Tense употребляется:

а. Для выражения действия спонтанного действия:
I’ll do it tomorrow.
б. Для обещаний, угроз, предложений:
I will help you.
в. В прогнозах, предсказаниях и выражении мнения (особенно с выражениями I think, I am (not) sure, maybe, I suppose и др.):
I think he will do well at his exams.
г. для выражения действия, которое совершится при определённых обстоятельствах и условиях (особенно если в придаточном условном предложении используются союзы **if, when, till, until, as soon as** и.т.д):
As soon as I come to see you, **I'll** bring you this book.

(В случаях, когда "**when**" и "**if**" являются частью главного предложения, то есть вопросительным словом или используются не в условных придаточных, в таких предложениях используется Future Simple:
When will the lecture **begin**?
I'll tell you **when** he **will be back**.)

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д. Для выражения желания говорящего получить от собеседника распоряжение**:**
Shall I do it in class or at home? = Сделать это в классе или дома?

е. "will/ won't" употребляются для выражения вежливой просьбы:
Won't you sit down, please?
Will you open the window, please?.
Open the window, please, **will** you?

Упражнения

Упражнение 1. Поставьте глаголы в предложениях в Present Simple tense. Переведите предложения на русский язык.
Например: He (to go) to school every day.
He goes to school every day.

1. I (to want) to study at university because it (to have) a good reputation and (to give) good knowledge.
2. We (to study) at university, so every day we (to have) to wake up early in the morning.
3. I (to commute) to university. I (to take) a bus, as I (not to have) a car. It (to take) a lot of time as I (to live) far from it.
4. He (not to look) like a medical student. He (to look) and (to talk) like an artist.
5. Our classes (to start) early in the morning, so every day she (to wake) up early.
6. You (to do) your homework? I (no to do). In my opinion, university (to differ) from school, you (not to have) to do your homework every day.
7. She (to teach) Maths at school. She (to say) it (to be) a stressful job.
8. You (to have) many friend at university? What you (to do) in your spare time?
9. Her father (to drive) her to school, but they (to be) often late, as they (to get) stuck in the traffic jams.
10. I (to like) to get presents and my husbands (to like) to make they, so we (to be) a perfect match.

Упражнение 2. Поставьте глаголы в предложениях в Past Simple tense. Переведите предложения на русский язык.
Например: He (to go) to school yesterday.
He went to school yesterday.

1. Isaac Newton (to be) born in Lincolnshire, near Grantham, on December 25, 1642. He (to be) educated at Trinity College, Cambridge, and (to live) there from 1661 till 1696. He (to die) at Kensington, London, on March 20, 1727.
2. On May 28, 1665 he (to take) B.A. degree.
3. When you (to enter) the university? When you (to finish)?
4. What major you (to get) at university? It (to be) difficult to study?
5. When I (to study) at university, I always (to do) my homework as I (to have) to meet very strict deadlines and I (not to like) to have debts.
6. This period (to be) crowded with brilliant discoveries. He (to think) out the fundamental principles of his theory of gravitation. He (to suspect) that the attraction (to vary). He also (to work) out the fluxional calculus tolerably completely.
7. -When Newton (to make) his ideas open to public? - Newton (to communicate) his results to his friends and pupils from and after 1669.
8. You (to get) a B.A. or M.A?

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9. He (to know) that, if a stone (to be) allowed to fall near the surface of the earth, the attraction of the earth (to cause) it to move through 16 feet in one second.
10. In a manuscript dated November 13, 1665, he (to use) fluxions to find the tangent and the radius of curvature at any point on a curve, and in October 1666 he (to apply) them to several problems in the theory of equations.

Упражнение 3. Поставьте глаголы в предложениях во Future Simple tense. Переведите предложения на русский язык.
Например: He (to go) to school tomorrow.
He will go to school tomorrow.

1. We (to have) 5 exams in summer. It (to be) difficult.
2. I (not to go) to my last class. I (to go) to the library to get information for my report. You (to come) with me?
3. -What you (to do) if you fail your exams? - I (to think) about it later.
4. I (not to have) time to buy food tomorrow. You (to do) it for me? You (to give) me a helping hand?
5. I never (to forget) the time I spent at university.
6. What you (to do) when you graduate?
7. I (not to come) to the party. I (to stay) at home and (to prepare) for the test.
8. He (not to pass) the exam. I think, he (to fail).
9. You (to be) home tomorrow? I (to need) you help.
10. They (not to go) to the cinema. They (to stay) in and (to watch) a video.

Упражнение 4. Сделайте предложения отрицательными.
Например: He was a mathematician. He was not a mathematician.

1. At the beginning of the eighteenth century, the ruler of Babylon was one Hammurabi.
2. In short order he conquered and unified the whole of Mesopotamia, and Babylon became its greatest city.
3. We now call this period Old Babylonian, and it is from this time that the great bulk of mathematical tablets come (although mostly not from Babylon itself).
4. The impact of Sargon's unification of Sumer and Akkad resonated down through the history of Mesopotamia for the next two thousand years.
5. The Sargonic empire lasted for almost a hundred and fifty years, before it fell to insurrections and invasions.
6. From the Early Dynastic period comes the earliest Sumerian literature, including the epic poetry about Gilgamesh.
7. The Sumerians lived in a complex, unpredictable and frequently hostile environment. They had to contend with floods, droughts, storms, dust, heat, disease and death.
8. They strove to uncover order and organization in the world to overcome feelings of futility and powerlessness.
9. The Ur III empire lasted for over a century (2112-2004) before falling to the violent incursions of nomadic Amorites.
10. With the fall of Ur went Sumerian civilization for ever.

Упражнение 5. Поставьте глаголы в скобках во времена группы Simple. Переведите текст письменно на русский язык.

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Zeno's Paradox

The great Greek philosopher Zeno of Elea (to be) born sometime between 495 and 480 B.C. He (to proposy) four paradoxes in an effort to challenge the accepted notions of space and time that he (to encounter) in various philosophical circles. His paradoxes (to confound) mathematicians for centuries, and it (not to be) until Cantor's development (in the 1860's and 1870's) of the theory of infinite sets that the paradoxes could be fully resolved.

Zeno's paradoxes (to focus) on the relation of the discrete to the continuous, an issue that (to be) at the very heart of mathematics. Here we (to describe) the first of his famous four paradoxes. Zeno's first paradox (to attack) the notion held by many philosophers of his day that space (to be) infinitely divisible, and that motion (to be) therefore continuous.

The Motionless Runner

A runner (to want) to run a certain distance -let us say 100 meters - in a finite time. But to reach the 100-meter mark, the runner must first reach the 50-meter mark, and to reach that, the runner must first run 25 meters. But to do that, he or she must first run 12.5 meters.

Since space (to be) infinitely divisible, we can repeat these 'requirements' forever. Thus the runner (to have) to reach an infinite number of 'midpoints' in a finite time. This (to be) impossible, so the runner can never reach his goal. In general, anyone who (to want) to move from one point to another must meet these requirements, and so motion (to be) impossible, and what we (to perceive) as motion (to be) merely an illusion.

Where the argument (to break down)? Why?

Задания к тексту 1.

Упражнение 1. Переведите слова письменно на русский язык. Выучите их наизусть.

complete
devotion
considerable
advancement
consequence
influential
subsequently
due to
prominent
calculus of functions
invention
tabulate the values of any function
illustrious
stellar astronomy
ultimately
underlie
mathematical treatment
the differential and integral calculus
calculus of finite differences
infinitesimal calculus
abandoned

Упражнение 2. Прочитайте текст. Переведите его письменно на русский язык.

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The Introduction of Analysis into England.

The complete isolation of the English school and its devotion to geometrical methods are the most marked features in its history during the latter half of the eighteenth century; and the absence of any considerable contribution to the advancement of mathematical science was a natural consequence. One result of this was that the energy of English men of science was largely devoted to practical physics and practical astronomy, which were in consequence studied in Britain perhaps more than elsewhere. In this text we will have a look at the biographies of to mathematicians who were the members of the Analytical Society.

George Peacock

George Peacock, who was the most influential of the early members of the new school, was born at Denton on April 9, 1791. He was educated at Trinity College, Cambridge, of which society he was subsequently a fellow and tutor. The establishment of the university observatory was mainly due to his efforts, and in 1836 he was appointed to the Lowndean professorship of astronomy and geometry. In 1839 he was made dean of Ely, and resided there till his death on Nov. 8, 1858. Although Peacock's influence on English mathematicians was considerable, he left but few memorials of his work; his report on progress in analysis, 1833, commenced those valuable summaries of current scientific progress which enrich many of the annual volumes of the *Transactions* of the British Association.

Charles Babbage

Charles Babbage was an important member of the Analytical Society was. He was born at Totnes on Dec. 26, 1792 and entered at Trinity College, Cambridge, in 1810; subsequently became Lucasian professor in the university; and died in London on Oct. 18, 1871. It was he who gave the name to the Analytical Society, which, he stated, was formed to advocate ``the principles of pure *d*-ism as opposed to the *dot*-age of the university." In 1820 the Astronomical Society was founded mainly through his efforts, and at a later time, 1830 to 1832, he took a prominent part in the foundation of the British Association. Modern scientists will remember him for his mathematical memoirs on the calculus of functions, and his invention of an analytical machine which could not only perform the ordinary processes of arithmetic, but could tabulate the values of any function and print the results.

John Frederick William Herschel

The third of those who helped to bring analytical methods into general use in England was the son of Sir William Hershel (1738-1822), the most illustrious astronomer of the latter half of the eighteenth century and the creator of modern stellar astronomy. Sir John Frederick William Herschel was born on March 7, 1792, educated at St. John's College, Cambridge, and died on May 11, 1871. His earliest original work was a paper on Cotes's theorem, and it was followed by others on mathematical analysis, but his desire to complete his father's work led ultimately to his taking up astronomy. His papers on light and astronomy contain a clear exposition of the principles which underlie the mathematical treatment of those subjects.

In 1813 the Analytical Society published a volume of memoirs, of which the preface and the first paper are due to Babbage; and three years later they issued a translation of Lacroix's *Traité élémentaire du calcul différentiel et du calcul intégral*. In 1817 and in 1819, the differential notation was used in the university examinations, and after 1820 its use was well established. The Analytical Society followed up this rapid victory by the issue in 1820 of two volumes of examples illustrative of the new method; one by Peacock on the differential and integral calculus, and the other by Herschel on the calculus of finite differences. Since then English works on the infinitesimal calculus have abandoned the exclusive use of the fluxional notation.

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Упражнение 3. Ответьте на вопросы устно.

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1. What are the most prominent features the of the English Mathematics school of the eighteenth century?
2. What did the English men of science devote their energy to?
3. What is similar in the biographies of the three scholars? What is different?
4. Why is George Peacock called the most influential of the early members of the new school? What were his main achievements?
5. Did he leave many memorials of his work? Name his most important work.
6. Who gave the name to the Analytical Society? What was it suppose to advocate?
7. Why will modern scientists remember C. Babbage?
8. What did sir William Herschel create?
9. Why did sir John Frederick William Herschel take up astronomy?
10. What are the most important victories of the Analytical Society?

Упражнение 4. Найдите в тексте времена группы Simple. Объясните их использование устно.

Упражнение 5. Поставьте глаголы в абзаце из текста в Past Simple.

Amongst those who materially (to assist) in extending the use of the new analysis (to be) William Whewell (1794-1866) and George Biddell Airy (1801-1892), both Fellows of Trinity College, Cambridge. The former (to issue) in 1819 a work on mechanics, and the latter, who (to be) a pupil of Peacock, (to publish) in 1826 his *Tracts*, in which the new method (to be) applied with great success to various physical problems. The efforts of the society (to be) supplemented by the rapid publication of good text-books in which analysis (to be) freely used. The employment of analytical methods (to spread) from Cambridge over the rest of Britain, and by 1830 these methods had come into general use there.

Упражнение 6. Задайте письменно пять типов вопросов к предложениям из текста:
1. His papers contain a clear exposition of the principles which underlie the mathematical treatment of those subjects.
2. He gave the name to the Analytical Society.
3. Babbage subsequently became Lucasian professor in the university.
4. Modern scientists will remember him for his mathematical memoirs

Упражнение 7. Перескажите текст на английском языке.

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Урок 2

Continuous Tenses

Времена группы «Continuous» образуются при помощи глагола to beи смыслового глагола с окончанием –ing.

THE PRESENT CONTINUOUS TENSE

1. Утвердительная форма **The Present Continuous Tense** образуется при помощи личной формы вспомогательного глагола ***to be*** и добавления к смысловому глаголу окончания ***-ing***

I am working
You (we, they) are working
He (she, it) is working.
а. если глагол оканчивается на гласную, она выпадает: take- taking
б. если глагол односложный или двусложный, оканчивающийся на ударный гласный звук, последний согласный удваивается: stop-stopping, refer- referring.

2. Вопросительная форма **The Present Continuous Tense** образуется при помощи форм глаголов to be (am, is, are), которые ставятся перед подлежащим:
Are you revising for your exam now?
Is he working late today?
What are you doing now?
Are you reading a book or watching TV?

3. Отрицательная форма **The Present Continuous Tense** образуется при помощи форм глаголов to be (am, is, are) и отрицательной частицы not (am not, are not (aren't), is not (isn't)):
I am not working at my report, I am learning grammar rules.

Утвердительная форма	Вопросительная форма	Отрицательная форма
I am studying	Am I studying?	I am not studying
He (she, it) is revising	Is he (she, it) revising?	He (she, it) isn't revising
We (you, they) are reading	Are we (you, they) reading?	We (you, they) aren't reading

The Present Continuous Tense употребляется:

а. для выражения действия, которое происходит в момент речи:
Please don`t make so much noise, I`**m studying**.
"Where`s Margaret?" "She`**s working in the library.**
б. для описания действия, которое происходит сейчас, но не в момент разговора, т.е. действие началось, но не закончилось:

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I`**m reading** an interesting book at the moment. (*не обязательно сейчас, главное, что начал и не закончил читать*.)
Now I`**m studying** English.
в. для описания изменяющейся ситуации:
The population of the world **is rising** very fast.
Is your English **getting** better?
г. для выражения действия, запланированного на ближайшее будущее:
I am taking my English exam tomorrow.

THE PAST CONTINUOUS TENSE
1. Утвердительная форма **Past Continuous** образуется при помощи личной формы глагола to be в прошедшем времени (was/were) и смыслового глагола с окончанием -ing.
I (he, she, it) was working
You (we, they) were working

2. Вопросительная форма **Past Continuous** образуется при помощи форм глаголов to be (was/ were), которые ставятся перед подлежащим:
Were you revising for your exam at 5 o'clock yesterday?
Was he working when you came home?
What were you studying?
Were you studying or talking on the phone with your friend?

3. Отрицательная форма **Past Continuous** образуется при помощи форм глаголов to be (was/were) и отрицательной частицы not (was not (wasn't)/were not (weren't)):
I was not working at my report, I was preparing for my exam.

Утвердительная форма	Вопросительная форма	Отрицательная форма
I (he, she, it) was revising We (you, they) were reading	Was I (he, she, it) studying? Were we (you, they) reading?	I (he, she, it) wasn't revising We (you, they) weren't reading

Past Continuous употребляется:

а. для выражения действия, которое происходило в определенный момент в прошлом:
What **were you doing** at five yesterday?
Время в прошлом может быть выражено придаточным предложением, в котором используется Past Simple: **They were having** dinner when I came.
What **were you doing** when I phoned you?
My son **was reading** for his exams when his friend came to see him
б. для описания фоновых событий:
It was getting dark. A cold wind was blowing and it was raining.
в. для описания двух и более одновременных процессов:
I was revising for my Exam while my friend was searching the Net.

THE FUTURE CONTINUOUS TENSE
1. Утвердительная форма **The Future Continuous Tense** образуется при помощи will, глагола be и смыслового глагола с окончанием -ing.
I (you, we, they, he, she, it) **will be** working.

2. Вопросительная форма **The Future Continuous Tense** образуется при помощи глагола will, который ставятся перед подлежащим и be+глагол с окончанием –ing, которые остаются за подежащим:

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Will you be revising for your exam at 5 o'clock tomorrow?
Will he be working?
What will you be doing when I come from work?
Will you be revising or reading when I return from work?

3. Отрицательная форма **The Future Continuous Tense** образуется при помощи глагола will и отрицательной частицы not (will not (won/t)), глагола be +глагол с окончанием –ing : I won't be doing my English when you finish your tasks.

Утвердительная форма	Вопросительная форма	Отрицательная форма
I (he, she, it, we, you, they) will be reading	Will I (he, she, it, we, you, they) be reading?	I (he, she, it, we, you, they) won't be reading

The Future Continuous Tense употребляется:

а. для выражения действия, которое будет происходить в определенный момент в будущем:
We will be waiting for you when you return home.

Упражнения

Упражнение 1. Поставьте глаголы в предложениях в The Present Continuous Tense. Например: He (to work) in the lab. He is working in the lab.

1. He (to search) the Net. He (to try) to find information for his report.
2. Why you (to look) at me like that?
3. She (to get) ready for the party.
4. He (to chat) with his girl friend on the phone.
5. I stopped doing sport. I (to learn) English as I (to go) to England this summer.
6. I (not to watch) TV. I (to cook).
7. Call her back later. She (to have) a shower.
8. He (to open) the door of his car.
9. They (to laugh) in the corridor.
10. We (not to leave) tomorrow. We (to leave) on Monday.

Упражнение 2. Поставьте глаголы в предложениях в The Past Continuous Tense. Например: He (to work) in the lab at 5 o'clock yesterday. He was working in the lab at 5 o'clock yesterday.

1. He (to write) his report at 5 o'clock yesterday.
2. She (not to listen) to music at 11 o'clock yesterday. She (to shop).
3. I (to cook) dinner while my friend (to write) a letter to his mother.
4. They (to quarrel) while they (shop).
5. He (to sing) while he (to shave).
6. What you (to do) at 7 o'clock yesterday?
7. Where you (to go) when I saw you?
8. When you (to talk) to your friend?
9. He (to work) in the garden when I called him?
10. I (not to chat) to my friend. I (to investigate) the disappearance of dinner from the fridge.

Упражнение 3. Поставьте глаголы в предложениях в The Future Continuous Tense.

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Например: He (to work) in the lab at 5 o'clock tomorrow. He will be working in the lab at 5 o'clock tomorrow.

1. We (to wait) for you at the station at 3 o'clock tomorrow.
2. They (to work) in the garden at 5 o'clock tomorrow while I (to prepare) for the test.
3. Do not call her at 5. She (to cook) dinner.
4. They (to watch) a new film when I come home.
5. She (to have) her hair cut at 5 o'clock, so she will not be able to cook dinner.
6. I (to sleep) when you come home, so do not make noise!
7. She (not to shop) at 3 o'clock tomorrow.
8. They (to bake) a cake together at 5 o'clock tomorrow.
9. He (to work) the whole evening tomorrow.
10. I (not to go) home at 5. I (to drive).

Упражнение 4. Поставьте глаголы в предложениях в The Present Simple or Continuous Tense.

Например: He (not take) exam every year. He does not take exams every year.
My teacher (not to give) a lecture now. My teacher is not giving a lecture now.

1. I (like) to learn foreign languages. So now I (to learn) Spanish. It (to be) so melodious.
2. I (not to know) what he (to do) now. I (think) he (to do) his homework.
3. She (not to drink) coffee at all! Why she (to drink) it now?
4. They (to leave) for Moscow tomorrow. The train (to leave) at 5 o'clock.
5. Why you (to shout)? I (not to understand) what you (to say).
6. She (to wash) up. She always (to wash) up when she (to find) it difficult to fall a sleep. It always (to work).
7. Why you (to disagree) with me? It (to annoy) me.
8. You (to understand) the rule she (to try) to explain.
9. You always (to put) too much salt in soup. It (to spoil) the taste.
10. I never (to answer) the phone when I (to drive).

Упражнение 5. Поставьте глаголы в предложениях в The Past Simple or Continuous Tense.

Например: I (not to go) to the university yesterday. I did not go to the university yesterday.
The students (to work) in the lab the whole day yesterday. The students were working in the lab the whole day yesterday.

1. According to the legend Mendeleyev (to see) the periodic table when he (to sleep).
2. Newton (to have) a rest under an apple tree, when an apple (to fall) down and (to hit) him on the head.
3. She (to print) out her report when the printer broke down.
4. When I (to prepare) for the test, the light (to go) out, so I (to take) out a candle and (to light) it up.
5. He (to copy) from her work when the teacher (to notice) it and (to ask) him to leave the classroom.
6. I (to fuel) my car, when a man (to open) the door of my car and (to snatch) my bag!
7. I (not to realize) what I (to do).
8. He (to stand) in the queue when a masked man (to rush) into the shop and (to start) shooting.
9. We (to listen) to the president's New Year address, when somebody (to knock) at the door .

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10. They (to watch) *Romeo and Juliet* when a fire (to break) out. The performance (to stop) and everyone (to hurry) to the exit.

Упражнени к тексту 2

Упражнение 1. Переведите слова на русский язык. Выучите их наизусть.
Literate
Emerged
Inherit
Capture
Plunder
Turbulent
Coincide
Scholarly (and not-so-scholarly) speculation
Celestial divination
Take to (making long lists)
Predictions of astronomical phenomena.
Shorthand
Token
Linear and quadratic equations
Computation
Multiplication
Square roots
Reciprocals

Упражнение 2. Прочитайте текст. Переведите его письменно на русский язык.

Mathematics in Babylon

When people speak of Mesopotamian mathematics as Babylonian, they are usually referring to Old Babylonian mathematics. During this period the literate elites, the scribes, the doctors, the teachers of language, literature and mathematics emerged as distinct professional groups. Inherited from bureaucratic and religious backgrounds is the characteristic style of Old Babylonian mathematics (and medicine and jurisprudence): a passion for lists, and an emphasis on algorithmic procedures, carving a complex world into numerous understandable cases.

In about 1600, while Egypt was falling to the Hyksos invasion, Mesopotamia was faced with troublesome northern neighbors. The Hittites captured and plundered Babylon, but they did not stay and hold the territory. Into the vacuum thus created came the Kassites from the Zagros mountains to the northeast. The Kassite rule of Babylon lasted for four hundred years.

The last centuries of the second millennium were yet another turbulent time. Throughout the Near East and southern and eastern Europe mass movements of peoples coincided with the destruction of all major centers of civilization. The end of the Bronze Age is shrouded in mystery and provides a fertile ground for scholarly (and not-so-scholarly) speculation.

The next empire to arise in Mesopotamia came from a different quarter, the Assyrians in the northeast. The Assyrians lived in a narrow strip of land surrounded by enemies but they emerged to conquer the whole of Mesopotamia and hold it for three hundred difficult years.

With the Assyrians came an increased emphasis on celestial divination, providing a new occupation for Babylonian scholars. The Babylonians took to making long lists of astronomical observations and in time, this led to the development of mathematical astronomy, which used

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arithmetical schemes to produce extremely detailed tables of predictions of astronomical phenomena.

The last of the great Neo-Assyrian kings, Assurbanipal (669-627), collected a vast library at his palace at Nineveh. In 1849, this library was rediscovered by the British archaeologist, Sir Henry Layard, and the modern discipline of Assyriology was born.

Mathematics in Mesopotamia grew out of the necessities of record-keeping for administrative and trade purposes. Starting around 7000, we find the use of clay tokens to represent stores and traded goods. To begin with, one token would represent one sheep, or one unit of grain. The next step was the development of symbols as a shorthand to stand for different quantities, so a sphere or pyramid of clay would mean, say, 5 or 10 sheep or units of grain. In order to keep a secure record of a transaction, the tokens were sealed inside a clay envelope. The outside of the envelope was marked with the tokens, so that you would know what was inside without having to break the envelope. Anyone reading the outside of the envelope was reading marks of shorthand symbols. Learning to manipulate the marks and create further generalizations and abstractions is the story of mathematics.

By 3000 B.C., these marks had evolved into complex systems of numbers, capable of recording very large quantities of goods. The number systems were still metrological in nature. That is, a scribe used different collections of signs for recording quantities of sheep or grain.

By the Old Babylonian period of around 2000 B.C. there was a fully-developed mathematics. Thousands of mathematical and economic tablets have been recovered. They detail an impressive knowledge of arithmetic, a great facility with what we would consider as linear and quadratic equations, numerous geometrical constructions and computations. There are multiplication tables, tables of squares, square roots, reciprocals, common constants. However, since most mathematics was applied, problems tended to be stated, and answers had to be given in particular units of weights and measures.

Babylonian mathematics does not seem to have changed much in the next 1500 years. The next great flowering we know of was the development of mathematical astronomy in the late Babylonian period of the last few centuries B.C.

Sumerian metrological numeration systems

By about 3000 BC, the Sumerians were drawing images of tokens on clay tablets. At this point, different types of goods were represented by different symbols, and multiple quantities represented by repetition. Three units of grain were denoted by three 'grain-marks', five jars of oil were denoted by five 'oil-marks' and so on.

There are two important limitations to such a system. Firstly, every different type of good for which you want to make a record must have its own distinctive sign. The second limitation concerns not the range of goods available, but their quantity. Recording a delivery or disbursement of three jars of oil by writing the oil-jar symbol three times is simple and convenient. Recording a delivery or disbursement of several hundred jars of oil the same way is no longer so convenient and is also a system to prone to error.

The first great innovation after the act of writing was the separation of the quantity of the good from the symbol for the good. That is, to represent three units of grain by a symbol for 'three' followed by a symbol for 'grain-unit' in the same way that we would write 3 sheep or 3 cows or, more generally, 3 liters or 3 kilometers. A system of this sort is a metrological numeration system, a system of weights and measures.

Упражнение 3. Ответьте на вопросы.

1. What is characteristic of Old Babylonian mathematics?
2. What troubled did Mesopotamia experience in about 1600? What was the result of this invasion?

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3. In what way did the problems in the Middle East coincide with the situation in Europe?
4. What was the influence of the Assyrian invasion on the Mesopotamian Mathematics? Why is it so?
5. What did mathematics in Mesopotamia grow out of? What did the people use tokens for? What was the nature of the number system?
6. Were the developments impressive? Name them. Why did not they change much in the next 1500 years, in your opinion? Do we still use these ancient inventions?
7. What were two important limitations to such a system? Were they overcome? How?
8. What was the first great innovation?
9. How are such systems called?
10. What elements of Mesopotamian mathematics still exist now? Can you name them?

Упражнение 4. Найдите в тексте времена групп Simple и Continuous. Объясните употребление времен. Объясните, почему в тексте не используются формы будущего времени?

Упражнение 5. Задайте письменно пять типов вопросов к предложениям из текста:

1. Modern scholars are referring to Old Babylonian mathematics.
2. In about 1600 Egypt was falling to the Hyksos invasion.
3. By about 3000 BC, the Sumerians were drawing images of tokens on clay tablets.
4. We use the same number signs, regardless of their metrological meaning

Упражнение 6. Поставьте глаголы в абзаце текста в Present/Past Simple илиPresent/Past Continuous.

Mesopotamia (to derive) its name and existence from the rivers Tigris and Euphrates. These two rivers (to create) the Fertile Crescent in the midst of surrounding inhospitable territory. The space we (to call) Mesopotamia (to be) roughly the same as that of the modern country of Iraq.

About ten thousand years ago, the people of this area (to begin) the agricultural revolution. At that time they (not to hunt) and (not to gather) their food, they (to domesticate) plants and animals. They (to live) in houses built from reeds or mud-brick. They (to build) granaries to store their grain, and they (to begin) developing a token system to record trade and accounts.

Between 3500 and 3000, for reasons still not well understood, the civilization of Southern Mesopotamia (to undergo) a sudden growth and change. In this same period came the beginnings of writing, metrological systems and arithmetic.

More than a dozen different such systems (to be) known today.

Over the next 500 years, writing gradually developed into the cuneiform script. Cuneiform (to mean) "wedge-shaped" and (to refer) to the way scribes (to write) marks on wet clay, using the cut tip of a stylus.

Упражнение 7. Заполните пропуски в тексте предложенными словами по смыслу: base, confusion, counting, calculations, equivalents, introduction, intermediate, system, sign, symbols, multiples, metrological, millennium, mean, problem, pair, vertical, solution.

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Yet another … was used for measuring grain capacity. Here the conversion factors were 5, 10, 3, and 10, so that the largest unit, a large cone containing a small circle, was worth 10x3x10x5=1500 of the small units.

Adding to the … for modern scholars attempting to unravel these complex … systems was the fact that a single … might be used in several systems, where it could mean …different of the base unit. In particular, the small circle could mean 6, 10 or 18 small cones, depending on context (as well as other multiples of base units denoted by other…).

Gradually, over the course of the third…, these signs were replaced by cuneiform … so that numbers could be written with the same stylus that was being used for the words in the text.

The final step in this story, occurring probably some time in the Ur III period, right at the end of the third millennium, was the … of a sexagesimal place value system. The number of signs was reduced to just two: a vertical wedge derived from the small cone often used for the … unit, and a corner wedge, derived from the small circle. The corner wedge had a value of ten … wedges. In the sexagesimal… system described above, the next size unit was the large cone, worth six circles. In the place value system, this unit was denoted by the same-sized vertical wedge as the base unit, and it was worth six corner wedges. Now the … of symbols could be repeated in an indefinitely larger alternating series of corner and vertical wedges, always keeping the same conversion factors of 10 and 6. The price paid was that a vertical wedge could now … 1, or 60 (6x10), or 3600 (60x60), and so on. Its actual value was determined by its *place*.

The sexagesimal place-value system greatly facilitated…, but, of course, at the end of the day, the final answer had to be translated back into the underlying metrological system of units. So a …would be stated in proper units and the …would be given in proper units, but the … calculations were carried out in the new sexagesimal place value system.

Упражнение 8. Перескажите текст из упражнения 2.

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Урок 3
Времена группы «Perfect»

Времена группы «Perfect» образуются с помощью вспомогательного глагола **"to have"** и формой страдательного причастия (participle II) основного глагола (правильный глагол с окончанием –ed (published) или неправильный- в форме страдательного причастия (spoken))**:**
He **has written** to his friend.
He **had written** to his friend.
He **will have written** for his friends.

THE PRESENT PERFECT TENSE

1. Утвердительная форма **The Present Perfect Tense** образуется при помощи личной формы глагола to have в настоящем времени (have/has) и смыслового глагола в форме страдательного причастия.
I (you, we, they) have finished/ spoken.
He (she, he) has finished/spoken.

2. Вопросительная форма **The Present Perfect Tense** образуется при помощи форм глаголов to have (have/ has), которые ставятся перед подлежащим:
Have you finished your composition yet?
Has he passed his exams?
What have you prepared for today?
Have you printed out your report or have you forgotten about it?

3. Отрицательная форма **The Present Perfect Tense** образуется при помощи форм глаголов to have (have/has) и отрицательной частицы not (have not (haven't)/has not (hasn't)):
I have not prepared my presentation.

Утвердительная форма	Вопросительная форма	Отрицательная форма
I (we, you, they) have bought it He (she, it) has bought it	Have I (we, you, they) bought it? Has he (she, it) bought it?	I (you, we, they) haven't bought it He (she, it) hasn't bought it

The Present Perfect Tense используется:

а. для обозначения результата действия, особенно когда время совершения действия неизвестно или указано время в настоящем (today, this year):

They have repaired their house (this year).

б. для обозначения результата действия вместе с наречиями already= so far-уже, yet – еще не (вместо "already" в вопросительных и отрицательных предложениях), still-, just- только что, ever- когда-нибудь, never- никогда, lately/recently/ of late-недавно:

He has already left.
My classes haven't finished yet.

с. вместе с союзами for- в течение, since – с (особенно с глаголами состояния):

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I have known him for ten years.

THE PAST PERFECT TENSE

1. Утвердительная форма прошедшего совершенного времени образуется при помощи вспомогательного глагола to have в прошедшем неопределенном времени had и страдательного причастия (Participle II)смыслового глагола:
She had hidden her letter by the time I came home.
They had come back by three o'clock yesterday.

2. Для образования вопросительной формы **The Past Perfect Tense** вспомогательный глагол had ставится перед подлежащим, а страдательное причастие смыслового глагола - после подлежащего:
Had she hidden her letter when I came in?
Had they come back by three o'clock yesterday?
What had she hidden?
Had she or he hidden the letter?
3. Для образования отрицательной формы **The Past Perfect Tense** после вспомогательного глагола had ставится отрицательная частица not:
He had not hidden a letter when I came in.
They had not come back by three o'clock yesterday.
В разговорной речи часто употребляется сокращенная отрицательная форма:
They hadn't come back by three o'clock yesterday.

Утвердительная форма	Вопросительная форма	Отрицательная форма
I (we, you, they, he, she, it) had finished it	Had I (we, you, they, he, she, it) finished it?	I (you, we, they, he, she, it) hadn’t finished it

The Past Perfect Tense употребляется:

a. Для выражения действия, закончившегося до указанного момента времени в прошлом, который может быть выражен точной датой, часом и т.д.:

We had finished our work by five o'clock.

b. Для выражения действия, предшествовавшего другому действию в прошлом:

He had hidden his letter , when the door was suddenly flang open and his wife rushed into the room.

THE FUTURE PERFECT TENSE

1. Утвердительная форма **The Future Perfect Tense** образуется при помощи вспомогательного глагола to have в будущем времени will have и страдательного причастия (Participle II) смыслового глагола:

He will have hidden her letter by the time I come home.
They will have come back by three o'clock tomorrow.

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2. Для образования вопросительной формы **The Future Perfect Tense** вспомогательный глагол will ставится перед подлежащим, a have и страдательное причастие смыслового глагола - после подлежащего:

Will she have hidden her letter when I come in?
Will they have come back by three o'clock tomorrow?
What will she have hidden?
Will she or he have hidden the letter?

3. Для образования отрицательной формы **The Future Perfect Tense** после вспомогательного глагола will ставится отрицательная частица not (won't):

He won't have hidden a letter by the time I come home.
They had not come back by three o'clock yesterday.

Утвердительная форма	Вопросительная форма	Отрицательная форма
I (we, you, they, he, she, it) will have finished it	Will I (we, you, they, he, she, it) have finished it?	I (you, we, they, he, she, it) won't have finished it

The Future Perfect Tense используется, когда речь идёт о действии, которое должно закончиться до определённого момента в будущем:

The exam will have finished by 1 p.m.

Упражнения

Упражнение 1. Поставьте глаголы в предложениях Present Perfect tense.
Например: She (to translate) the text. She has translated the text.

1. He (not to finish) to prepare for exam yet.
2. She already (to discuss) her report with the tutor.
3. They (to go) to Moscow to attend the conference.
4. I (not to realize) that is so serious.
5. We (to do) the equations.
6. You (to print) out the document?
7. What you (to prepare) for today?
8. We never (to been) abroad.
9. They (not to read) the document yet.
10. What you (to do) with my dictionary?

Упражнение 2. Поставьте глаголы в предложениях в Past Perfect tense.
Например: She (to translate) the text by 3 o'clock yesterday. She had translated the text by 3 o'clock yesterday.

1. They (to publish) the results by the end of the year.
2. I (to complete) the research by September.
3. I showed him the work I (to do).
4. They said they (not to apply) for the job yet.
5. She was given the document she (to ask) for.
6. They did not hear what he (to say).

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7. I (to forget) what I (to lean).
8. I was sorry he (not to pass) the exam.
9. He did not recognize her because she (to change) a lot.
10. Analytical methods (to come) into use by 1830.
11. While the mass movements all around them (to bring) down one nation after another, the Assyrians (to hold) onto their territory, and indeed, kept one dynasty for over two hundred years. They (to mature) as a people, and built up a fearsome military reputation.

Упражнение 3. Поставьте глаголы в предложениях в Future Perfect tense.
Например: She (to translate) the text by 3 o'clock tomorrow. She will have translated the text by 3 o'clock tomorrow.

1. They (to publish) the report by tomorrow?
2. I (to sort) out the problem by the time you return.
3. They (not to come) back by 12 o'clock.
4. She (not to finish) her composition by 5 o'clock.
5. I (to manage) to get the results by the end of the week.
6. You (to return) by the end of the month.
7. They (to do) it by Monday.
8. We (to get) the results by the end of the year and even (to make) them public.
9. She (to be) married by the end of the month and (to go) on her honey moon.
10. He (to get) his Ph. D by June.

Упражнение 4. Поставьте глаголы в скобках в Past Simple или Past Perfect.

1. Isaac Newton (to be) born in Lincolnshire. His father, who (to die) shortly before Newton (to be) born, (to be) a yeoman farmer.
2. He (not to have) any interest for general society or for any pursuits save science and mathematics. Luckily he (to keep) a diary.
3. He (not to read) any mathematics before coming to Cambridge. At the beginning of his first October term he (to happen) to stroll down to Stourbridge Fair, and there (to pick) up a book on astrology, but could not understand it on account of the geometry and trigonometry. He therefore (to buy) a Euclid, and (to be) surprised to find how obvious the propositions (to seem). He also (to attend)Barrow's lectures.
4. At a later time, on reading Euclid more carefully, he (to form) a high opinion of it as an instrument of education, and he (to use) to express his regret that he (not to apply) himself to geometry before proceeding to algebraic analysis.
5. By 1665 (to take) is B.A. It (to be) about the same time that he (to discover) the binomial theorem.
6. By that time he and several physicists (to conjecture) from Kepler's third law that the attraction of the earth on a body would be found to decrease as the body was removed farther away from the earth inversely as the square of the distance from the centre of the earth. In 1679, when he (to repeat) the investigation, *TM'* (to be) found to have the value which (to be) required by the hypothesis, and the verification (to be) complete; but in 1666 his estimate of the distance of the moon (to be) inaccurate, and when he (to make) the calculation he (to find) that *TM'* (to be) about one-eighth less than it ought to have been on his hypothesis.
7. When he (to return) to Cambridge in 1667 Barrow and Collins (to ask) to edit and add notes to a translation of Kinckhuysen's *Algebra*; he (to consent) to do this, but on condition that his name should not appear in the matter.

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8. In 1670 he also (to begin) a systematic exposition of his analysis by infinite series. This work (to be) never finished: the fragment (to be) published in 1711, but he (to print)the substance of it as an appendix to the *Optics* by 1704.
9. When first appointed Newton (to choose) optics for the subject of his lectures and researches, and by the end of 1669 he (to work) out the details of his discovery of the decomposition of a ray of white light into rays of different colours by means of a prism. The complete explanation of the theory of the rainbow (to follow) from this discovery
10. By a curious chapter of accidents Newton (to fail) to correct the chromatic aberration of two colours by means of a couple of prisms. He therefore (to abandon) the hope of making a refracting telescope which should be achromatic, and instead (to design) a reflecting telescope, probably on the modal of a small one which he (to make) in 1668. In 1672 he (to invent) a reflecting microscope, and some years later he (to invent) the sextant which (to be) rediscovered by J. Hadley in 1731.
11. By 1669 he, at Collins's request, (to solve) some problems on harmonic series and on annuities which previously (to baffle).
12. Many geometricians from the time of Apollonius (to try) to find a geometrical solution and (to fail), but what (to prove) insuperable to his predecessors seems to have presented little difficulty to Newton who (to give) an elegant demonstration that the locus (to be) a conic.

Упражнение 5. Употребите глаголы в скобках в Present Simple, Past Simple, Past Continuous или Past Perfect.

Hypatia

Hypatia (to be) the daughter of Theon of Alexandria who (to be) a teacher of mathematics with the Museum of Alexandria in Egypt. A center of Greek intellectual and cultural life, the Museum (to include) many independent schools and the great library of Alexandria.

Hypatia (to study) with her father, and with many others including Plutarch the Younger. She herself (to teach) at the Neoplatonist school of philosophy. She (to become) the salaried director of this school by 400. She probably (to write) on mathematics, astronomy and philosophy, including about the motions of the planets, about number theory and about conic sections.

Hypatia (to correspond) with and (to host) scholars from others cities. Synesius, Bishop of Ptolemais, (to be) one of her correspondents and he (to visit) her frequently. Hypatia (to be) a popular lecturer, drawing students from many parts of the empire.

From the little historical information about Hypatia that (survive), it (to appear) that she (to invent) the plane astrolabe, the graduated brass hydrometer and the hydroscope, with Synesius of Greece, who (to be) her student and later colleague.

Hypatia (to dress) in the clothing of a scholar or teacher, rather than in women's clothing. She (to move) about freely, driving her own chariot, contrary to the norm for women's public behavior. She (to exert) considerable political influence in the city.

Orestes, the governor of Alexandria, like Hypatia, (to be) a pagan (non-Christian). Orestes (to be) an adversary of the new Christian bishop, Cyril, a future saint. Orestes, according to the contemporary accounts, (to be) murdered after he (to object) to Cyril expelling the Jews from the city.

Cyril probably (to object) to Hypatia on a number of counts: She (to represent) heretical teachings, including experimental science and pagan religion. She (to be) an associate of Orestes. And she (to be) a woman who (not to know) her place. As a result a mob led by fanatical Christian monks in 415 (to attack) Hypatia as she (to drive) her chariot through Alexandria. It (to turn) out that it (to be) Cyril's preaching against Hypatia that (to incite) the mob. They (to drag)

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her from her chariot and, according to accounts from that time, (to strip) her, (to kill) her, (to strip) her flesh from her bones, (to scatter) her body parts through the streets, and (to burn) some remaining parts of her body in the library of Caesareum.

Hypatia's students (to flee) to Athens, where the study of mathematics (to flourish) after that. The Neoplatonic school, she (to head), (to continue) in Alexandria until the Arabs (to invade) in 642.

The works of Hypatia (to be) destroyed because the Arab conquerors (to burn) it and (to use) fuel for baths.

We (to know) her writings today through the works of others who (to quote) her -- even if unfavorably -- and a few letters written to her by contemporaries.

Упражнение 6. Переведите на английский язык письменно, используя изученные времена.

Римские цифры (Roman numerals)

Римская система нумерации с помощью букв была распространена в Европе на протяжении двух тысяч лет. Только в позднем средневековье ее сменила более удобная для вычислений десятичная система цифр, которую европейцы заимствовали у арабов. Но, до сих пор мы используем римские цифры для обозначения дат на монументах, времени на часах и (в англо-американской типографической традиции) страницы книжных предисловий. Кроме того, в русском языке римскими цифрами часто обозначают порядковые числительные.

Для обозначения чисел римляне применяли 7 букв латинского алфавита: I = 1, V = 5, X = 10, L = 50, C = 100, D = 500, M = 1000. Они образовывали промежуточные числа путем прибавления нескольких букв справа или слева. Сначала они писали тысячи и сотни, затем десятки и единицы. Таким образом, число 24 изображалось как XXIV. Горизонтальная линия над символом означала умножение на тысячу.

Натуральные числа записываются при помощи повторения этих цифр. При этом, если большая цифра стоит перед меньшей, то они складываются (принцип сложения), если же меньшая - перед большей, то меньшая вычитается из большей (принцип вычитания). Последнее правило применяется только во избежание четырёхкратного повторения одной и той же цифры. Например, мы ставим I, X, C соответственно перед X, C, M для обозначения 9, 90, 900 или перед V, L, D для обозначения 4, 40, 400. Например, VI = 5+1 = 6, IV = 5 - 1 = 4 (вместо IIII). XIX = 10 + 10 - 1 = 19 (вместо XVIIII), XL = 50 - 10 =40 (вместо XXXX), XXXIII = 10 + 10 + 10 + 1 + 1 + 1 = 33 и т.д.

Выполнение арифметических действий над многозначными числами в этой записи весьма неудобно. Система Римских цифр настоящее время не применяется, за исключением, в отдельных случаях, обозначения веков (XV век и т.д.), годов н. э. (MCMLXXVII т. д.) и месяцев при указании дат (например, 1. V.1975), порядковых числительных,

а также иногда производных небольших порядков, больших трёх: yIV, yV и т.д

Задания к тексту 3.

Упражнение 1. Переведите слова на русский язык. Выучите их наизусть.

The rectification of the ellipse

Theorem in attractions

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Homogeneous ellipsoid
Devote
To be knighted
A multiple
Contemporary
To bring into vogue
Employment
Constant assumption of non-evident principles
Trigonometry
A historical treatise
Universally respected
A caustic wit
Unsoundness of some methods
Exercise much influence on
Partisan

Упражнение 2. Прочитайте текст. Переведите его письменно на русский язык.

Great English Mathematicians of the 18th century (extract)

Almost the only English mathematician at the beginning of this century who used analytical methods before the creation of The Cambridge Analytical School, and whose work requires mentioning here, is Sir James Ivory, a Scottish mathematician, and his celebrated theorem in attractions. Ivory was born in Dundee and attended Dundee Grammar School. In 1779 he entered the University of St Andrews, distinguishing himself especially in mathematics. He then studied theology; but, after two sessions at St Andrews and one at Edinburgh University, he abandoned all idea of the church, and in 1786 he became an assistant-teacher of mathematics and natural philosophy in the newly established Dundee Academy. Three years later he became partner in, and manager of, a flax spinning company at Douglastown in Forfarshire, still devoting moments of leisure to his favourite studies. He was essentially a self-trained mathematician, and was not only deeply versed in ancient and modern geometry, but also had a full knowledge of the analytical methods and discoveries of the continental mathematicians.

His earliest memoir, dealing with an analytical expression for the rectification of the ellipse, is published in the Transactions of the Royal Society of Edinburgh (1796); and this and his later papers on Cubic Equations (1799) and Kepler's Problem (1802) evince great facility in the handling of algebraic formulae. In 1804 after the dissolution of the flax-spinning company of which he was manager, he obtained one of the mathematical chairs in the Royal Military College at Marlow (afterwards removed to Sandhurst); and until the year 1816, when failing health obliged him to resign, he discharged his professional duties with remarkable success.

During this period he published in the Philosophical Transactions several important memoirs, which earned for him the Copley Medal in 1814 and ensured his election as a Fellow of the Royal Society in 1815. Of special importance in the history of attractions is the first of these earlier memoirs, in which the problem of the attraction of a homogeneous ellipsoid upon an external point is reduced to the simpler case of the attraction of another but related ellipsoid upon a corresponding point interior to it. This theorem is known as **Ivory's theorem**. His later papers in the Philosophical Transactions treat of astronomical refractions, of planetary perturbations, of equilibrium of fluid masses, etc. For his investigations in the first named of these he received a royal medal in 1826 and again in 1839.

In 1831, on the recommendation of Lord Brougham, he was knighted. King William IV granted him a pension of £300 per annum, and conferred on him the Hanoverian Guelphic order of knighthood. Besides being directly connected with the chief scientific societies of his own country, he was a corresponding member of the Royal Academy of Sciences both of Paris and Berlin, and of the Royal Society of Göttingen.

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Towards the beginning of the century the more thoughtful members of the Cambridge school of mathematics began to recognize that their isolation from their continental contemporaries was a serious evil. The earliest attempt in England to explain the notation and methods of the calculus as used on the continent was due to Woodhouse, who stands out as the apostle of the new movement. It is doubtful if he could have brought the analytical methods into vogue by himself; but his views were enthusiastically adopted by three students, Peacock, Babbage and Herschel, who succeeded in carrying out the reforms he had suggested.

Robert Woodhouse was born at Norwich on April 28, 1773; was educated at Caius College, Cambridge, of which society he was subsequently a fellow; was Plumian professor in the university; and continued to live at Cambridge till his death on December 23, 1827.

Woodhouse's earliest work, entitled the Principles of Analytical Calculation, was published at Cambridge in 1803. In this he explained the differential notation and strongly pressed the employment of it; but he severely criticized the methods used by continental writers, and their constant assumption of non-evident principles. This was followed in 1809 by a trigonometry (plane and spherical), and in 1810 by a historical treatise on the calculus of variations and isoperimetrical problems. He next produced an astronomy; of which the first book (usually bound in two volumes), on practical and descriptive astronomy, was issued in 1812, and the second book, containing an account of the treatment of physical astronomy by Laplace and other continental writers, was issued in 1818. All these works deal critically with the scientific foundation of the subjects considered - a point which is not infrequently neglected in modern textbooks.

A man like Woodhouse, of scrupulous honour, universally respected, a trained logician, and with a caustic wit, was well fitted to introduce a new system; and the fact that when he first called attention to the continental analysis he exposed the unsoundness of some of the usual methods of establishing it, more like an opponent than a partisan, was as politic as it was honest. Woodhouse did not exercise much influence on the majority of his contemporaries, and the movement might have died away for the time being if it had not been for the advocacy of Peacock, Babbage, and Herschel, who formed an Analytical Society, with the object of advocating the general use in the university of analytical methods and of the differential notation.

Упражнение 3. Ответьте на вопросы.

1. Was Sir James Ivory seriously interested in mathematics? Where did he get his education?
2. What were his papers mainly devoted to?
3. What did he get a Copley Medal for? What is the essence of his theorem?
4. How was he honoured by the king?
5. Why, in your opinion, the more thoughtful members of the Cambridge school of mathematics begin to recognize that their isolation from their continental contemporaries as an evil? Why is Woodhouse called the apostle of the new movement? Who succeeded him?
6. When and where was Robert Woodhouse born?
7. What was the title of his first work? When as it published? What did he try to explain in it?
8. What did he criticize the continental writers?
9. What were his interests focused on?
10. Did he exercise much influence on the majority of his contemporaries? Why is he still remembered?

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Упражнение 4. Найдите в тексте времена групп Simple и Perfect. Объясните употребление времен. Объясните, почему в тексте не используются формы будущего времени и формы Continuous?

Упражнение 5. Задайте письменно пять типов вопросов к предложениям из текста:

1. He had suggested the reforms.
2. He next produced an astronomy.
3. His later papers treat of astronomical refractions.
4. Herschel succeeded in carrying out the reforms.
5. These works dealt critically with the scientific foundation of the subjects considered.

Упражнение 6. Употребите глаголы в скобках в одном из изученных в этом и предыдущих уроках времен.

ARABIC NUMERALS

The system of numeration employed throughout the greater part of the world today (to be) probably developed in India, but because it (to be) the Arabs who (to transmit) this system to the West the numerals, it (to use), (to come) to be called Arabic.

After extending Islam throughout the Middle East, the Arabs (to begin) to assimilate the cultures of the peoples they (to subdue). One of the great centers of learning (to be) Baghdad, where Arab, Greek, Persian, Jewish, and other scholars (to pool) their cultural heritages and where in 771 an Indian scholar (to appeare), bringing with him a treatise on astronomy using the Indian numerical system.

Until that time the Egyptian, Greek, and other cultures (to use) their own numerals in a manner similar to that of the Romans.

The Egyptians actually (write) them from right to left, but they (to) set down above from left to right to call attention to the similarities of the systems.

The Indian contribution (to be) to substitute a single sign (in this case meaning "3" and meaning "2") indicating the number of signs in each cluster of similar signs. In this manner the Indians would render Roman CCC XX 111 as: 3 2 3.

This new way of writing numbers (to be) economical but not flawless. The Roman numeral CCC II, for instance, (to present) a problem. If a 3 and a 2 respectively (to be) substituted for the Roman clusters CCC and II, the written result was 32. Clearly, the number intended was not thirty-two but three hundred and two. The Arab scholars (to perceive) that a sign representing "nothing" or "nought" (to be) required because the place of a sign gave as much information as its unitary value (to do). The place (to have) to be shown even if the sign which (to show) it (to indicate) a unitary value of "nothing." It (to be) uncertain whether the Arabs or the Indians (to fill) this need by inventing the zero, but in any case the problem (to be) solved: now the new system could show neatly the difference between XXX II (32) and CCC II (302).

If the origin of this new method (to be) Indian, it (not to be) at all certain that the original shapes of the Arabic numerals also (to be) Indian. In fact, it (to seem) quite possible that the Arab scholars (to use) their own numerals but (to manipulate) them in the Indian way. The Indian way (to have) the advantage of using much smaller clusters of symbols and greatly simplifying written computations. The modern forms of the individual numbers in both eastern Arabic and western Arabic, or European, (to appear) to have evolved from letters of the Arabic alphabet.

The Semites and Greeks traditionally (to assign) numerical values to their letters and (to use) them as numerals. This alphabetical system (to be) still used by the Arabs, much as Roman numerals (to be) used in the West for outlines and in enumerating kings, emperors, and popes. The new mathematical principle on which the Arabic numerals (to be) based greatly (to simplify)

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arithmetic. Their adoption in Europe (to begin) in the tenth century after an Arabic mathematical treatise (to be) translated by a scholar in Spain and spread throughout the West.

Упражнение 7. Перескажите текст из упражнения 2 или 6.

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Урок 4

Времена группы «Perfect Continuous»

Времена группы «Perfect Continuous» образуются с помощью вспомогательного глагола “to be” в форме Perfect и формой действительного причастия (participle I) основного глагола (глагол с окончанием -ing)**:**
I **have been working/**He **has been working** for two hours.
He **had been working** for two hours before the rain started.
He **will** already **have been working for two hours** before you come home.

THE PRESENT PERFECT CONTINUOUS TENSE
1. Утвердительная форма **The Present Perfect Continuous Tense** образуется при помощи вспомогательного глагола to be в настоящем совершенном времени (have been, has been) и действительного причастия (Participle I) смыслового глагола:
We have been studying English for three years.

2. Для образования вопросительной формы вспомогательный глагол to have (have/has) ставится перед подлежащим, а остальная часть временной формы - после подлежащего:
Have you been studying English for three years?

3. Для образования отрицательной формы после вспомогательного глагола to have (have/has) ставится отрицательная частица not (havn’t/hasn’t):
We have not been studying English for three years.

Утвердительная форма	Вопросительная форма	Отрицательная форма
I (you, we, they) have been working He (she, it) has been working	Have I (you, we, they) been working? Has he (she, it) been working?	I (you, we, they) have not been working He (she, it) has not been working

The Present Perfect Continuous Tense употребляется:
a. Для выражения действия, которое началось в прошлом и продолжается до настоящего момента определенный период, а иногда и в момент разговора:
We have been translating this article since twelve o'clock.

b. Для выражения действия, которое началось в прошлом, продолжалось в течение определенного периода и закончилось до момента речи или до определенного момента времени в настоящем. В этом случае обычно указывается, сколько времени длилось действие:
The house is full of wonderful smells. Mom has been cooking.

THE PAST PERFECT CONTINUOUS TENSE
1. Утвердительная форма **The Past Perfect Continuous Tense** образуется при помощи вспомогательного глагола to be в форме Past Perfect (had been) и действительного причастия (Participle I) смыслового глагола:
I had been searching for two hours before a managed to find the book I needed.

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2. Для образования вопросительной формы **The Past Perfect Continuous Tense** вспомогательный глагол to have (had) ставится перед подлежащим, а остальная часть временной формы - после подлежащего:
Had you been searching for the book for two hours.
What had you been searching for two hours?
3. Для образования отрицательной формы **The Past Perfect Continuous Tense** после вспомогательного глагола to have (had) ставится отрицательная частица not:
I had not been searching for the book for two hours.

Утвердительная форма	Вопросительная форма	Отрицательная форма
I (you, we, they, he, she, it) had been working	Had I (you, we, they, he, she, it) been working?	I (you, we, they, he, she, it) had not been working

The Past Continuous Perfect Tense употребляется для обозначения действия, начавшегося до какого-то момента в прошлом, протекавшего в течение целого периода и закончившегося до определенного момента в прошлом.

He looked very tired when I came to his place for he had been preparing for his exams for several days.

THE FUTURE PERFECT CONTINUOUS TENSE)
1. Утвердительная форма **The Future Perfect Continuous Tense** образуется при помощи вспомогательного глагола to be в будущем совершенном времени (will have been) и действительного причастия (Participle I) смыслового глагола.
2. Для образования вопросительной формы **The Future Perfect Continuous Tense** вспомогательный глагол will ставится перед подлежащим, а остальная часть временной формы - после подлежащего.
3. Для образования отрицательной формы **The Future Perfect Continuous Tense** после вспомогательного глагола will ставится отрицательная частица not.

Утвердительная форма	Вопросительная форма	Отрицательная форма
I (you, we, they, he, she, it) will have been working	Will I (you, we, they, he, she, it) have been working?	I (you, we, they, he, she, it) will not have been working

The Future Perfect Continuous Tense употребляется для выражения действия, которое начнется до определенного момента или периода времени в будущем, будет длиться определенный период и будет продолжаться вплоть до определенного момента в будущем.Употребляется эта форма редко:

By the end of September we shall have been living here for three years.

Упражнения

Упражнение 1. Поставьте глаголы в скобках в Present Perfect Continuous.
Например: They (to research) the issue for a year. They have been researching the issue for a year.

1. He (to run) for two ours without any rest. Tell him to stop.
2. Her eye are red. She (to cry).
3. I (to look) all over for you. Where have you been?
4. We (to argue) for two hours and haven’t found any solution yet.
5. The students (to take) and exam for 6 hours.

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6. The professor (to deliver) the lecture for 4 hours already. When will he stop?
7. The scientists (to research) the subject for two years without any visible results.
8. My friend (to live) here for 10 years.
9. You (to wait) long?
10. The secretary (to type) the document for an hour.

Упражнение 2. Поставьте глаголы в скобках в Past Perfect Continuous.
Например: They (to research) the issue for a year when the funding was cut off. They had been researching the issue for a year when the funding was cut off.

1. The child (to lie) in the snow for hours before someone heard his cry.
2. He (to study) English for 5 years before he took his FCE test.
3. They told me they (to carry) out the research for ten years.
4. The resident said he (to think) about the solution to the problem since he came into office.
5. You (to look) for on the Net for two hours when I told you to stop?
6. They (to sail) for 2 week when they finally saw the land.
7. He told me he (to wait) for her for half an hour in the rain.
8. The shoppers (to queue) since midnight when the doors flung open.
9. Her family (to live) there for 20 years.
10. I did not know that he (to work) at it for so many years.

Упражнение 3. Используя новые обстоятельства времени и дополнения, измените и запишите предложения, используя времена Present Perfect Simple и Present Perfect Continuous. Объясните, почему в некоторых предложениях возможна только одна форма.

1. My mom cooks cakes.
2. The scientist works in the institute.
3. She writes detective stories.
4. The students always talk at the lectures.
5. They know the truth.
6. I do not recognize you.
7. She always shouts at her dog.
8. What do you do?
9. I often drive to work.
10. Scientists carry out experiments.

Упражнение 4. Раскройте скобки, употребляя глаголы в Past Perfect Simple, Past Perfect Continuous, Past Continuous и Past Simple.

1. There (to be) 38 students in the classroom. They (to talk) as the lecture (not to come) and the class (not started).
2. They (to say) they (to get) impressive results.
3. She (to look) as if she (to cry) for the whole day. I (to ask) her why she (to cry).
4. When I (to come) to the university in the early my friend (to tell) me that all classes (to be) cancel, because the majority of my classmate (to fall) ill and it (to be) very cold in the classrooms.
5. He (not to tell) the police what he (to look) for in the laboratory.
6. I (not to tell) my parents I (not to pass) my exam.
7. I (not to believe) a single word she (to say).
8. The Judge (to inform) the first offender that he (to spoil) his chances for respectable life when he (to commit) the crime.

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9. She (to promise) to tell me what (to happen) to her family.
10. He (to come) home upset as his boss (to shout) at him.

Упражнение 5. Прочитайте текст, назовите , в каких временах вы использовали бы глаголы в тексте при переводе на английский язык. Объясните свой выбор.

- (Pierre-Simon Laplace) родился 23 марта 1749. Он был выдающимся французским математиком, физиком и астрономом. Он был известен работами в области небесной механики (celestial mechanics), дифференциальных уравнений, один из создателей теории вероятностей. Заслуги Лапласа в области чистой и прикладной математики и особенно в астрономии громадны: он усовершенствовал почти все отделы этих наук. Был членом Французского Географического общества.

Упражнение 6. Поставьте глаголы в скобках в нужное время.

Laplace's early published work in 1771 (to start) with differential equations and finite differences but he already (to start0 to think about the mathematical and philosophical concepts of probability and statistics. However, before his election to the *Académie* in 1773, he already (to draft) two papers that would establish his reputation. The first, *Mémoire sur la probabilité des causes par les événements* (to be) ultimately published in 1774 while the second paper, published in 1776, further (to elaborate) his statistical thinking and also (to begin) his systematic work on celestial mechanics and the stability of the solar system. The two disciplines would always be interlinked in his mind. Gerald James Whitrow, a British mathematician, cosmologist and science historian (to write): "Laplace (to take) probability as an instrument for repairing defects in knowledge."

Упражнение 7. Раскройте скобки, используя Present Simple, Present Perfect, Present Perfect Continuous, Future Perfect tenses.

Prime Numbers

One of the most important and beautiful fields of mathematics (to be) number theory - the study of numbers and their properties. Despite the fact that mathematicians (to study) numbers for as long as humans (to be) able to count, the field of number theory (to be) far from being outdated; some of the most exciting and important problems in mathematics today (to have) to do with the study of numbers. In particular, prime numbers (to be) of great interest.
Definition: A number p is prime if it (to be) a positive integer greater than 1 and is divisible by no other positive integers other than 1 and itself.
Positive integers greater than 1, that (no to be) prime, (to be) called composite integers.
Examples: 2,3, and 5 (to be) prime. 6 is composite. All positive integers n (to have) at least one prime divisor: if n (to be) prime, then it (to be) its own prime divisor. If n (to be) composite, and one (to factors) it completely, one (to reduce) n to prime factors.

Задания к тексту 4.

Упражнение 1. Переведите слова письменно на русский язык. Выучите их наизусть.

Tutor
Petition
Fulfill the required credits
Computation of the orbit of the comet
The board of trustees
Refuse her application

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Vote
A degree with highest honors
Alumna trustee
Earning her master's degree
Promote to associate professor
Pursue her mathematical research
Be on sabbatical leave
Teach part-time
Infect other students with the spark
Challenge

Упражнение 2. Прочитайте и переведите текст.

Winifred Edgerton Merrill (1861-1951)

Winifred Edgerton, the first American woman to receive a Ph.D. in mathematics, was born in Ripon, Wisconsin. She received her early education from private tutors before earning her B.A. degree from Wellesley College in 1883. After some work at Harvard she was allowed to study mathematics and astronomy at Columbia University. At the end of her second year she petitioned to receive a Ph.D. degree, having fulfilled the required credits and written an original thesis titled "Multiple Integrals" that dealt with geometric interpretations of multiple integrals and translations and relations of various systems of coordinates. Her work in mathematical astronomy included computation of the orbit of the comet of 1883. Despite the support of President Barnard, a campaigner for women's education, the board of trustees refused her application. Barnard suggested that Edgerton personally talk to each trustee. This effort proved successful and at the next meeting the board unanimously voted to award her the Ph.D. in mathematics, which she received in 1886 with highest honors.

In 1887 Edgerton married Frederick Merrill, an 1885 graduate of Columbia who received his Ph.D. from Columbia in 1890. He served as the New York State geologist from 1899 to 1904 and as the director of the New York State Museum before his death in 1916. They had four children.

Merrill taught mathematics at various institutions for several years after her graduation from Columbia. She had been offered a position as professor of mathematics at Wellesley, but declined because of her impending marriage. In 1906 she founded the Oaksmere School for Girls which she directed until 1928. It became well known for its high scholastic standards. A branch of the school was established in Paris in 1912. In 1928 Merrill discontinued the school and moved to New York City. She wrote many articles on education for journals and was a popular speaker of educational topics. She served for some years as alumna trustee of Wellesley College.

Mary Emily Sinclair (1878 – 1955)

Mary Sinclair was born in Worcester, Massachusetts, where her father, John Elbridge Sinclair, was professor of mathematics at Worchester Polytechnic Institute. She received her A.B. degree in 1900 from Oberlin College and then studied at the University of Chicago, earning her master's degree in mathematics in 1903. From 1904 to 1907 she was an instructor at the University of Nebraska while continuing to work on her graduate studies in mathematics. She published two papers about surfaces of revolution in the Annals of Mathematics. In 1908 Sinclair became the first woman to receive a Ph.D. in mathematics from the University of Chicago. Her dissertation in the calculus of variations, written under the direction of Oscar Bolza, was about "Concerning a Compound Discontinuous Solution in the Problem of the Surface of Revolution of Minimum Area."

In 1907 Sinclair had returned to Oberlin College as an instructor in mathematics. She was promoted to associate professor upon receiving her Ph.D., and to full professor in 1925. In 1941 she was appointed Clark Professor of Mathematics at Oberlin College. Sinclair taught at Oberlin for 37 years, including being department chair from 1939 until her retirement in 1944.

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Mary Sinclair never married. In 1914, however, she adopted an infant daughter, Margaret Emily. The following year she also adopted a son. She was on sabbatical leave during 1914-15 to care for her new family, and she also studied at Columbia and John Hopkins. During the 1922-1923 academic year, Sinclair pursued her mathematical research at the University of Chicago and Cornell University under the auspices of a Julia C. G. Piatt Fellowship from the American Association of University Women. Other sabbatical leaves were spent at the University of Rome and the Sorbonne (1925-26) and the Institute for Advanced Study (spring 1935).

After her retirement in 1944, Sinclair taught part-time at Berea College in Kentucky before returning to live in Oberlin in 1947. She moved to Maine in 1953 where she died two years later. After her death, the Journal of the American Association of University Women, in writing about Sinclair's generous gift to the AAUP to support the Fellowship Fund that had provided her "the best period of creative scholarship in my life," remarked that:

Modest and selfless, she never became an "ivory tower" scholar. Rather, she sought to infect other students with the spark that finds in creative research one of the world's greatest challenges. In her teaching, she shared the spark; with her gift, she opened up a path to research for others.

Упражнение 3. Ответьте на вопросы.

1. Were the women English or American?
2. Was it easy for W. Edgerton Merrill to get a Ph. Degree in mathematics? How did she solve the problem? What was her thesis about?
3. Were, in your opinion, her men colleagues happy about a Woman' getting a Ph. and then a Doctor's degree?
4. Was she more of a scientist or of a teacher? Prove your answer.
5. Did M. Sinclair have the same difficulties in getting the Ph. D? What did her dissertation concern?
6. Did she enjoy a happy family life" did she manage to combine it with her career?
7. What is a sabbatical leave? Did she use them productively?
8. Do you see any similarities in the careers of these women? What are the differences?
9. Did you learn anything about the family life of men-mathematicians from the text that you read in the previous lessons? Can you explain why?
10. What an "ivory tower" scholar"? Is it a compliment for a scientist to be called so?

Упражнение 4. Задайте письменно 5 типов вопросов к предложениям.

1. Sinclair taught part-time.
2. He served as the New York State geologist from 1899 to 1904.
3. She had already returned to Berlin.

Упражнение 5. Найдите в тексте известные вам времена. Каких времен вы не нашли? Объясните, почему.

Упражнение 6. Раскройте скобки, используя все изученные времена.

Sofia Kovalevskaya (1850-1981)

Sofia Kovalevskaya (to be) the first woman to hold a university chair in modern Europe and first woman on the editorial staff of a mathematical journal. She (to be) born in Moscow, Russia, in 1850.

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As a young child Sofia Kovalevskaya (to be) fascinated with the unusual wallpaper on the wall of a room on the family estate: the lecture notes of Mikhail Ostrogradsky on differential and integral calculus.

Although her father (to provide) her with private tutoring -- including calculus at age 15 -- he would not allow her to study abroad for further education, and Russian universities would not then admit women. But Sofia Kovalevskaya (to want) to continue her studies in mathematics, so she (to find) a solution: she (to enter) into a marriage of convenience. In 1869, she and her husband left Russia and went to Heidelberg, where she (to obtain) permission of the mathematics professors to allow her to study at the University of Heidelberg. After two years she (to go) to Berlin to study with Karl Weierstrass. She (to have) to study privately with him, as the university in Berlin would not allow any women to attend class sessions.

With Weierstrass' support Sofia Kovalevskaya (to pursue) a degree in mathematics, and her work (to earn) her a doctorate *sum cumma laude* from the University of Göttingen in 1874. Her doctoral dissertation on partial differential equations (to be) today called the Cauch-Kovelevskaya Theorem. It so (to impress) the faculty that they (to award) Kovalevskaya the doctorate without examination.

Sofia Kovalevskaya and her husband (to return) to Russia after she (to earn) her doctorate. They (to be) unable to find the academic positions they (to desire). They (to pursue) commercial ventures and (to produce) a daughter as well. Kovalevskaya (to begin) writing fiction. Kovalensky (to immerse) in a financial scandal and (to commit) suicide in 1883, but Sofia Kovalevskaya already (to return) to Berlin and mathematics, taking their daughter with her.

In 1888 Sofia Kovalevskaya (to win) the Prix Bordin from the French Academie Royale des Sciences for research now called the Kovelevskaya top. This research (to examine) how Saturn's rings (to rotate).

She only (to publish) ten papers before her death from influenza in 1891.

Упражнение 7. Раскройте скобки, используя все изученные времена.

Maria Agnesi

Maria Agnesi (to be) a mathematician, philosopher, philanthropist. She (to write) first mathematics book that still (to survive) and was first woman appointed as a mathematics professor at a university.

Maria Agnesi's father (to be) Pietro Agnesi, a wealthy nobleman and a professor of mathematics at the University of Bologna. A few Italian families (to educate) daughters in academic subjects; a few attended lectures at the university or even lectured there.

Pietro Agnesi (to recognize) the talents and intelligence of his daughter Maria, (to treat) as a child prodigy. He (to invite) groups of his colleagues to gatherings at their home, and Maria Agnesi (to present) speeches to the assembled men. In 1738, Maria Agnesi (to assemble) almost 200 of the speeches she (to resent) to her father's gatherings, and (to publish) them in Latin and in English (*Philosophical Propositions).* But the topics (to go) beyond philosophy as we (to think) of the topic today, and (to include) scientific topics like celestial mechanics, Isaac Newton's gravitation theory, and elasticity.

Pietro Agnesi married twice more after Maria's mother died, so she also (to teach) her siblings. This task (to keep) her from her own goal of entering a convent. Maria Agnesi (to begin to write a mathematics textbook, which (to absorb) her for ten years and (to cover) arithmetic, algebra, trigonometry, analytic geometry, calculus and differential equations. No one before (to publish) a text on calculus that (to include) so much information.

Maria Agnesi (to bring) together ideas from many contemporary mathematical thinkers and (to integrate) many of the ideas in a novel way that (to impress) the mathematicians and other scholars of her day.

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As recognition of her achievement, in 1750 she (to be) appointed to the chair of mathematics and natural philosophy at the University of Bologna by an act of Pope Benedict XIV. She (to be) also recognized by the Hapsburg Empress Maria Theresa of Austria.

Maria Agnesi ever (to accept) the Pope's appointment? It (to be) a real appointment or an honorary one? So far, the historical record (not to answer) those questions.

Maria Agnesi's name (to live) on in the name that English mathematician John Colson (to give) to a mathematical problem - finding the equation for a certain bell-shaped curve. Colson (to confuse) the word in Italian for "curve" for a somewhat similar word for "witch," and so today this problem and equation still (to carry) the name "witch of Agnesi."

Her father's death (to release) Maria from her responsibility to educate her siblings, and she (to use) her wealth and her time to help those less fortunate. She (to establish) in 1759 a home for the poor. In 1771 she (to head) up a home for the poor and ill. She (to give) away everything she (to own) by the time she died in 1799, and (to be) buried in a pauper's grave.

Упражнение 8. Чья биография произвела на вас большее впечатление? Почему? Перескажите её.

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Урок 5
Revision (повторение)

Таблица форм глаголов изъявительного наклонения активного залога

Аспект/ время	Simple	Continuous	Perfect	Perfect Continuous
Present Tenses	**Present Simple** I (you, we, they) take He (she, it) takes I (you, we, they) don't take he (she/ it) doesn't take do I (you, we, they) take? does he (she, it) take?	**Present Continuous** I am taking We (you, they) are taking he (she, it) is taking I am not taking we (you, they) aren't taking he (she, it) isn't taking am I taking? are we(you, they) taking? is he (she, it) taking?	**Present Perfect** I (you, we, they) have taken he (she, it) has taken I (you, we, they) haven't taken he (she, it) hasn't taken have I (you, we, they) taken? has he (she, it) taken?	**Present Perfect Continuous** I (you, we, they)have taking he (she, it) has been taking I (you, we, they) haven't been taking he (she, it) hasn't been taking have I (you, we, they) been taking? has he (she, it) been taking?
Past Tenses	**Past Simple** I (you, we, they, he, she, it) played I (you, we, they, he, she, it) didn't play did I (you, we, they, he, she, it) play? I (you, we, they, he, she, it) took I (you, we, they, he, she, it) didn't take did I (you, we, they, he, she, it) take?	**Past Continuous** I (he, she, it) was taking We (you, they) were taking I (he, she, it) was not taking We (you, they) weren't taking was I (he, she, it) taking? were we (you, they) taking? was he (she, it) taking?	**Past Perfect** I (you, we, they, he, she, it) had taken/finished I (you, we, they, he, she, it) hadn't taken/finished had I (you, we, they, he, she, it) taken/finished?	**Past Perfect** I (you, we, they, he, she, it) had taken/finished I (you, we, they, he, she, it) hadn't taken/finished had I (you, we, they, he, she, it) taken/finished?
Future Tenses	**Future Simple** I (you, we, they, he, she, it) will ('ll) l take I (you, we, they, he, she, it) won't take will I (you, we, they, he, she,	**Future Continuous** I (you, we, they, he, she, it) will ('ll) be taking I (you, we, they, he, she, it) won't be taking	**Future Perfect** I (you, we, they, he, she, it) will ('ll) have taken I (you, we, they, he, she, it) won't have taken will I (you, we,	**Future Perfect Continuous** I (you, we, they, he, she, it) will ('ll) have been taking I (you, we, they, he, she, it) won't have been taking

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	it) take?	will I (you, we, they, he, she, it) be taking?	they, he, she, it) have taken?	will I (you, we, they, he, she, it) have been taking?

Упражнения

Упражнение 1. Раскройте скобки, употребляя изученные времена

Prehistoric mathematics

The origins of mathematical thought (to lie) in the concepts of number, magnitude, and form. Modern studies of animal cognition (to show) that these concepts (not to be not) unique to humans. The idea of the "number" concept evolving gradually over time (to be) supported by the existence of languages which (to preserve) the distinction between "one", "two", and "many", but not of numbers larger than two.

The oldest known possibly mathematical object (to be) the Lebombo bone. It (to be) discovered in the Lebombo mountains of Swaziland and (to date) to approximately 35,000 BC. It (to consist) of 29 distinct notches cut into a baboon's fibula. Also prehistoric artifacts discovered in Africa and France, dated between 35,000 and 20,000 years old, (to suggest) early attempts to quantify time.

The Ishango bone, found near the headwaters of the Nile river (to consist) of a series of tally marks carved in three columns running the length of the bone. Common interpretations (to be) that the Ishango bone (to show) either the earliest known demonstration of sequences of prime numbers or a six month lunar calendar. In the book *How Mathematics Happened: The First 50,000 Years*, Peter Rudman (to argue) that the development of the concept of prime numbers could only have come about after the concept of division, which he (to date) to after 10,000 BC, with prime numbers probably not being understood until about 500 BC. He also (to write) that "no attempt (to be) made yet to explain why a tally of something should exhibit multiples of two, prime numbers between 10 and 20, and some numbers that (to be) almost multiples of 10."

Predynastic Egyptians of the 5th millennium BC pictorially (to represent) geometric designs. It (to be) claimed that megalithic monuments in England and Scotland, dating from the 3rd millennium BC, (to incorporate) geometric ideas such as circles, ellipses, and Pythagorean triples in their design.

All of the above (to be) disputed however, and the currently oldest undisputed mathematical usage (to be) in Babylonian and dynastic Egyptian sources. Thus it (to take) human beings at least 45,000 years from the attainment of behavioral modernity and language (generally thought to be a long time before that) to develop mathematics as such.

Упражнение 2. Раскройте скобки, употребляя изученные времена

Ancient Science and Its Modern Fates

Until recently, historians of the Scientific Revolution of the 16th and 17th centuries (to treat) it as a kind of rebellion against the authority of ancient books and humanist scholarship. In fact, however, it (to begin) with the revival of several tremendously important and formidably difficult works of Greek science.

The mathematics and astronomy of the Greeks (to be) known in medieval western Europe only through often imperfect translations, some of them made from Arabic intermediary texts rather than the Greek originals. The papal curia (to become) a center for the recovery of the original Greek manuscripts, often very old and remarkably elegant, and the production of new translations of these works. Ptolemy's "Geography" which (to inspire) Columbus to attempt his

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voyage, and (to remain) the model of all systematic atlases – (to be) dedicated to Popes Gregory XII and Alexander V by its first translator, the apostolic secretary Jacopo Angeli. Illustrated texts of this elegant atlas (to find) readers everywhere in Europe. Nicholas V (to support) translations of the greatest of Greek mathematicians, Archimedes, and the greatest of Greek astronomers, Ptolemy. Cardinal Bessarion (to collect) a vast range of Greek texts (which eventually (to wind) up in Venice, as the nucleus of another great Renaissance library). A scholar whom he (to help) in many ways, Joannes Regiomontanus, (to become) the first western European in centuries really to master Ptolemy's astronomy, which (to be) preserved and improved in the Islamic world. His work done in and for the curia (to lay) the essential foundations on which Copernicus and other innovators (to build) a new astronomy in the sixteenth century, using the Greek texts as their basic source of data and methods.

Scholarship (to support) science in this world where faith and science (to be) not yet seen as two, irreconcilable cultures.

Задания к тексту 5

Упражнение 1. Переведите слова письменно на русский язык.

Natural boundaries
Conquer by foreign invaders
Consequence
Rapid advance, mathematical advance
periods of decline
Concise
Sketchy
An arithmetic progression
An indeterminate proble
Cubic equations
Cube /square roots
To embrace other approaches to mathematics
A collection of mathematical treatises
Binomial coefficient
Multiplication, Division, Root-extraction
Quadratic and simultaneous equations
A rectangle
A trapezium
Solve equations
Develop a cubic interpolation formula
An extension of the "coefficient array method" or "method of the celestial unknown”
A divine gift
Rejecting it as heresy
Edit
Accessible
It is to the credit of
Adulate
Despise.

Упражнение 2. Прочитайте и переведите текст письменно.

Overview of Chinese Mathematics

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Several factors led to the development of mathematics in China being, for a long period, independent of developments in other civilisations. The geographical nature of the country meant that there were natural boundaries (mountains and seas) which isolated it. On the other hand, when the country was conquered by foreign invaders, they were assimilated into the Chinese culture rather than changing the culture to their own. As a consequence there was a continuous cultural development in China from around 1000 BC and it is fascinating to trace mathematical development within that culture. There are periods of rapid advance, periods when a certain level was maintained, and periods of decline.

The first thing to understand about ancient Chinese mathematics is the way in which it differs from Greek mathematics. Unlike Greek mathematics there is no axiomatic development of mathematics. The Chinese concept of mathematical proof is radically different from that of the Greeks, yet one must not in any sense think less of it because of this. Rather one must marvel at the Chinese approach to mathematics and the results to which it led.

Chinese mathematics was, like their language, very concise. It was very much problem based, motivated by problems of the calendar, trade, land measurement, architecture, government records and taxes. By the fourth century BC counting boards were used for calculating, which effectively meant that a decimal place valued number system was in use. It is worth noting that counting boards are uniquely Chinese, and do not appear to have been used by any other civilisation.

Our knowledge of Chinese mathematics before 100 BC is very sketchy although in 1984 the Suan shu shu (A Book on Arithmetic) dating from around 180 BC was discovered. It is a book written on bamboo strips and was found near Jiangling in Hubei province. The next important books of which we have records are a sixteen chapter work Suanshu (Computational prescriptions) written by Du Zhong and a twenty-six chapter work Xu Shang suanshu (Computational prescriptions of Xu Shang) written by Xu Shang. Neither of these texts has survived and little is known of their content. The oldest complete surviving text is the Zhoubi suanjing (Zhou Shadow Gauge Manual) which was compiled between 100 BC and 100 AD.

The method of calculation is very simple to explain but has wide application. This is because a person gains knowledge by analogy, that is, after understanding a particular line of argument they can infer various kinds of similar reasoning.

The Zhoubi suanjing contains a statement of the Gougu rule (the Chinese version of Pythagoras's theorem) and applies it to surveying, astronomy, and other topics.

In fact much Chinese mathematics from this period was produced because of the need to make calculations for constructing the calendar and predicting positions of the heavenly bodies. The Chinese word 'chouren' refers to both mathematicians and astronomers showing the close link between the two areas.

The most famous Chinese mathematics book of all time is the Nine Chapters on the Mathematical Art. The book certainly contains contributions to mathematics which had been made over quite a long period, but there is little in the original text to distinguish the precise period of each. Many later developments came through commentaries on this text.

A significant mathematical advance was made by Liu Hui (about 220 - about 280) who ushered in an era of mathematical theorisation in ancient China, and made great contributions to the domain of mathematics. Liu Hui made skilful use of thinking in images as well as in logical and dialectical ways. He solved many mathematical problems, pushing his mathematical reasoning further along the dialectical way.

Liu Hui gave a more mathematical approach than earlier Chinese texts, providing principles on which his calculations are based. He found approximations to π. Liu used Pythagoras's theorem to calculate heights of objects and distances to objects which cannot be measured directly. This was to become one of the themes of Chinese mathematics.

About fifty years after Liu's remarkable contributions, a major advance was made in astronomy when Yu Xi discovered the precession of the equinoxes.

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The texts by Sun Zi made a number of important contributions. Xiahou Yang (about 400 - about 470) was the supposed author of the Mathematical Manual which contains representations of numbers in the decimal notation using positive and negative powers of ten. Zhang Qiujian (about 430 - about 490) wrote his Mathematical Manual some time between 468 and 486. Its 92 problems illustrate the formula for summing an arithmetic progression. Perhaps it is most famous for presenting the 'Hundred fowls problem' which is an indeterminate problem with three non-trivial solutions.

One of the most significant advances was by Zu Chongzhi (429-501) and his son Zu Geng (about 450 - about 520). Zu Chongzhi was an astronomer who made accurate observations which he used to produce a new calendar, which was based on a cycle of 391 years. He wrote the Method of Interpolation in which he proved that $3.1415926 < \pi < 3.1415927$. With his son Zu Geng he computed the formula for the volume of a sphere using Cavalieri's principle. The beginnings of Chinese algebra is seen in the work of Wang Xiaotong (about 580 - about 640). He wrote the Continuation of Ancient Mathematics, a text with only 20 problems which later became one of the Ten Classics. He solved cubic equations by extending an algorithm for finding cube roots. His work is seen as a first step towards the "coefficient array method" or "method of the celestial unknown" of Li Zhi for computing with polynomials.

Interpolation was an important tool in astronomy and Liu Zhuo (544-610) was an astronomer who introduced quadratic interpolation with a second order difference method. Certainly Chinese astronomy was not totally independent of developments taking place in the subject in India and similarly mathematics was influenced to some extent by Indian mathematical works, some of which were translated into Chinese. Historians argue today about the extent of the influence on the Chinese development of Indian, Arabic and Islamic mathematics. It is fair to say that their influence was less than it might have been, for the Chinese seemed to have little desire to embrace other approaches to mathematics. Early trigonometry was described in some of the Indian texts which were translated and there was also development of trigonometry in China. For example Yi Xing (683-727) produced a tangent table.

From the sixth century mathematics was taught as part of the course for the civil service examinations. Li Chunfeng (602 - 670) was appointed as the editor-in-chief for a collection of mathematical treatises to be used for such a course, many of which we have mentioned above. The collection is now called The Ten Classics, a name given to them in 1084.

The period from the tenth to the twelfth centuries is one where few advances were made and no mathematical texts from this period survive. However Jia Xian (about 1010 - about 1070) made good contributions which are only known through the texts of Yang Hui since his own writings are lost. He improved methods for finding square and cube roots, and extended the method to the numerical solution of polynomial equations computing powers of sums using binomial coefficients constructed with Pascal's triangle.

The next major mathematical advance was by Qin Jiushao (1202 - 1261) who wrote his famous Mathematical Treatise in Nine Sections which appeared in 1247. He was the first of the great thirteenth century Chinese mathematicians. The treatise contains remarkable work on the Chinese remainder theorem, gives an equation whose coefficients are variables and, among other results, Heron's formula for the area of a triangle. Equations up to degree ten are solved using the Ruffini-Horner method.

The next major figure from this golden age of Chinese mathematics was Yang Hui (about 1238 - about 1298). He wrote the Detailed analysis of the mathematical rules in the Nine Chapters and their reclassifications in 1261. He described multiplication, division, root-extraction, quadratic and simultaneous equations, series, computations of areas of a rectangle, a trapezium, a circle, and other figures. He also gave a wonderful account of magic squares and magic circles.

Guo Shoujing (1231-1316) worked on spherical trigonometry, and solved equations using the Ruffini-Horner numerical method. He also developed a cubic interpolation formula

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tabulating differences of the accumulated difference as in Newton's forward difference interpolation method.

The last of the mathematicians from this golden age was Zhu Shijie (about 1260 - about 1320) who wrote the Introduction to mathematical studies, published in 1299.

The decline in Chinese mathematics from the fourteenth century was not by any means dramatic. The deep works of the 13th century ceased to be even understood much less developed further. Certainly this does not mark the end of the Chinese mathematics tradition, but from the time China was greatly influenced by other mathematical traditions.

Concerning the 17th century, it is important to mention the Mei family. The most famous member of this family was Mei Wending (1633-1721) and his comment on the golden section is typical of the sensible attitude he took towards Western mathematics:

"After having understood how to make use of the golden section, I began to believe that the different geometrical methods could be understood and that neither the missionaries attitude of considering this simple technique as a divine gift, nor the Chinese attitude of rejecting it as heresy is correct."

Certain people from the eighteenth century onwards did an excellent job in recording the Chinese tradition so that much of it is still accessible to us today. For example Dai Zhen edited a new edition of the Nine Chapters on the Mathematical Art after copying the complete text as part of this project.

It is to the credit of Chinese mathematicians that they did not let their mathematical tradition be replaced by the western tradition. For example Li Shanlan (1811-1882) is important as a translator of Western science texts but he is most famous for his own mathematical contributions. He produced his own versions of logarithms, infinite series, and combinatorics which did not follow the style of western mathematics but his research naturally developed out of the foundations of Chinese mathematics. There were many other efforts to promote Chinese mathematics, and in particular a mathematics journal was set up in 1899. The editors wrote:

"Western methods should not be adulated and Chinese methods despised".

Упражнение 3. Ответьте на вопросы письменно:

1. What are the peculiarities of Mathematics developments.
2. What determined the differences?
3. In what way is it different from Mathematics in Greece.
4. What are the greatest advances of Chinese mathematics?
5. What periods can the development of Chinese mathematics be divided?

Упражнение 4. Найдите в тексте примеры изученных времен. Объясните их использование. Какие времена отсутствуют? Почему?

Упражнение 5. Выберите любой период развития математики в Китае и сделайте письменный краткий пересказ, упоминая наиболее значимые, на ваш взгляд, достижения.

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Контрольная работа

Прочитайте и переведите текст письменно.

Four color theorem

The four color theorem (also known as the four color map theorem) states that given any plane separated into regions, such as a political map of the states of a country, the regions may be colored using no more than four colors in such a way that no two adjacent regions receive the same color. Two regions are called "adjacent" only if they share a border segment, not just a point. Each region must be contiguous: that is, it may not have exclaves like some real countries such as Angola, Azerbaijan, Italy, the United States, or Russia.

It is often the case that using only three colors is inadequate. This applies already to a map with one region surrounded by three other regions (although with an even number of surrounding countries three colors are enough) and it is not at all difficult to prove that five colors are sufficient to color a map.

The four color theorem was the first major theorem to be proven using a computer, and the proof is not accepted by all mathematicians because it would be infeasible for a human to verify by hand. Ultimately, in order to believe the proof, one also has to have the belief (which can be justified or not) that the proof assistant software works as intended and that there were no other errors - such as in the functioning of the hardware - that corrupted the output. The proof is also considered inelegant.

History

The conjecture was first proposed in 1852 when Francis Guthrie, while trying to color the map of counties of England, noticed that only four different colors were needed.

There were several early failed attempts at proving the theorem. One proof of the theorem was given by Alfred Kempe in 1879, which was widely acclaimed; another proof was given by Peter Guthrie Tait in 1880. It was not until 1890 that Kempe's proof was shown incorrect by Percy Heawood, and 1891 that Tait's proof was shown incorrect by Julius Petersen—each false proof stood unchallenged for 11 years. In 1890, Heawood proved that all planar graphs are five-colorable.

Significant results were produced by Croatian mathematician Danilo Blanuša in the 1940s by finding an original snark. In 1943, Hugo Hadwiger formulated the Hadwiger conjecture, a far-reaching generalization of the four-color problem that still remains unsolved.

By 1980s German mathematician Heinrich Heesch had developed methods of applying the computer in searching for a proof.

It was not until 1976 that the four-color conjecture was finally proven by Kenneth Appel and Wolfgang Haken at the University of Illinois. They were assisted in some algorithmic work by John A. Koch.

Using mathematical rules and procedures based on properties of reducible configurations, Appel and Haken found an unavoidable set of reducible configurations, thus proving that a minimal counterexample to the four-color conjecture could not exist. Their proof reduced the infinitude of possible maps to 1,936 reducible configurations (later reduced to 1,476) which had to be checked one by one by computer. This reducibility part of the work was independently double checked with different programs and computers. However, the unavoidability part of the proof was over 500 pages of hand written counter-counter-examples. The computer program ran for hundreds of hours.

In 1980, George Spencer-Brown deposited his purported proof of the four color map theorem at the Royal Society. The validity of this proof, is generally doubted.

In 2004 Benjamin Werner and Georges Gonthier formalized a proof of the theorem inside the Coq proof assistant. This removes the need to trust the various computer programs used to verify particular cases; it is only necessary to trust the Coq kernel.

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Formal statement in graph theory

To formally state the theorem, it is easiest to rephrase it in graph theory. It then states that the vertices of every planar graph can be colored with at most four colors so that no two adjacent vertices receive the same color, or "every planar graph is four-colorable" for short. Here, every region of the map is replaced by a vertex of the graph, and two vertices are connected by an edge if and only if the two regions share a border segment (not just a corner). It is possible to represent a map with polygonal regions directly as a graph, where the edges bordering regions are graph edges and corners are vertices; this is the dual graph of the graph just described.

False disproofs

Like many famous open problems of mathematics, the four color theorem has attracted a large number of false proofs and disproofs in its long history.

Generally, the simplest "counterexamples" attempt to create one region which touches all other regions. This forces the remaining regions to be colored with only three colors. Because the four color theorem is true, this is always possible; however, because the person drawing the map is focused on the one large region, they fail to notice that the remaining regions can in fact be colored with three colors.

Other false disproofs violate the assumptions of the theorem in unexpected ways, such as using a region that consists of multiple disconnected parts, or disallowing regions of the same color from touching at a point.

Упражнения

Упражнение 1. Ответьте на вопросы письменно:

1. What is the colour theorem about? When can this principle be used?
2. Was it proven by a person or a computer? Why is the proof not accepted by all mathematicians?
3. When was the conjecture first proposed?
4. Was it easy to prove? What makes you think so? How many pages did the prove take?
5. When was the theorem finally proven?
6. Why are there so many false proofs and disproofs of the theorem in its long history?

Упражнение 2. Задайте письменно пять типов вопросов к каждому предложению:

1. The four color theorem has attracted a large number of false proofs and disproofs in its long history.
2. Every region of the map is replaced by a vertex of the graph.
3. False disproofs violate the assumptions of the theorem in unexpected ways.
4. Appel and Haken found an unavoidable set of reducible configurations.
5. Hugo Hadwiger formulated the Hadwiger conjecture.

Упражнение 3. Найдите в тексте изученные времена. Объясните их употребление. Какие времена отсутствуют? Как это можно объяснить?

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Тест на видо-временные формы

Выберите один из вариантов:

I. 1. It (often / rain) in England.
A is often raining B often rains

2. Can you phone a bit later, please? Jennifer (have a bath).
A is having a bath B has a bath

3. Don't forget your umbrella. It (rain) cats and dogs.
A rains B is raining

4. Granny is in the kitchen. She (make) an apple-pie.
A is making B makes

5. My wife (often / make) pies.
A is often making B often makes

6. Run downstairs. Your mother (wait) for you.
A is waiting B waits

7.1 don't know English, but I (learn) it now.
A am learning B learn

8. John (still / work) in the garden. A is still working B still works

9. Dad (never / work) on Saturdays.
A is usually working B usually works

10. Usually I (have coffee) in the morning, but now I (drink) tea.
A am having coffee A drink
B have coffee B am drinking

11. We (sometimes /go) to the sea.
A are sometimes going B sometimes go

12. - What she (do)?- She is a teacher at our college.
A is she doing B she does C does she do

13. Why you (sit) at my desk? Could you take your place, please?
A Why you are sitting B Why do you sit C Why are you sitting

14. We've got tickets, and tomorrow evening we (go) to the cinema.
A go B are going

15. -... you (do) anything tomorrow afternoon? –I (play) tennis with my friend.
A Are you doing A am playing
B Do you do B play

16. We (not / have) a holiday last year.

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A didn't have B haven't had C hadn't have

17. My parents (be) to the USA many times.
A have been B were C have being

18. I (buy) a new hat last week, but I (not / wear) it yet.
A have bought A haven't worn
B bought B were
C had bought C didn't wear

19. ... it (stop) raining yet?
A Did it stop B Is it stopped C Has it stopped

20. Don't worry about the documents. I (send) it the day before yesterday.
A sended B have sent C sent

21. I (lose) my purse.
A lose B have lost C lost

22. When you (finish) school?
A When had you finished B When have you finished C When did you finish

23. When I was a child, I (always / be) late for school.
A have always been B was always late C. had always been

24. She can't find her umbrella. I think somebody (take) by mistake.
A took B takesC has taken

25.-Are you tired? - Yes, a little. I (fix) the car today.
A have painted B painted C paint

26. We (not/see) them this week, but we (see) him a couple of weeks ago.
A didn’t see A have seen
B haven't saw B saw
C haven't seen C have saw

12. - Have you got any money?
- Yes, I (borrow) it from my brother.
A borrowed B have borrowed C did borrow

13 She (go) the hairdresser. She'll be back soon.
A went B has gone to C has been to

14. My husband (work) at university for three years since 1990 to 1993.
A has worked B had worked C worked

15. Mom (lose) her car keys, so we have to open the door by force.
A has lost B lost C losed

16. My sister and her husband (be married) since last Christmas.
A were married B have married C have been married

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17.... the mail (come) today?
A Did the mail come B Has the mail come C Has the mail came

18. I saw a light in your window as I (pass) by.
A passed B was .passing

19. Yesterday as I was walking down the street, I (meet) Thomas.
A met B was meeting

20. While my sister (wait) for my return, somebody knocked at the door.
A waited B was wailing

21. We (talk) about him when he suddenly (come) in.
A talked B A came in
B were talking B was coming in

22. Yesterday while Dad (shave), he (cut) himself slightly.
A shaved A Cut
B was shaving B was cutting

23. They (quarrel) while they (wash) their car.
A quarrelled A washed
B were quarrelling B were washing

24. He knows Africa well because he (travel) a lot there.
A has been travelling B has traveled

25. You (write) this composition for two hours and can't complete it.
A have been writing B have written

26. - John is still repairing his car. He (repair) it all day.
A has repaired B has been repairing

27. Jane promised to come, but she's absent. Something (happen) to her.
A has been happening B has happen

28. The children are drawing. They (draw) since they came home.
A have been drawing B have drawn

29.... they (tell) anything about their summer plans?
A Have they been telling B Have they told

30. My aunt (have) the big house in the country.
A has always been having B has always had

31. We were late. The meeting (start).
A started B had started

32. She was the most boring person I (ever /meet).
A ever met B had ever met

33. He was tired because he (work) hard in the garden all day.

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A worked B had worked

34. The Smiths managed to arrive exactly on time because they (take) a taxi.
A took B had taken

35. He said he (break) into the house.
A broke B had broken

36. We asked Peter to come with us, but he refused. He (already / promise) to play football with his friends.
A already promised B had already promised

37. She punished the child because he (be) naughty.
A has been B had been
38. Why are you looking so unhappy? -I…my purse.
A have lost B had lost

39. Sam was upset because his girl friend....
A hasn't come B hadn't come

40. Mother asked the children if they... some biscuits for tea.
A has bought B had bought

41. ... some photos to be developed. Are they ready?
A have left B had left

42. Tell your mom about these wonderful islands. She... about them.
A has never heard B had never heard

43. I'm so happy to see you again. I... you since you left for Moscow.
A haven't seen B hadn't seen

44. He said he ...me since I left for Moscow.
A hasn't seen B hadn't seen

45. I (talk) over the phone when they brought me the letter.
A talked B had talked C had been talking D was talking

46. They (wait) outside when the taxi arrived.
A sat B had sat C had been sitting D were sitting

47. I visited Brazil in April. I (stay) at a nice hotel for a fortnight
A stayed B had stayed C had been staying D was slaying

48. I (stay) at the hotel for a fortnight when I received your letter.
A stayed B bad stayed C had been staying D was staying

49. He quickly forgot everything he (learn) at school.
A learnt B had learnt C had been learning D was learning

50. The musician (play) the piano for a whole hour when, we came in
A had played B had been playing C was playing D played

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51. Alice rose from the sofa on which she (lie) for more than two hours.
A lay B had lain C had been lying D was lying

52. A man (be) unconscious for a few minutes when an ambulance arrived.
A was B had been C had being
53. We (walk) along a forest road for two hours when we saw a house.
A walked B had walked C had been walking D were walking

54. I (talk) over the phone for a whole hour when the porter knocked at the door.
A talked B had talked C had been talking D was talking

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