МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ
ЧЕРКАСЬКИЙ НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ
ІМЕНІ БОГДАНА ХМЕЛЬНИЦЬКОГО

МЕТОДИЧНІ РЕКОМЕНДАЦІЇ
ДО САМОСТІЙНОГО ВИВЧЕННЯ ІНОЗЕМНОЇ МОВИ МАГІСТРАНТАМИ ФІЗИКО-МАТЕМАТИЧНИХ СПЕЦІАЛЬНОСТЕЙ

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К 90 Методичні рекомендації до самостійного вивчення іноземної мови магістрантами фізико-математичних спеціальностей. Видання друге (перероблене) / укл. І. М. Куліш, Г. О. Королюк. – Черкаси: Вертикаль, видавець Кандич С. Г., 2021. – 98 с.

«Методичні рекомендації» призначаються для самостійного вивчення дисципліни «Наукова комунікація іноземною мовою» магістрантами фізико-математичних спеціальностей. «Методичні рекомендації» включають зміст курсу, теми самостійної роботи, рекомендації щодо виконання певних завдань, семестрові завдання, граматичний довідник.

Тематика самостійної роботи відповідає програмі з іноземної мови для магістрантів природничих та фізико-математичних спеціальностей.

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ЗМІСТ

I. ВСТУП

Проблема підготовки фахівців, які б володіли іноземною мовою професійно, є однією з важливіших завдань професійної педагогіки вищої школи. Професійна самореалізація та відповідне життя індивіду здебільш залежить від його професійної компетенції, вміння адаптуватися, реалізовувати свої професійні здібності, нахили, інтереси, бути мобільним в професійному самовизначенні та кар'єрі. Іноземна мова наближує ситуацію навчального процесу до реальних умов, що породжує потребу в знаннях, їх практичному застосуванні й забезпечує персональну зацікавленість студентів, перехід від пізнавальної мотивації до професійної.

Навчальна дисципліна "Наукова комунікація іноземною мовою" є необхідною складовою частиною підготовки магістрантів природничих та фізико-математичних спеціальностей. Дисципліна розрахована на магістрантів першого року навчання. Основна мета курсу – сформувати комунікативну спроможність в сфері професійного та наукового спілкування в усній і письмовій формах, вдосконалювати вміння користуватися широким тематичним словником засвоєної функціональної лексики за фахом, розширювати та збагачувати його. Активне використання навичок двостороннього перекладу, вміння використовувати різноманітні засоби читання для подальшої роботи з інформацією, навички аудіювання, реферування і анотування тексту, оволодіння новітньою фаховою інформацією через іноземні джерела також вдосконалюються у рамках курсу іноземної мови за професійним та науковим спрямуванням.

Основні завдання курсу:

1. Розвиток монологічного мовлення з використанням функціональної лексики професійного та наукового спілкування.
2. Розвиток непідготовленого діалогічного мовлення з використанням функціональної лексики та засвоєних граматичних конструкцій.
3. Вдосконалення навичок двостороннього усного перекладу в процесі ділових контактів та ділових зустрічей.
4. Вдосконалення навичок письмового перекладу та закріплення навичок аналізу граматичних і лексичних трансформацій при перекладі текстів за фахом.
5. Вдосконалення навичок ознайомчого та пошукового читання для подальшого використання отриманої інформації.
6. Вдосконалення навичок вивчаючого читання із використанням словника для подальшого розширення лексичного запасу за фахом.
7. Формування та розвиток вмінь реферування, анотування, складання резюме та аналізу текстів за фахом.
8. Розвиток навичок аудіювання англомовного тексту.
9. Закріплення навичок ділового листування.

За підсумками вивчення курсу магістрант повинен знати функціональну лексику іноземної мови професійної та наукової тематики, що вивчається протягом року; граматичний матеріал в обсязі, передбаченому програмою курсу; основні принципи, методи та лінгвістичні особливості анотування та реферування текстів; принципи та план аналізу граматичних та лексичних трансформацій при перекладі текстів за фахом.

Студент повинен вміти аналізувати робочі ситуації та обмінюватися досвідом з основних аспектів спеціальності іноземною мовою, проводити обговорення проблем загальнонаукового та професійно-орієнтованого характеру, що має на меті досягнення порозуміння; перекладати з іноземної та на іноземну мову інформацію з використанням функціональної лексики за фахом; перекладати тексти у письмовій формі, використовуючи термінологічні двомовні словники, електронні словники; аналізувати граматичні та лексичні трансформації, що виникають при перекладі з іноземної мови та на іноземну мову, в залежності від цього правильно вибирати перекладацьку стратегію; робити аналітичне опрацювання іншомовних джерел з метою отримання інформації, що необхідна для вирішення певних завдань професійно-виробничої діяльності, реферувати та анотувати англомовні джерела за фахом, працювати з інформацією та обробляти інформацію; здійснювати ефективне слухання повідомлень на іноземній мові.

ІІ. САМОСТІЙНЕ ВИВЧЕННЯ ДИСЦИПЛІНИ

Самостійна робота студентів є формою організації навчання, яка зв'язує усі блоки навчання та одночасно існує паралельно кожному з них. Самостійна робота – це процес відображення та перевтілення в свідомості студентів явищ об'єктивної дійсності. В цьому процесі самостійна робота студентів виступає як об'єкт діяльності (тобто навчальні завдання, які він мусить виконати) і як форма прояву певних дій в навчанні по виконанню цих завдань. Виходячи з цього, ми дотримуємося такого визначення самостійної роботи студентів – це запланована пізнавальна діяльність виконання творчих навчальних завдань різних видів, яка виконується самостійно з метою надбання знань, накопичення вмінь та навичок, досвіду творчої викладацької діяльності й вироблення професійно важливих якостей. Реалізація такої мети на практиці сприяє розв'язанню завдань інтеграції – повному злиттю навчання і виховання, здійсненню принципу розвиваючого навчання, формуванню особистості майбутнього фахівця.

Самостійна робота з іноземної мови вирішує такі завдання:

- удосконалення знань, навичок і вмінь набутих на практичних заняттях;
- розширення світогляду студентів;
- розвиток творчих здібностей, самостійності, естетичних смаків.

Ефективність навчальної діяльності залежить від готовності студента до самонавчання та його індивідуальних якостей. Здатність до самонавчання є однією з найважливіших передумов не тільки успішного оволодіння іноземною мовою, але й формування навичок самостійної діяльності взагалі. Лише готуючи здатну до самонавчання особистість можна реалізувати модель фахівця нового типу, орієнтованого до умов інформаційного суспільства та широких міжнародних контактів.

У процесі організації самостійної роботи з іноземної мови необхідно враховувати як психологічні особливості особистості, так і психологічні особливості колективу: рівень його розвитку, ступень організації, психологічної, інтелектуальної та емоційної єдності. Знання психологічних особливостей студентів – необхідна передумова успішного виконання вибору відповідних форм самостійної роботи, визначення змісту цих форм організації самостійної роботи. Результативність самостійної роботи з іноземної мови передбачає врахування таких аспектів в його організації, які забезпечують взаємодію взаємозумовлених факторів впливу на особистісний розвиток фахівця та формування його комунікативної компетенції, а саме: мотиваційного, ситуативного, комунікативного, особистого і діяльнісного.

Необхідною умовою організації самостійної роботи є формування особистісної значущості навчання, яка виникає у студента внаслідок його інтересу не тільки до змісту навчального матеріалу, а й самого процесу набуття знань. Для розвитку продуктивної самостійної роботи доцільно використовувати таку її організацію, яка поступово орієнтує студентів на підвищення автономії їхнього навчання.

Основними організаційними принципами самостійної роботи з іноземної мови є принципи урахування і розвитку індивідуальних особливостей та інтересів студентів, принципи комплексності, захопленості та розвитку ініціативи і самодіяльності.

Вимоги щодо організації самостійної роботи:

- інформативність і змістовність, які сприяють реалізації практичних та загальноосвітніх цілей;
- комунікативна спрямованість: усі види самостійної роботи повинні забезпечувати користування іноземною мовою як засобом одержання і передачі інформації в типових природних ситуаціях спілкування;
- ситуативність;
- орієнтація завдань на підвищення мовленнєвої активності студентів;
- емоційність форм і способів реалізації, що сприяє підвищенню інтересу студентів до іншомовної діяльності.

Центральною проблемою щодо організації самостійної роботи є проблема забезпечення високої внутрішньої мотивації до самостійного її опанування. Продуктивність самостійної роботи з іноземної мови залежить від психолого-педагогічних умов його організації: як мотивується навчально-пізнавальна діяльність студентів; як реалізується професіонально-комуні-

кативна компетенція студента; як здійснюється контроль його навчальних досягнень.

Самостійна робота – це самостійна навчально-пізнавальна діяльність проблемного, творчого та практичного характеру. Самостійна робота базується на володінні студентами навичками та вміннями, набутими на практичних заняттях з іноземної мови, тому важливим є те, щоб студенти якнайповніше використовували ці навички та вміння під час самостійної роботи. Самостійна робота має позитивно впливати на навчальну діяльність студентів з іноземної мови.

Мета навчання іноземної мови за професійним спрямуванням полягає в формуванні необхідної комунікативної спроможності в своїй галузі. Студентам пропонуються різноманітні продуктивні вправи:

1) підбір та накопичення мовних засобів для вираження певних комунікативних намірів;
2) тлумачення мовних засобів;
3) складання глосаріїв;
4) творчі завдання, які пов'язані з текстом,
5) коментування подій та фактів;
6) формування ідей, які виражено у тексті неясно;
7) висловлювання свого ставлення до фактів і подій;
8) аргументація свого погляду щодо наведених у тексті тверджень;
9) обгрунтування висновків;
10) використання фактів з тексту для описуваного повідомлення.

III. ЗМІСТ КУРСУ ТА ТЕМИ ДО САМОСТІЙНОЇ РОБОТИ

Згідно з робочою програмою з дисципліни на самостійну роботу студентів виносяться усні та письмові завдання для закріплення тем, опрацьованих на практичних заняттях.

Форми контролю:

1) усна (читання та переклад текстів, анотації, завдання з діалогічного та монологічного мовлення);
2) письмова (лексичні та граматичні вправи, складання термінологічних словників).

IV. ЯК САМОСТІЙНО ПРАЦЮВАТИ НАД ТЕМОЮ

Якщо вам необхідно самостійно опрацювати тему, ми рекомендуємо вам працювати за такою схемою:

- Прочитайте и перекладіть основний текст теми.
- Випишіть незнайомі слова та словосполучення (попрацюйте зі словником).

- Виконайте лексичні вправи на ознайомлення та закріплення з новими термінами та термінологічними словосполученнями.
- Дайте відповіді на запитання до тексту.
- Прочитайте граматичний матеріал до теми заняття.
- Виконайте граматичні вправи на автоматизацію дій з новими граматичними структурами.
- Запишіть свої запитання до викладача, якщо щось залишилося для вас нез'ясованим.

V. ЯК ПІДГОТУВАТИСЯ ДО АНОТАЦІЇ СТАТТІ

Щоб підготувати анотацію статті, ми рекомендуємо вам працювати за такою схемою:

1. Перегляньте англомовне джерело в паперовому або електронному варіанті.
2. Виберіть статтю, заголовок якої здається вам цікавим.
3. Прочитайте статтю, користуючись словником та виписуючи невідомі слова та словосполучення.
4. Повторіть зразок для анотації статті.
5. Виберіть цитати з основною інформацією статті.
6. Проанотуйте статтю за зразком, використовуючи вибрані цитати в письмовій формі.
7. На подальших етапах, після ряду письмових анотацій, ви зможете анотувати статті і в усній формі.

VI. ЯК ПІДГОТУВАТИСЯ ДО ОБГРУНТУВАННЯ НАУКОВОГО ДОСЛІДЖЕННЯ

Щоб підготувати обґрунтування наукового дослідження, ми рекомендуємо вам працювати за такою схемою:

1. Прочитайте та перекладіть зразок для обгрунтування наукового дослідження.
2. Перегляньте вступ до магістерського дослідження.
3. Використовуючи речення-кліше зразку, перекладіть основну інформацію вступу до магістерської роботи.
4. Підготуйте обгрунтування наукового дослідження в друкованому варіанті .
5. Підготуйтеся до усної презентації обґрунтування.

VII. СЕМЕСТРОВІ ЗАВДАННЯ

Unit I
PHYSICS AS A SCIENCE

Theoretical Physics

Text 1

Theoretical physics is a branch of physics which employs mathematical models and abstractions of physical objects and systems to rationalize, explain and predict natural phenomena. This is in contrast to experimental physics, which uses experimental tools to probe these phenomena.

The advancement of science depends in general on the interplay between experimental studies and theory. In some cases, theoretical physics adheres to standards of mathematical rigour while giving little weight to experiments and observations. For example, while developing special relativity, Albert Einstein was concerned with the Lorentz transformation which left Maxwell's equations invariant, but was apparently uninterested in the Michelson–Morley experiment on Earth's drift through a luminiferous ether. On the other hand, Einstein was awarded the Nobel Prize for explaining the photoelectric effect, previously an experimental result lacking a theoretical formulation.

1. Find the English equivalents in the text:

Застосовувати моделі, передбачати явища, розвиток науки, залежати від взаємодії, дотримуватися стандартів, спостереження, бути нагородженим премією, пояснити.

2. Translate the following terms and terminological expressions:

Theoretical physics, mathematical model, natural phenomena, experimental physics, Earth's drift, luminiferous ether, photoelectric effect, experimental result, theoretical formulation.

3. Find the definitions:

Michelson–Morley experiment	a set of four linear partial differential equations that summarize the classical properties of the electromagnetic field
Lorentz transformation	the set of equations that, in Einstein's special theory of relativity, relate the space and time coordinates of one frame of reference to those of another
Maxwell's equations	an experiment performed in 1887 that attempted to measure the relative motion of the earth and the ether by measuring the speed of light in directions parallel and perpendicular to the earth's motion. The result disproved the existence of the ether, which contradicted Newtonian physics but was explained by Einstein's special theory of relativity.

Answer the following questions:

1. What branch is theoretical physics?
2. What does experimental physics use?
3. What does the advancement of science depend on?
4. What was Einstein awarded the Nobel Prize for?

4. Give a summary of the text.

6. Read and translate the model to the annotation of the article:

ANNOTATION

1. I was supposed to annotate the following article.
2. It was published in the British journal (magazine, newspaper) …
3. The title (headline) of the article is …
4. The author of the article is …
   (The article was written by a special correspondent of the journal).
5. The article represents a definite interest from the point of view …
6. It gives facts (tables, diagrams, figures, schemes).
7. The article considers the problem of …
8. It describes (discusses) …
9. The article draws the reader's attention to …
10. The author points out that …
11. He stresses that …
12. The writer analyses the achievements of …
13. He approves …
14. The key problem of the article is …
15. To my mind (in my opinion) …
16. The article is worth reading because the problem is of great interest (of good use, actual, informative).

Text 2

A **physical theory** is a model of physical events. It is judged by the extent to which its predictions agree with empirical observations. The quality of a physical theory is also judged on its ability to make new predictions which can be verified by new observations. A physical theory differs from a mathematical theorem in that while both are based on some form of axioms. Judgment of mathematical applicability is not based on agreement with any experimental results.

A physical theory involves one or more relationships between various measurable quantities. Archimedes realized that a ship floats by displacing its mass of water. Pythagoras understood the relation between the length of a vibrating string and the musical tone it produces. Other examples include entropy as a measure of the uncertainty regarding the positions and motions of unseen particles

and the quantum mechanical idea that (action and) energy are not continuously variable.

1. Find the English equivalents in the text:

Якість теорії, оцінюватися, робити передбачення, перевірити спостереженнями, базуватися на, вимірювані величини, довжина струни, рух невидимих частинок.

2. Translate the following terms and terminological expressions:

Empirical observations, mathematical theorem, measurable quantities, displacing its mass of water.

3. Put 4 questions to the text.

4. Make an annotation to the article:

Do Great Minds Think Alike?

(From Wavelength Intermediate. By Kathy Burke and Ben Wordon)

What makes a person so brilliant that they change the course of history? Is there a recipe for genius – a list of ingredients that all geniuses share? Perhaps not, but geniuses really seem to have quite a lot in common.

For example, geniuses often come from an unhappy background, and many are orphans. One study of important creators found that twenty per cent of them lost one or both parents in childhood. Tolstoy, Michelangelo, Bach, Raphael, Wagner, and Charlie Chaplin all lost parents before they were ten years old. Seventy-five per cent of the geniuses in another study came from families affected by poverty, divorce, abuse, alcoholism, and mental illness.

What is the connection? Perhaps stress made the children escape into there own private worlds – they felt different from other children and so decided to become even more different. Or were they working hard to please parents who were not there?

Geniuses are also incredibly productive. Picasso is responsible for 20,000 works. Thomas Edison, inventor of the light bulb, patented 1093 inventions. Freud produced 330 publications. Of course, high productivity will include failures, but what makes geniuses different is that they do not give up when they fail – they build on failure to create their biggest successes. Freud had his breakthrough about the importance of dreams after spending years on another project, which finally came to nothing. He was already over forty – but according to one study, most great works are done between the ages of thirty-five and forty-five. Whenever their great creations come, however, one thing seems to connect all geniuses (even young ones like Mozart) – a “ten-year rule”. Geniuses have always worked hard in their chosen areas for at least a decade before they create their first masterpieces.

Finally, could genius also be a question of simple childlike curiosity? Einstein often said that his greatest discoveries came from simply asking the same kinds of questions children ask – but unlike most adults, he never stopped asking them. (*Adapted from The Sunday Times by The Moscow News)*

Text 3

Theoreticial physics consists of several different approaches. In this regard, theoretical particle physics forms a good example. For instance: "phenomenologists" might employ (semi-) empirical formulas to agree with experimental results, often without deep physical understanding. "Modellers" (also called "model-builders") often appear much like phenomenologists, but try to model speculative theories that have certain desirable features (rather than on experimental data), or apply the techniques of mathematical modelling to physics problems.

Some attempt to create approximate theories, called *effective theories*, because fully developed theories may be regarded as unsolvable or too complicated. Other theorists may try to unify, formalise, reinterpret or generalise extant theories, or create completely new ones altogether. Sometimes the vision provided by pure mathematical systems can provide clues to how a physical system might be modeled; e.g., the notion, due to Riemann and others, that space itself might be curved.

Theoretical problems that need computational investigation are often the concern of computational physics.

1. Agree or disagree with the statements:

1. "Phenomenologists" employ empirical formulas to agree with experimental results with deep physical understanding.
2. "Modellers" apply the techniques of mathematical modelling to physics problems.
3. Some theorists try to formulate effective theories because of complicated character of developed theories.
4. Computational physics deals with theoretical problems that need computational investigation.

2. Complete the following statements:

1. “Model-builders” attempt to model speculative theories that have … .
2. Approximate theories created by some theorists are called … .
3. Some theorists try to create completely new … .
4. Theoretical problems that need … are often the concern of computational physics.

3. Make up 4 questions on the text.

4. Make an annotation of the article:

Stephen Hawking

There is a man driving around in a motorized wheelchair in Cambridge, England. He can only move his eyes and two fingers on his left hand. He communicates through a computer. He types words on the computer and the computer speaks for him. This man is Stephen Hawking. People know him for his courage and his sense of humour. He is also the greatest physicist since Albert Einstein.

Stephen Hawking was born in 1942 in Oxford, England. His farther was a specialist in tropical diseases. Stephen wanted to be a scientist too. He went to the University of Oxford and received a degree in physics. He then went to the University of Cambridge to study for a Ph.D. During this time doctors discovered that he had ALS, which is sometimes called Lou Gehrig's disease. This fatal disease weakens all body's muscles. Most people with ALS live for five years. The doctors thought Hawking would live for only two and a half more years. When Hawking heard this, he became very depressed.

At about this time he met Jane Wilde, a language student at Cambridge. They fell in love and got married in 1965. Hawking has often said that his wife gave him courage to continue to study and work. Although Hawking had become more severely paralyzed, he became a Professor at Cambridge. Luckily, the work of a physicist only requires one thing: the mind. Hawking had a son and then a daughter. He had another son 12 years later when his disease had gotten much worse. His youngest son never heard his father's real voice. He has only heard the voice from the computer.

Hawking does research about how the universe began. He sees connections and works out explanations that other people cannot. His research has influenced many other scientists. Some of his ideas are so advanced that other scientist cannot prove them yet. His most famous ideas are about black holes. Black holes are not really holes. They are so dense that even light cannot pass through. That is why they are called black holes.

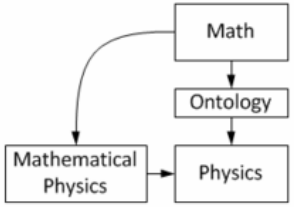
As his disease got worse, money became a problem for Stephen Hawking. He had a lot of medical expenses. He needed special wheelchair, nurses 24 hours a day, and machines to help him read and speak. To earn extra money, Hawking gave speeches and published articles. Then someone told him to write a book that explained the universe to ordinary people. Hawking agreed and wrote *A Brief History of Time*. The book sold over 8 million copies worldwide, and Hawking became a millionaire. Even though most people could not understand Hawking's ideas, he amazed them. Hawking became world famous. He met the Queen of England, he was on the covers of magazines, and he appeared on television shows.

In 1990 Hawking ended his 25-year marriage. This was shocking to many of his friends because his wife, Jane, was very devoted to him. She took care of all his needs. She fed him, bathed him, dressed him, and raised their children by herself. Hawking left her for a younger woman – his nurse! They were married in 1995.

Hawking's strong personality and spirit have helped him to live with ALS for over 30 years. He has helped to make people aware of ALS and other disabilities. Hawking teaches us that even though a person is physically disabled, the mind has no limits.

(*From: What a life! By Milada Broukal*)

Text 4



Theoretical advances may consist in setting aside old, incorrect paradigms or may be an alternative model that provides answers that are more accurate or that can be more widely applied. In the latter case, a correspondence principle will be required to recover the previously known result. Sometimes though, advances may proceed along different paths. For example, an essentially correct theory may need some conceptual or factual revisions. Atomic theory, first postulated millenia ago (by several thinkers in Greece and India) and the two-fluid theory of electricity are two cases in this point. Furthermore, the wave-particle duality is a theory combining aspects of different, opposing models via the Bohr complementarity principle.

Physical theories become accepted if they are able to make correct predictions and no (or few) incorrect ones. The theory should have, at least as a secondary objective, a certain economy and elegance (compare to mathematical beauty), a notion sometimes called "Occam's razor" after the 13th-century English philosopher William of Occam (or Ockham), in which the simpler of two theories that describe the same matter just as adequately is preferred (but conceptual simplicity may mean mathematical complexity). They are also more likely to be accepted if they connect a wide range of phenomena. Testing the consequences of a theory is part of the scientific method.

1. Find the English equivalents in the text:

Полягати в, відкладати невірні парадигми, надавати відповіді, бути більш точним, бути ширше застосованим, проходити різними шляхами, фактичні зміни, корпускулярно-хвильової дуалізм, принцип доповнюваності, робити правильні передбачення, вторинна мета, лезо (бритва) Окама (принцип простоти), широкпе коло явищ, тестування (перевірка) наслідків.

2. Agree or disagree with the statements:

1. Theoretical advances may mean finding alternative model for the existing ones.
2. Theoretical advances may proceed along different paths.
3. A correct theory does not need any revision.
4. Physical theories become accepted if they connect fewer phenomena.

3. Complete the sentences:

1. A correspondence principle will be required to recover the … .
2. A correct theory may need … .
3. Physical theories become accepted if … .
4. William of Occam Ockham stated that entities must not be multiplied beyond … .

4. Make up 4 questions on the text and ask your partner to answer them.

5. Make an annotation of the article:

Erwin Schrödinger

Erwin Rudolf Josef Alexander Schrödinger (12 August 1887 – 4 January 1961), was an Austrian physicist who developed a number of fundamental results in the field of quantum theory, which formed the basis of wave mechanics: he formulated the wave equation (stationary and time-dependent Schrödinger equation) and revealed the identity of his development of the formalism and matrix mechanics.

Schrödinger proposed an original interpretation of the physical meaning of the wave function and in subsequent years repeatedly criticized the conventional Copenhagen interpretation of quantum mechanics (using e.g. the paradox of Schrödinger's cat). In addition, he was the author of many works in various fields of physics statistical mechanics and thermodynamics, physics of dielectrics, color theory, electrodynamics, general relativity, and cosmology, and he made several attempts to construct a unified field theory.

In his book *What Is Life?* Schrödinger addressed the problems of genetics, looking at the phenomenon of life from the point of view of physics. He paid great attention to the philosophical aspects of science, ancient and oriental philosophical concepts, ethics and religion. He also wrote on philosophy and theoretical biology.

In 1887 Schrödinger was born in Vienna, Austria, to Rudolf Schrödinger (cerecloth producer, botanist) and Georgine Emilia Brenda (daughter of Alexander Bauer, Professor of Chemistry, Technische Hochschule Vienna). He was their only child.

He was also able to learn English outside of school, as his maternal grandmother was British. Between 1906 and 1910 Schrödinger studied in Vienna under Franz S. Exner (1849–1926) and Friedrich Hasenöhrl (1874–1915). He also conducted experimental work with Karl Wilhelm Friedrich Fritz" Kohlrausch.

Early in his life, Schrödinger experimented in the fields of electrical engineering, atmospheric electricity, and atmospheric radioactivity; he usually worked with his former teacher Franz Exner. He also studied vibrational theory, the theory of Brownian movement, and mathematical statistics. Schrödinger gave a theoretical estimate of the probable height distribution of radioactive substances, which is required to explain the observed radioactivity of the atmosphere, and in August 1913 executed several experiments in Zeehame that confirmed his theoretical estimate and those of Victor Franz Hess. For this work, Schrödinger was awarded the 1920 Haytingera Prize (Haitinger-Preis) of the Austrian Academy of Sciences.

He was awarded with Nobel Prize for Physics (1933) for the formulation of the Schrödinger equation. In quantum mechanics, the Schrödinger equation is a partial differential equation that describes how the quantum state of some physical system changes with time. It was formulated in late 1925, and published in 1926, by the Austrian physicist Erwin Schrödinger.

Text 5

Theoretical physics began at least 2,300 years ago, under the Pre-Socratic philosophy, and continued by Plato and Aristotle, whose views held sway for a millennium. During the rise of medieval universities, the only acknowledged intellectual disciplines were the seven liberal arts of the *Trivium* like grammar, logic, and rhetoric and of the *Quadrivium* like arithmetic, geometry, music and astronomy.

During the Middle Ages and Renaissance, the concept of experimental science, the counterpoint to theory, began with scholars such as Ibn al-Haytham and Francis Bacon. As the Scientific Revolution gathered pace, the concepts of matter, energy, space, time and causality slowly began to acquire the form we know today, and other sciences spun off from the rubric of natural philosophy. Thus, began the modern era of theory with the Copernican paradigm shift in astronomy, soon followed by Johannes Kepler's expressions for planetary orbits, which summarized the meticulous observations of Tycho Brahe; the works of these men can perhaps be considered to constitute the Scientific Revolution.

1. Find the English equivalents in the text:

Панувати протягом тисячоліття, підйом середньовічних університетів, визнані дисципліни, контрапункт до теорії, набирати темпу, поняття матерії, поняття причинності, набувати форми, виділити з рубрики, допитливі спостереження.

2. Translate the following terms and terminological expressions:

Pre-Socratic philosophy, medieval universities, arithmetic, geometry, astronomy, matter, energy, space, time, causality, natural philosophy, planetary orbits, the Scientific Revolution.

3. Answer the following questions:

1. When did theoretical physics begin?
2. What were the acknowledged disciplines during the rise of medieval universities?
3. When did the concepts of matter, energy, space, time and causality begin to acquire the form we know today?
4. What works can be considered to constitute the Scientific Revolution?

4. Give a summary of the text.

5. Make an annotation of the article:

The Nobel Prize in Physics 2014
Isamu Akasaki, Hiroshi Amano, Shuji Nakamura

The Nobel Prize in Physics 2014 was awarded jointly to Isamu Akasaki, Hiroshi Amano and Shuji Nakamura *"for the invention of efficient blue light-emitting diodes which has enabled bright and energy-saving white light sources".*

New light to illuminate the world

This year's Nobel Laureates are rewarded for having invented a new energy-efficient and environment-friendly light source – the blue light-emitting diode (LED). In the spirit of Alfred Nobel the Prize rewards an invention of greatest benefit to mankind; using blue LEDs, white light can be created in a new way. With the advent of LED lamps we now have more long-lasting and more efficient alternatives to older light sources.

When **Isamu Akasaki**, **Hiroshi Amano** and **Shuji Nakamura** produced bright blue light beams from their semi-conductors in the early 1990s, they

triggered a fundamental transformation of lighting technology. Red and green diodes had been around for a long time but without blue light, white lamps could not be created. Despite considerable efforts, both in the scientific community and in industry, the blue LED had remained a challenge for three decades.

They succeeded where everyone else had failed. Akasaki worked together with Amano at the University of Nagoya, while Nakamura was employed at Nichia Chemicals, a small company in Tokushima. Their inventions were revolutionary. Incandescent light bulbs lit the 20th century; the 21st century will be lit by LED lamps.

White LED lamps emit a bright white light, are long-lasting and energy-efficient. They are constantly improved, getting more efficient with higher luminous flux (measured in lumen) per unit electrical input power (measured in watt). The most recent record is just over 300 lm/W, which can be compared to 16 for regular light bulbs and close to 70 for fluorescent lamps. As about one fourth of world electricity consumption is used for lighting purposes, the LEDs contribute to saving the Earth's resources. Materials consumption is also diminished as LEDs last up to 100,000 hours, compared to 1,000 for incandescent bulbs and 10,000 hours for fluorescent lights.

Text 6

The great push toward the modern concept of explanation started with Galileo, one of the few physicists who was both a consummate theoretician and a great experimentalist. The analytic geometry and mechanics of Descartes were incorporated into the calculus and mechanics of Isaac Newton, another theoretician/experimentalist of the highest order, writing Principia Mathematica. It contained a grand synthesis of the work of Copernicus, Galileo, and Kepler; as well as Newton's theories of mechanics and gravitation, which held way as world views until the early 20th century.

Simultaneously, progress was also made in optics (in particular the ancient science of geometrical optics and colour theory), courtesy of Newton, Descartes and the Dutchmen Snell and Huygens. In the 18th and 19th centuries Joseph-Louis Lagrange, Leonhard Euler and William Rowan Hamilton would extend the theory of classical mechanics considerably. Each of these individuals picked up the interactive intertwining of mathematics and physics begun two millennia earlier by Pythagoras.

1. Find the English equivalents in the text:

Неперевершений теоретик, бути включеним у обчислення, світогляд, значно розширити теорію, переплетіння.

2. Translate the following terms and terminological expressions:

Analytic geometry, mechanics, calculus, gravitation, optics, colour theory.

3. Find the definitions of the notions:

Analytical geometry	is concerned with the set of physical laws describing the motion of bodies under the action of a system of forces
Optics	study of geometry using a coordinate system
Classical mechanics	the branch of physics which involves the behaviour and properties of light, including its interactions with matter and the construction of instruments that use or detect it

4. Answer the following questions:

1. Whom did the great push toward the modern concept of explanation start with?
2. What were the analytic geometry and mechanics of Descartes incorporated into?
3. What did Newton's Principia Mathematica contain?
4. Who extended the theory of classical mechanics considerably?

5. Give a summary of the text.

6. Make an annotation of the article:

Nobel Prize for Physics 2011 awarded for cosmology research

Topic: Nobel Prize 2011

Nobel Prize for Physics 2011 awarded for cosmology research

© AFP/ Jonathan Nackstrand

15:11 04/10/2011

The Nobel Prize for Physics 2011 has been awarded to U.S. and Australian cosmology researchers, the Royal Swedish Academy of Sciences said on Tuesday. Americans Saul Perlmutter and Adam G. Riess, and Australian Brian P. Schmidt won the Nobel Prize "for the discovery of the accelerating expansion of the Universe through observations of distant supernovae."

In 2007, Perlmutter, Riess and Schmidt won the Gruber Prize in Cosmology, the most prestigious award in this field. Since then, they have been the most likely candidates for the Nobel Prize.

Last year the prize was awarded to Russian-born Andre Geim and Konstantin Novoselov working in Britain for their research in two-dimensional material graphene.

On Wednesday, the Nobel Prize committee will announce the winner(s) of the Nobel Prize in Chemistry.

The prize in each nomination is worth 10 million Swedish kronas (1 million euros). The awarding ceremony is to be held in Stockholm on December 10, the day of Alfred Nobel's death (1833-1896).

Text 7

Among the great conceptual achievements of the 19th and 20th centuries were the consolidation of the idea of energy (as well as its global conservation) by the inclusion of heat, then electricity and magnetism and light.

The laws of thermodynamics, and most importantly the introduction of the singular concept of entropy began to provide a macroscopic explanation for the properties of matter. Statistical mechanics (followed by statistical physics) emerged as an offshoot of thermodynamics late in the 19th century.

Another important event in the 19th century was the discovery of electromagnetic theory, unifying the previously separate phenomena of electricity, magnetism and light.

1. Find the English equivalents in the text:

Концептуальне досягнення, консолідація ідеї, збереження енергії, властивості матерії, виникнути як відгалуження термодинаміки, об'єднання раніше окремих явищ.

2. Translate the following terms and terminological expressions:

Heat, electricity, magnetism, light, the laws of thermodynamics, concept of entropy, the discovery of electromagnetic theory.

3. Find the definitions of the notions:

Heat	the set of physical phenomena associated with the presence and flow of electric charge
Electricity	a property of thermodynamical systems invented by Rudolf Clausius who named it from the Greek word "transformation"
Magnetism	electromagnetic radiation within a certain portion of the electromagnetic spectrum
Light	a class of physical phenomena that are mediated by magnetic fields
Energy	the amount of work that a *thermodynamic* system can perform
Entrophy	one of the forms of energy

4. Answer the following questions:

1. What ideas were among the great conceptual achievements of the 19th and 20th centuries?
2. What did the laws of thermodynamics begin to provide?
3. What was another important event in the 19th century?
4. What did the electromagnetic theory unify?

5. Give a summary of the text.

6. Make an annotation of the article:

Michael Faraday (1791-1867)

Michael Faraday was born on 22 September 1791 in south London. His family was not well off and Faraday received only a basic formal education. When he was 14, he was apprenticed to a local bookbinder and during the next seven years, educated himself by reading books on a wide range of scientific subjects. In 1812, Faraday attended four lectures given by the chemist Humphry Davy at the Royal Institution. Faraday subsequently wrote to Davy asking for a job as his assistant. Davy turned him down but in 1813 appointed him to the job of chemical assistant at the Royal Institution.

A year later, Faraday was invited to accompany Davy and his wife on an 18-month European tour, taking in France, Switzerland, Italy, and Belgium and meeting many influential scientists. On their return in 1815, Faraday continued to work at the Royal Institution, helping with experiments for Davy and other scientists. In 1821 he published his work on electromagnetic rotation (the principle behind the electric motor). He was able to carry out little further research in the 1820s, busy as he was with other projects. In 1826, he founded the Royal Institution's Friday Evening Discourses and in the same year the Christmas Lectures, both of which continue to this day. He himself gave many lectures, establishing his reputation as the outstanding scientific lecturer of his time.

In 1831, Faraday discovered electromagnetic induction, the principle behind the electric transformer and generator. This discovery was crucial in allowing electricity to be transformed from a curiosity into a powerful new technology. During the remainder of the decade, he worked on developing his ideas about electricity. He was partly responsible for coining many familiar words including 'electrode', 'cathode' and 'ion'. Faraday's scientific knowledge was harnessed for practical use through various official appointments, including scientific adviser to Trinity House (1836-1865) and Professor of Chemistry at the Royal Military Academy in Woolwich (1830-1851).

However, in the early 1840s, Faraday's health began to deteriorate, and he did less research. He died on 25 August 1867 at Hampton Court, where he had been given official lodgings in recognition of his contribution to science. He gave his name to the 'farad', originally describing a unit of electrical charge but later a unit of electrical capacitance.

Text 8

The pillars of modern physics, and perhaps the most revolutionary theories in the history of physics, have been relativity theory and quantum mechanics. Newtonian mechanics was subsumed under special relativity and Newton's gravity was given a kinematic explanation by general relativity.

Quantum mechanics led to an understanding of blackbody radiation (which indeed, was an original motivation for the theory) and of anomalies in the specific heats of solids — and finally to an understanding of the internal structures of atoms and molecules.

Quantum mechanics soon gave way to the formulation of quantum field theory (QFT), begun in the late 1920s. In the after math of World War 2, more progress brought much renewed interest in QFT, which had since the early efforts, stagnated.

The same period also saw fresh attacks on the problems of superconductivity and phase transitions, as well as the first applications of QFT in the area of theoretical condensed matter.

1. Find the English equivalents in the text:

Стовпи сучасної фізики, бути включеним, пояснення, випромінювання чорного тіла, теплоємність твердого тіла, внутрішня структура, квантова теорія поля, надпровідність, фазові переходи, конденсоване середовище.

2. Translate the following terms and terminological expressions:

Relativity theory, quantum mechanics, quantum field theory, blackbody radiation, superconductivity, phase transitions, theoretical condensed matter.

3. Find the definitions of the notions:

Relativity theory	a theoretical framework for constructing quantum mechanical models of subatomic particles in particle physics and quasi particles in condensed matter physics
Quantum mechanics	encompasses two theories by Albert Einstein: special relativity and general relativity
Quantum field theory	a fundamental branch of physics which deals with physical phenomena at nanoscopic scales, where the action is on the order of the Planck constant

4. Answer the following questions:

1. What are the pillars of modern physics?
2. What did quantum mechanics lead to?
3. What gave way to the formulation of quantum field theory?
4. What discoveries did the same period see?

5. Give a summary of the text.
6. Make an annotation of the article:

Charles Glover Barkla

Charles Glover Barkla (7 June 1877 – 23 October 1944) was a British physicist, and the winner of the Nobel Prize in Physicsin 1917 for his work in X-ray spectroscopy and related areas in the study of X-rays (Roentgen rays).

Barkla was born in Widnes, England to John Martin Barkla, a secretary for the Atlas Chemical Company and Sarah Glover, daughter of a watchmaker. Barkla studied at the Liverpool Institute and proceeded by Liverpool University with a County Council Scholarship and a Bibby Scholarship. Barkla initially studied Mathematics but later specialised in Physics under Sir Oliver Lodge. During the absence of Oliver Lodge due to ill health, Barkla would replace him in lectures.

In 1899, Barkla was admitted to Trinity College, Cambridge, with an 1851 Research Fellowship from the Royal Commission for the Exhibition of 1851, to work in the Cavendish Laboratory under the physicist J. J. Thomson (discoverer of the electron). During his first two years at Cambridge, Barkla would, under the directions of J.J. Thomson, study the velocity of electromagnetic waves along wires of different widths and materials.

After a year and a half at Trinity College, Cambridge, his love of music led him to transfer to King's College, Cambridge in order to sing in their chapel choir. Barkla's baritone voice was of remarkable beauty and his solo performances would always be fully attended. He completed his Bachelor of Arts degree in 1903, and then his Master of Arts degree in 1907.

In 1913, after having worked at the Universities of Cambridge, Liverpool, and King's College London, Barkla was appointed as a Professor of Natural Philosophy at the University of Edinburgh, a position that he held until his death. Barkla married Mary Esther Cowell in 1907, with whom he would have two sons and one daughter.

Barkla made significant progress in developing and refining the laws of X-ray scattering, X-ray spectroscopy, the principles governing the transmission of X-rays through matter, and especially the principles of the excitation of secondary X-rays. For his discovery of the characteristic X-rays of elements, Barkla was awarded the Nobel Prize in Physics in 1917. He was also awarded the Hughes Medal of the British Royal Society that same year.

Unit II
APPLIED MATHEMATICS AS A SCIENCE

Text 1

Applied mathematics is a branch of mathematics that concerns itself with mathematical methods that are typically used in science, engineering, business, and industry. Thus, "applied mathematics" is a mathematical science with specialized knowledge. The term "applied mathematics" also describes the professional specialty in which mathematicians work on practical problems; as a profession focused on practical problems, *applied mathematics* focuses on the formulation and study of mathematical models. In the past, practical applications have motivated the development of mathematical theories, which then became the subject of study in pure mathematics, where mathematics is developed primarily for its own sake. Thus, the activity of applied mathematics is vitally connected with research in pure mathematics.

1. Find the English equivalents in the text:

Стосуватися, використовуватися у машинобудуванні (техніці), описувати спеціальність, зосереджуватися на проблемах, для (заради) себе, бути пов'язаним з науковим дослідженням.

2. Translate the following terms and terminological expressions:

Applied mathematics, a branch of mathematics, mathematical methods, mathematical science, mathematician, the formulation of mathematical model, mathematical theory, pure mathematics, research.

3. Find the definitions:

Engineering	the practice of making one's living by engaging in commerce.
Science	the intellectual and practical activity encompassing the systematic study of the structure and behavior of the physical and natural world through observation and experiment
Business	the branch of science and technology concerned with the design, building, and use of engines, machines, and structures

4. Answer the following questions:

1. What does applied mathematics concern itself with?
2. What does the term "applied mathematics" describe?
3. What is the activity of applied mathematics vitally connected with?

5. Give a summary of the text.

6. Read and translate the model to the annotation of the article:

ANNOTATION

1. I was supposed to annotate the following article.
2. It was published in the British journal (magazine, newspaper) …
3. The title (headline) of the article is …
4. The author of the article is …
   (The article was written by a special correspondent of the journal).
5. The article represents a definite interest from the point of view …
6. It gives facts (tables, diagrams, figures, schemes).
7. The article considers the problem of …
8. It describes (discusses) …
9. The article draws the reader's attention to …
10. The author points out that …
11. He stresses that …
12. The writer analyses the achievements of …
13. He approves …
14. The key problem of the article is …
15. To my mind (in my opinion) …
16. The article is worth reading because the problem is of great interest (of good use, actual, informative).

Text 2

HISTORY

Historically, applied mathematics consisted principally of applied analysis, most notably differential equations; approximation theory (broadly construed, to include representations, asymptotic methods, variational methods, and numerical analysis); and applied probability. These areas of mathematics were intimately tied to the development of Newtonian physics, and in fact, the distinction between mathematicians and physicists was not sharply drawn before the mid-19th century. This history left a legacy as well: until the early 20th century, subjects such as classical mechanics were often taught in applied mathematics departments at American universities rather than in physics departments, and fluid mechanics may still be taught in applied mathematics departments. Engineering and computer science departments have traditionally made use of applied mathematics.

1. Find the English equivalents in the text:

Складатися з, сфери (області) математики, бути тісно пов'язаним, різниця (відмінність), математик, фізик, залишити у спадок, фізичний факультет, факультет інформатики.

2. Translate the following terms and terminological expressions:

Applied analysis, differential equation, approximation theory, asymptotic methods, variational methods, numerical analysis, applied probability, Newtonian physics, classical mechanics, fluid mechanics, computer science.

3. Find the definitions:

Fluid mechanics	the study of the principles and use of computers
Classical mechanics	a sub-field of mechanics concerning with the set of physical laws describing the motion of bodies under the action of a system of forces
Computer science	the branch of mechanics dealing with the properties of fluids in various states and with their reaction to forces acting upon them

4. Answer the following questions:

1. What did applied mathematics consist of?
2. What were these areas of mathematics closely connected with?
3. What branches have traditionally made use of applied mathematics?

5. Give a summary of the text.

6. Make an annotation to the article:

Do Great Minds Think Alike?

(From Wavelength Intermediate. By Kathy Burke and Ben Wordon)

What makes a person so brilliant that they change the course of history? Is there a recipe for genius – a list of ingredients that all geniuses share? Perhaps not, but geniuses really seem to have quite a lot in common.

For example, geniuses often come from an unhappy background and many are orphans. One study of important creators found that twenty per cent of them lost one or both parents in childhood. Tolstoy, Michelangelo, Bach, Raphael, Wagner, and Charlie Chaplin all lost parents before they were ten years old. Seventy-five per cent of the geniuses in another study came from families affected by poverty, divorce, abuse, alcoholism, and mental illness.

What is the connection? Perhaps stress made the children escape into there own private worlds – they felt different from other children and so decided to become even more different. Or were they working hard to please parents who were not there?

Geniuses are also incredibly productive. Picasso is responsible for 20,000 works. Thomas Edison, inventor of the light bulb, patented 1093 inventions. Freud

produced 330 publications. Of course, high productivity will include failures, but what makes geniuses different is that they do not give up when they fail – they build on failure to create their biggest successes. Freud had his breakthrough about the importance of dreams after spending years on another project, which finally came to nothing. He was already over forty – but according to one study, most great works are done between the ages of thirty-five and forty-five. Whenever their great creations come, however, one thing seems to connect all geniuses (even young ones like Mozart) – a "ten-year rule". Geniuses have always worked hard in their chosen areas for at least a decade before they create their first masterpieces.

Finally, could genius also be a question of simple childlike curiosity? Einstein often said that his greatest discoveries came from simply asking the same kinds of questions children ask – but unlike most adults, he never stopped asking them. (*Adapted from The Sunday Times by The Moscow News)*

Text 3

DIVISIONS

Today, the term "applied mathematics" is used in a broader sense. It includes the classical areas noted above as well as other areas that have become increasingly important in applications. Even fields such as number theory that are part of pure mathematics are now important in applications (such as cryptography), though they are not generally considered to be part of the field of applied mathematics.

Sometimes, the term "applicable mathematics" is used to distinguish between the traditional applied mathematics that developed alongside physics and the many areas of mathematics that are applicable to real-world problems today.

There is no consensus as to what the various branches of applied mathematics are. Such categorizations are made difficult by the way mathematics and science change over time, and also by the way universities organize departments, courses, and degrees.

1. Agree or disagree with the statements:

1. The meaning of the term "applied mathematics" has become more narrow.
2. Cryptography is considered to be the branch of pure mathematics.
3. The term "applicable mathematics" is used to distinguish between pure mathematics and applied mathematics.
4. There is no distinct definitions of applied mathematics fields.

2. Complete the sentences:

1. Nowadays the term "applied mathematics" involves traditional fields and …
2. Cryptography is the art of writing or solving … .
3. Number theory is traditionally considered to be a part of …
4. … is used to distinguish between the traditional applied mathematics and some new branches.

3. Make up 4 questions on the text and discuss it with your partner.

4. Find the definitions of the notions:

Physics	deals with mathematical methods that find use in science, engineering, business, computer science, and industry
Mathematics	the branch of science concerned with the nature and properties of matter and energy
Applied Mathematics	the abstract science of number, quantity, and space

5. Make an annotation of the article:

Emmy Noether

German mathematician Emmy Noether (1882–1935) revolutionized the areas of abstract algebra and theoretical physics. Even Einstein called her a genius.

Amalie Emmy Noether was born in Germany on March 23, 1882. She taught at the University of Göttingen until the Nazi regime dismissed all Jewish professors. Noether then moved to Bryn Mawr College in the U.S. Her groundbreaking work in abstract algebra and theoretical physics led to concepts like "Noether's Theorem," "Noetherian rings," and "Noetherian induction."

Born on March 23, 1882 in Bavaria Germany, Amalie Emmy Noether made several contributions in the field of Mathematics.

Noether's work was divided into 3 epochs. The first epoch was between 1907-1919, in which she devoted her time in the field of algebraic invariant theory, Galois Theory and Physics. Noether proved two theorems that were important for elementary particle physics and general relativity. One of her theorems known as 'Noether's Theorem' is one of the most significant contributions in the development of modern physics.

In the second epoch from 1920-1926, she concentrated on the theory of mathematical rings. She developed the abstract and conceptual approach to

algebra, which resulted in several principles unifying topology, logic, geometry, algebra and linear algebra. Her works were a breakthrough in abstract algebra. Her study based on chain conditions on the ideals of commutative rings were honored by many mathematicians all over the world. Her paper 'Ideal theorie in Ringbereichen' or 'Theory of Ideals in Ring Domains', published 1921, became the foundation for commutative ring theory. The 'Noetherian rings' and 'Noetherian ideals' formed part of her mathematical contributions. Her insights and ideas in topology had a great impact in the field of Mathematics.

The third epoch began from 1927-1935, where non-commutative algebras, representation theory, hyper-complex numbers and linear transformations became the primary focus of her study. Noether was awarded the Ackermann-Teubner Memorial Prize in Mathematics in 1932.

Text 4

Many mathematicians distinguish between "applied mathematics," which is concerned with mathematical methods, and the "applications of mathematics" within science and engineering.

A biologist using a population model and applying known mathematics would not be *doing* applied mathematics, but rather *using* it; however, mathematical biologists have posed problems that have stimulated the growth of pure mathematics.

Mathematicians such as Poincaré and Arnold deny the existence of "applied mathematics" and claim that there are only "applications of mathematics". Similarly, non-mathematicians blend applied mathematics and applications of mathematics. The use and development of mathematics to solve industrial problems is also called "industrial mathematics".

The success of modern numerical mathematical methods and software has led to the emergence of computational mathematics, computational science, and computational engineering, which use high-performance computing for the simulation of phenomena and the solution of problems in the sciences and engineering. These are often considered interdisciplinary disciplines.

1. Agree or disagree with the statements:

1. "Applications of mathematics" are concerned with mathematical methods.
2. Applied mathematics in biology is the use of population model.
3. Some mathematicians recognize only the term "applications of mathematics."
4. The success of modern numerical mathematical methods and software has led to the emergence of applied mathematics.

2. Complete the sentences:

1. Mathematical biology models biological problems using … .
2. Industrial mathematics is … .
3. Computational mathematics is a branch of … .
4. Computational science and computational engineering are considered to be ... .

3. Make up 4 questions on the text and discuss it with your partner.

4. Find the definitions of the notins:

Industrial mathematics	mathematical science used in the social sciences
Computational mathematics	the use and development of mathematics to solve industrial problems
Statistics	Involves mathematical research in areas of science where computing plays a central and essential role

5. Make an annotation of the article:

Peter Naur

Computer Science Personalities

Peter Naur (born October 25, 1928) is a Danish pioneer in computer science and Turing award winner. His last name is the N in the BNF notation (Backus-Naur form), used in the description of the syntax for most programming languages. He contributed to the creation of the ALGOL 60 programming language.

He began his career as an astronomer for which he received his PhD degree in 1957, but his encounter with computers led to a change of profession. From 1959 to 1969 he was employed at Regnecentralen, the Danish computing institute, while at the same time giving lectures at the Niels Bohr Institute and the Technical University of Denmark. From 1969 to 1998 Peter was a professor of computer science at University of Copenhagen.

His main areas of inquiry are design, structure and performance of computer programs and algorithms. Areas such as software engineering and software architecture have also been pioneered by Naur. In his book *Computing: A Human Activity* (1992), which is a collection of his contributions to computer science, he rejects the formalist school of programming that view programming as a branch of mathematics. He does not like being associated with the Backus-Naur form (attributed to him by Donald Knuth) and says that he would prefer it to be called the *Backus Normal Form*.

Peter Naur was married with the computer scientist Christiane Floyd.

Naur dislikes the very term *computer science* and suggests it be called *datalogy*. This term has also been adopted in Denmark and in Sweden as *datalogi*. In later years he has also been quite outspoken of the pursuit of science as a whole: Naur can possibly be identified with the empiricist school, that tells that one shall not seek deeper connections between things that manifest themselves in the world, but keep to the observable facts. He has attacked both certain strands of philosophy and psychology from this viewpoint. He is also currently developing a theory of human thinking which he calls Synapse-State Theory of Mental Life.

Naur won the 2005 ACM A.M. Turing Award for his work on defining the ALGOL 60 programming language. In particular, his role as editor of the influential "Report on the Algorithmic Language ALGOL 60" with its pioneering use of BNF was recognized. Naur is the only Dane to have won the Turing Award.

Text 5

UTILITY

Historically, mathematics was the most important in the natural sciences and engineering. However, since World War II, fields outside of the physical sciences have spawned the creation of new areas of mathematics, such as game theory and social choice theory, which grew out of economic considerations, or neural networks, which arose out of the study of the brain in neuroscience.

The advent of the computer has created new applications: studying and using the new computer technology itself (computer science) to study problems arising in other areas of science (computational science) as well as the mathematics of computation (for example, theoretical computer science, computer algebra, numerical analysis). Statistics is probably the most widespread mathematical science used in the social sciences, but other areas of mathematics, most notably economics, are proving increasingly useful in these disciplines.

1. Find the English equivalents in the text:

Природничі науки, зароджувати створення, теорія суспільного вибору, економічні міркування, нейронні мережі, дослідження мозку в неврології, поява кмп'ютера, інформатика, чисельні методи, найбільш поширена математична наука.

2. Translate the following terms and terminological expressions:

Computer science, computational science, the mathematics of computation, theoretical computer science, computer algebra, numerical analysis, statistics.

3. Find the definitions:

Computer science	mathematical research in areas of science where computing plays a central and essential role, emphasizing algorithms, numerical methods, and symbolic methods
Computational science	is concerned with constructing mathematical models and quantitative analysis techniques and using computers to analyze and solve scientific problems
Mathematics of computation	the scientific and practical approach to computation and its applications

4. Answer the following questions:

1. What science was the most important in the natural sciences and engineering?
2. What new areas of mathematics were created?
3. What has created new applications: studying and using the new computer technology itself?
4. What is the most widespread mathematical science?

5. Give a summary of the text.

6. Make an annotation of the article:

Maurice Wilkes

Computer Science Personalities

Sir Maurice Vincent Wilkes (26 June 1913 – 29 November 2010) was a British computer scientist credited with several important developments in computing. At the time of his death, Wilkes was an Emeritus Professor of the University of Cambridge. He received a number of distinctions: he was a knight bachelor, Distinguished Fellow of the British Computer Society, a Fellow of the Royal Academy of Engineering and a Fellow of the Royal Society.

In 1945, Wilkes was appointed as the second director of the University of Cambridge Mathematical Laboratory (later known as the Computer Laboratory). The Cambridge laboratory initially had many different computing devices, including a differential analyser. Wilkes obtained a copy of John von Neumann's prepress description of the EDVAC, a successor to the ENIAC under construction by Presper Eckert and John Mauchly at the Moore School of Electrical Engineering. He had to read it overnight because he had to return it and no photocopy facilities existed. He decided immediately that the document described the logical design of future computing machines, and that he wanted to be involved in the design and construction of such machines.

In 1956 he was elected a Fellow of the Royal Society.

He was a founder member of the British Computer Society (BCS) and its first president (1957–1960). Wilkes received the Turing Award in 1967, with the following citation: "Professor Wilkes is best known as the builder and designer of the EDSAC, the first computer with an internally stored program. Built in 1949, the EDSAC used a mercury delay line memory. He is also known as the author, with Wheeler and Gill, of a volume on *Preparation of Programs for Electronic Digital Computers* in 1951, in which program libraries were effectively introduced." In 1968 he received the Harry H. Goode Memorial Award, with the following citation: "For his many original achievements in the computer field, both in engineering and software, and for his contributions to the growth of professional society activities and to international cooperation among computer professionals

He was awarded the Faraday Medal by the Institution of Electrical Engineers in 1981. The Maurice Wilkes Award, awarded annually for an outstanding contribution to computer architecture made by a young computer scientist or engineer, is named after him. In 1986, he returned to England, and became a member of Olivetti's Research Strategy Board. In 1993 Wilkes was presented, by Cambridge University, an honorary Doctor of Science degree. In 1994 he was inducted as a Fellow of the Association for Computing Machinery. He was awarded the Mountbatten Medal in 1997. He was knighted in the 2000 New Year Honours List. In 2001, he was inducted as a Fellow of the Computer History Museum. In 2002, Wilkes moved back to the Computer Laboratory, University of Cambridge, as an Emeritus Professor.

Text 6

Combinatorics

Combinatorics involves the general study of discrete objects. Reasoning about such objects occurs throughout mathematics and science. For example, major biological problems involving decoding the genome and phylogenetic trees are largely combinatorial. Researchers in quantum gravity have developed deep combinatorial methods to evaluate integrals, and many problems in statistical mechanics are discretized into combinatorial problems. Three of the four 2006 Fields Medals were awarded for work closely related to combinatorics: Okounkov's work on random matrices and Kontsevich's conjecture, Tao's work on primes in arithmetic progression, and Werner's work on percolation.

MIT Mathematics department has been on the leading edge of combinatorics for the last forty years. The late Gian-Carlo Rota is regarded as the founding father of modern enumerative/algebraic combinatorics, transforming it from a bag of ad hoc tricks to a deep, unified subject with important connections to other areas of mathematics.

MIT Mathematics department has been the nexus for developing connections between combinatorics, commutative algebra, algebraic geometry, and representation theory that have led to the solution of major long-standing problems. It is also a leader in extremal, probabilistic, and algorithmic combinatorics, which have close ties to other areas including computer science.

1. Find the English equivalents:

Охоплювати, міркувати, декодування геному, філогенетичні дерева, бути переважно комбінаторним, оцінити інтеграли, бути дискретизованим у комбінаторним задачах, випадкові матриці, гіпотеза, прості числа в арифметичній прогресії, перколяція, обчислювальна комбінаторика, спеціальні прийоми, зв'язок, комутативна алгебра, теорія представлень, ймовірнісна комбінаторика, інформатика.

2. Translate the following terms and terminological expressions:

Decoding the genome, phylogenetic trees, quantum gravity, statistical mechanics, combinatorial problems, random matrices, Kontsevich's conjecture, primes in arithmetic progression, percolation, enumerative/algebraic combinatorics, commutative algebra, algebraic geometry, representation theory, probabilistic, and algorithmic combinatorics, computer science.

3. Find the definitions of the notions:

Quantum gravity	the description of physical phenomena in terms of a statistical treatment of the behaviour of large numbers of atoms or molecules, especially with regard to the distribution of energy among them
Statistical mechanics	a theory that attempts to explain gravitational physics in terms of quantum mechanics
Representation theory	is a branch of mathematics that studies abstract algebraic structures by *representing* their elements as linear transformations of vector spaces, and studies modules over these abstract algebraic structures

4. Answer the following questions:

1. What does combinatorics involve?
2. How many 2006 Fields Medals were awarded for work closely related to combinatorics?
3. What has been the nexus for developing connections between combinatorics, commutative algebra, algebraic geometry, and representation theory?
4. What field is MIT Mathematics department a leader in?

5. Make an annotation of the article:

James H. Wilkinson

Computer Science Personalities

James Hardy Wilkinson (27 September 1919 – 5 October 1986) was a prominent figure in the field of numerical analysis, a field at the boundary of applied mathematics and computer science particularly useful to physics and engineering.

Born in Strood, England, he attended the Sir Joseph Williamson's Mathematical School in Rochester. He studied at Trinity College, Cambridge, where he graduated top of the class.

Taking up war work in 1940, he began working on ballistics but transferred to the National Physical Laboratory in 1946, where he worked with Alan Turing on the ACE computer project.

Later, Wilkinson's interests took him into the numerical analysis field, where he discovered many significant algorithms.

He received the Turing Award in 1970 "for his research in numerical analysis to facilitate the use of the high-speed digital computer, having received special recognition for his work in computations in linear algebra and 'backward' error analysis." In the same year, he also gave the John von Neumann Lecture at the Society for Industrial and Applied Mathematics.

The J. H. Wilkinson Prize for Numerical Software is named in his honour.

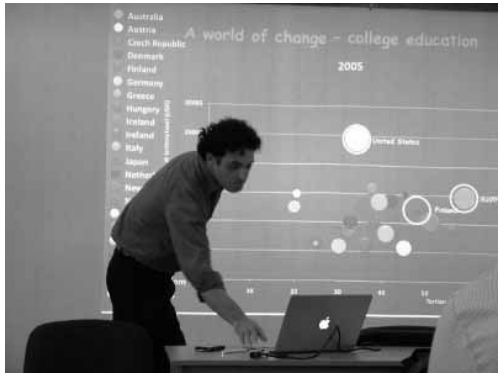
In linear algebra, Wilkinson matrices are symmetric, tridiagonal, order-*N* matrices with pairs of nearly, but not exactly, equal eigenvalues. It is named after the British mathematician James H. Wilkinson.

Wilkinson matrices have applications in many fields, including scientific computing, numerical linear algebra, and signal processing.

In numerical analysis, Wilkinson's polynomial is a specific polynomial which was used by James H. Wilkinson in 1963 to illustrate a difficulty when finding the root of a polynomial: the location of the roots can be very sensitive to perturbations in the coefficients of the polynomial.

Unit III
Lesson 1

Educational Measurement



Educational measurement refers to the use of educational assessments and the analysis of data such as scores obtained from educational assessments to infer the abilities and proficiencies of students. The approaches overlap with those in psychometrics. Educational measurement is the assigning of numerals to traits such as achievement, interest, attitudes, aptitudes, intelligence and performance.

The aim of theory and practice in educational measurement is typically to measure abilities and levels of attainment by students in areas such as reading, writing, mathematics, science and so forth. Traditionally, attention focuses on whether assessments are reliable and valid. In practice, educational measurement is largely concerned with the analysis of data from educational assessments or tests. Typically, this means using total scores on assessments, whether they are multiple choice or open-ended and marked using marking rubrics or guides.

1. Find the English equivalents in the text:

Освітнє оцінювання, зробити висновок про здібності та уміння, частково збігатися з психометрією, рівень досягнень, длстовірне та дійсне оцінювання, бути пов’язаним з аналізом даних, використання орієнтирів.

2. Translate the following terms and terminological expressions:

Educational measurement, educational assessments, abilities and proficiencies, to measure abilities, levels of attainment, multiple choice, open-ended.

3. Answer the following questions:

1. What does educational measurement refer to?
2. What is the aim of educational measurement?
3. What does attention focus on in educational measurement?
4. What does educational measurement concerned with?

4. Find the definitions of the notions:

Achievement	the action or process of performing a task or function
Aptitude	the ability to learn or understand things
Intelligence	capability, ability; innate or acquired capacity for something, talent
Performance	something that has been done through effort: a result of hard work

5. Try to define the notions:
Assessment, proficiency, ability, theory, practice.

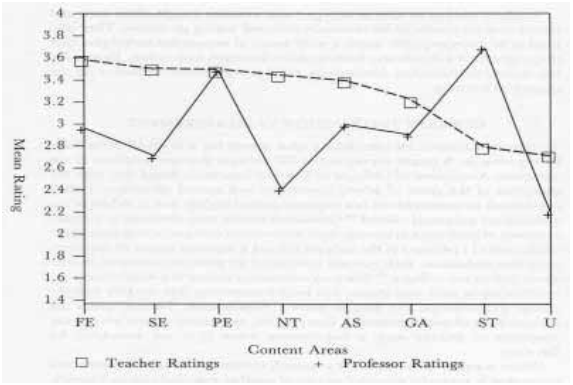
6. Read the model for an annotation of the article:

ANNOTATION

1. I have read the article in … (“Digest”, “Art News”) .
2. It is … (Ukrainian, British, American) … (newspaper, magazine, journal).
3. The title of the article is … .
4. The author of the article is … .
5. The article considers the problem of … .
6. It gives … (facts, photos, diagrams, schemes).
7. The author points out that … .
8. The article draws the readers' attention to the fact that … .
9. The author stresses that … .
10. The key problem of the article is …
11. To my mind, … .
12. The article is worth reading because the problem discussed in the article is of great interest (informative, of good use).

Lesson 2

Theory and Techniques in Educational Measurement



In technical terms, the pattern of scores by individual students to individual items is used to infer so-called scale locations of students, the "measurements". This process is one form of scaling. Essentially, higher total scores give higher scale locations, consistent with the traditional and everyday use of total

scores. If certain theory is used, though, there is not a strict correspondence between the ordering of total scores and the ordering of scale locations. The Rasch model provides a strict correspondence provided all students attempt the same test items, or their performances are marked using the same marking rubrics.

In terms of the broad body of purely mathematical theory drawn on, there is substantial overlap between educational measurement and psychometrics. However, certain approaches considered to be a part of psychometrics, including Classical test theory, Item Response Theory and the Rasch model, were originally developed more specifically for the analysis of data from educational assessments.

One of the aims of applying theory and techniques in educational measurement is to try to place the results of different tests administered to different groups of students on a single or common scale through processes known as test equating. The rationale is that because different assessments usually have different difficulties, the total scores cannot be directly compared. The aim of trying to place results on a common scale is to allow comparison of the scale locations inferred from the totals via scaling processes.

1. Find the English equivalents in the text:
З технічної точки зору, шкала рейтингу (місця), форма визначення шкали (шкалювання), вищі бали, відповідний, чітка відповідність, розподіл, істотний збіг (співпадіння), певний підхід, вводити різним групам, тест прирівнювання, логічне обгрунтування, бути безпосередньо порівненим, дозволити порівняння.

2. Translate the following terms and terminological expressions:
Scale locations, form of scaling, total scores, purely mathematical theory, Classical test theory, Item Response Theory, the Rasch model, test equating.

3. Answer the following questions:
1. What is the aim of using the pattern of scores by individual students to individual items?
2. What scale locations do higher total scores give?
3. Is there a strict correspondence between the ordering of total scores and the ordering of scale locations?
4. What psychometrics approaches were originally developed more specifically for the analysis of data from educational assessments?
5. What is the aim of applying theory and techniques in educational measurement?

4. Read the text; put 4 questions to it; discuss it with your partner.

Classical test theory is a body of related psychometric theory that predicts outcomes of psychological testing such as the difficulty of items or the ability of test-takers. Generally speaking, the aim of classical test theory is to understand and improve the reliability of psychological tests.

Classical test theory may be regarded as roughly synonymous with true score theory. The term "classical" refers not only to the chronology of these models but also contrasts with the more recent psychometric theories, generally referred to collectively as item response theory, which sometimes bear the appellation "modern" as in "modern latent trait theory".

Classical test theory as we know it today was codified by Novick (1966) and described in classic texts such as Lord & Novick (1968) and Allen & Yen (1979/2002). The description of classical test theory below follows these seminal publications.

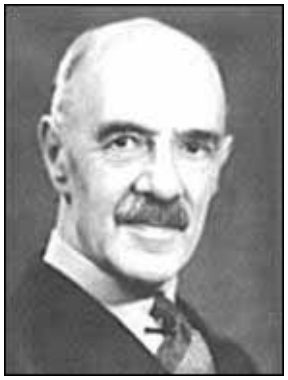
Classical Test Theory was born only after the following 3 achievements or ideas were conceptualized: 1) a recognition of the presence of errors in measurements, 2) a conception of that error as a random variable, 3) a conception of correlation and how to index it. In 1904,

Charles Spearman was responsible for figuring out how to correct a correlation coefficient for attenuation due to measurement error and how to obtain the index of reliability needed in making the correction. Spearman's finding is thought to be the beginning of Classical Test Theory by some (Traub, 1997). Others who had an influence in the Classical Test Theory's framework include: George Udny Yule, Truman Lee Kelley, those involved in making the Kuder-Richardson Formulas, Louis Guttman, and, most recently, Melvin Novick, not to mention others over the next quarter century after Spearman's initial findings.

5. Make an annotation of the article:

Charles Spearman

Thomson, Godfrey (1947). "Charles Spearman. 1863-1945"



Charles Edward Spearman (10 September 1863 – 17 September 1945) was an English psychologist known for work instatistics, as a pioneer of factor analysis, and for Spearman's rank correlation coefficient. He also did seminal work on models forhuman intelligence, including his theory that disparate cognitive test scores reflect a single General intelligence factor and coining the term *g* factor.

Spearman had an unusual background for a psychologist. In his childhood he was ambitious to follow an academic career. He first joined the army as a regular officer of engineers in the British Army. After 15 years he resigned to study for a PhD in experimental psychology.

In Britain, psychology was generally seen as a branch of philosophy and Spearman chose to study in Leipzig underWilhelm Wundt, because Spearman had

no conventional qualifications and Leipzig had liberal entrance requirements. There he met Krueger and Wirth, both of whom he really admired. He started in 1897, and after some interruption (he was recalled to the army during the South African War) he obtained his degree in 1906. He had already published his seminal paper on the factor analysis of intelligence (1904).

Spearman met and impressed the psychologist William McDougall who arranged for Spearman to replace him when he left his position at University College London. Spearman stayed at University College until he retired in 1931. Initially he was Reader and head of the small psychological laboratory. In 1911 he was promoted to the Grote professorship of the Philosophy of Mind and Logic. His title changed to Professor of Psychology in 1928 when a separate Department of Psychology was created.

Factor analysis is a statistical test that is used to find relationships between multiple correlated measures and Spearman played a clear part in its development. Spearman coined the term factor analysis and used it extensively in analyzing multiple measures of cognitive performance. It was factor analytic data which lead Spearman to postulate his original general and specific factor models of ability. Spearman applied mathematical procedures to psychological phenomena, and molded the outcome of his analysis into a theory – which has greatly influenced modern psychology. Factor analysis and its modern relations confirmatory factor analysis and structural equation modelling underlie much of modern behaviour research.

Lesson 3

Item Response Theory

In psychometrics, **item response theory** (**IRT**) also known as **latent trait theory**, **strong true score theory**, or **modern mental test theory**, is a paradigm for the design, analysis, and scoring of tests, questionnaires, and similar instruments measuring abilities, attitudes, or other variables. Unlike simpler alternatives for creating scales evaluating questionnaire responses it does not assume that each item is equally difficult. Item response theory treats the difficulty of each item (the ICCs) as information to be incorporated in scaling items.

It is based on the application of related mathematical models to testing data. Because it is generally regarded as superior to classical test theory, it is the preferred method for developing scales, especially when optimal decisions are demanded.

The name *item response theory* is due to the focus of the theory on the item, as opposed to the test-level focus of classical test theory. Thus IRT models the response of each examinee of a given ability to each item in the test. The term *item* is generic: covering all kinds of informative item. They might be multiple choice questions that have incorrect and correct responses, but are also commonly statements on questionnaires that allow respondents to indicate level of agreement or patient symptoms scored as present/absent, or diagnostic information in complex systems.

IRT is based on the idea that the probability of a correct/keyed response to an item is a mathematical function of person and item parameters. The person parameter is construed as (usually) a single latent trait or dimension. Examples include general intelligence or the strength of an attitude. Parameters on which items are characterized include their difficulty (known as "location" for their location on the difficulty range), discrimination (slope or correlation) representing how steeply the rate of success of individuals varies with their ability, and a pseudoguessing parameter, characterising the (lower) asymptote at which even the least able persons will score due to guessing (for instance, 25% for pure chance on a multiple choice item with four possible responses).

1. Find the English equivalents in the text:

Анкета, змінна величина, припускати, розглядати труднощі, бути включеним, пункт шкалювання, загальний термін, ймовірність правильної відповіді, тлумачитися (пояснюватися), прихована риса.

2. Translate the following terms and terminological expressions:

Scoring of tests, scaling items, developing scales, test-level focus, multiple choice question, incorrect and correct responses, to indicate level of agreement, mathematical function, difficulty range, correlation, pseudoguessing parameter, asymptote.

3. Answer the following questions:

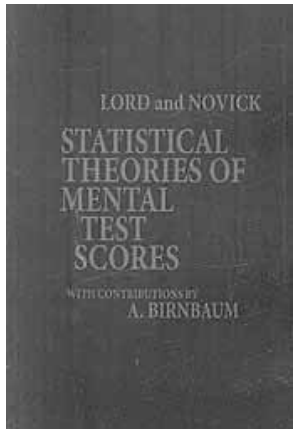
1. What does item response theory mean in psychometrics?
2. What is the theory based on?
3. What does the theory focus on?
4. What does the term item mean?
5. What idea is IRT based on?
6. What parameters characterize items?

4. Make a summary of the text.

5. Make an annotation of the article.

Frederic Lord

By JACQUES STEINBERG
Published: February 10, 2000



Frederic Lord, a mathematician whose doctoral work at Princeton a half-century ago laid the foundation for scoring the fill-in-the-bubble examinations that have tormented generations of No. 2-pencil-wielding applicants to colleges and graduate schools, died on Saturday at a nursing home in Naples, Fla. He was 87, and had lived in Naples since 1993.

Dr. Lord joined the fledgling Educational Testing Service, the developer of the College Board exams, in March 1949 as director of statistical analysis. He stayed for 33 years.

Dr. Lord did not write test questions. What he did, first as a graduate student at Princeton and later at the testing service, was devise a trailblazing mathematical model that enabled test writers to categorize particular questions, based on their difficulty. Among the ripples from his research were formulas that have allowed the testing service to compare student performance on a range of questions on multiple versions of the SAT in one year.

In seeking to explain the magnitude of Dr. Lord's ideas, which came to be known as Item Response Theory, Martha Stocking, a principal research scientist at the testing service since 1967, used a staple of the College Board exams: an analogy.

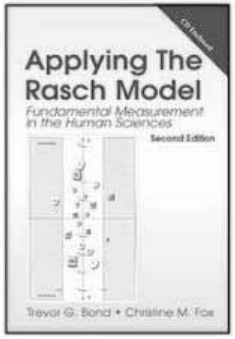
Frederic Mather Lord was born on Nov. 12, 1912, in Hanover, N.H. His father, Frederick Pomeroy Lord, was a professor of anatomy at the Dartmouth Medical School. His great-great grandfather, Nathan Lord, was Dartmouth College's sixth president, serving from 1828 to 1863.

Dr. Lord graduated from Dartmouth in 1936, with a bachelor's degree in sociology. What followed was a period of some aimlessness, in which he moved to the Midwest to explore a career as a novelist. But he ultimately landed at the University of Minnesota, where he earned a master's degree in educational psychology and where his interest in test theory was ignited.

Dr. Lord was the author or a contributor to more than 100 books or papers. In 1958, he expanded his dissertation into the book "Statistical Theories of Mental Test Scores," written with Melvin R. Novick, which was regarded as another milestone in test theory.

Lesson 4

The Rasch Model



The **Rasch model**, named after Georg Rasch, is a psychometric model for analyzing categorical data, such as answers to questions on a reading assessment or questionnaire responses, as a function of the trade-off between (a) the respondent's abilities, attitudes or personality traits and (b) the item difficulty. For example, they may be used to estimate a student's reading ability, or the extremity of a person's attitude to capital punishment from responses on a questionnaire. In addition to psychometrics and educational research, the Rasch model and its extensions are used is other areas, including the health profession and market research because of their general applicability.

The mathematical theory underlying Rasch models is a special case of item response theory and, more generally, a special case of a generalized linear model. However, there are important differences in the interpretation of the model parameters and its philosophical implications that separate proponents of the **Rasch model** from the item response modeling tradition. A central aspect of this divide relates to the role of specific objectivity, a defining property of the Rasch model according to Georg Rasch, as a requirement for successful measurement.

1. Find the English equivalents in the text:

Категоріальні дані, завдання з читання, функція компромісу, ставлення до смертної кари, філософське значення, прихильники, специфічна об'єктивність.

2. Translate the following terms and terminological expressions:

Psychometric model, questionnaire responses, market research, response theory, linear model, successful measurement.

3. Answer the following questions:

1. What is the Rasch model?
2. What areas is the model used in?
3. What is the mathematical theory underlying Rasch model?
4. What is the central aspect that separates proponents of the Rasch model from the item response modeling tradition?

4. Make a summary of the text.

5. Make an annotation of the article:

Georg Rasch

Lina Wøhlk Olsen, Essays on Georg Rasch and his contributions to statistics


Georg Rasch (1901-1980)

Georg Rasch (21 September 1901 - 19 October 1980) was a Danish mathematician, statistician, and psychometrician, most famous for the development of a class of measurement models known as Rasch models. He studied with R.A. Fisher and also briefly with Ragnar Frisch, and was elected a member of the International Statistical Institute in 1948.

In 1919, Rasch began studying mathematics at the University of Copenhagen. He completed a masters degree in 1925 and received a doctorate in science with thesis director Niels Erik Nørlund in 1930. Rasch married in 1928. Unable to find work as a mathematician in the 1930s, he turned to work as a statistical consultant. In this capacity he worked on a range of problems, including problems of biological growth.

Georg Rasch is best known for his contributions to psychometrics. His work in this field began when he used the Poisson distribution to model the number of errors made by students when reading texts. He referred to the model as the multiplicative Poisson model.

He later developed the Rasch model for dichotomous data, which he applied to response data derived from intelligence and attainment tests including data collected by the Danish military. At the same epoch, American scientists independently developed item response theory (IRT). Within IRT, the Rasch model is one of the most simple response models. In contrast to other simple models, the Rasch model has a distinctive mathematical property: the model parameters (item difficulties, examinee ability) are sufficient statistics. Rasch demonstrated that his approach met criteria for measurement deduced from an analysis of measurement in the physical sciences. He also proposed generalizations of his model (Rasch, 1960/1980, 1977).

Today, the Rasch model is used extensively in assessment in education and educational psychology, particularly for attainment and cognitive assessments.

Lesson 5

Educational Measurement and its Professionals

Educational measurement is the science underlying the valid and reliable assessment of teaching and learning for individuals in grades K through 12 (a term for the sum of primary and secondary education), higher education, and certain professions, such as for licensing and certification. The science of educational measurement is called psychometrics and the people who work in this field are called psychometricians. It is critical that assessments are carefully designed and that results are interpreted accurately and used properly.

Measurement professionals come from a variety of educational backgrounds—psychology, sociology, mathematics, K–12 education, and health-related fields—as well as the field of measurement itself. In all cases, graduate training is a must. Graduate programs in education or psychology with a concentration in measurement are a popular route to a career in psychometrics, as are programs in curriculum and instruction or educational psychology. Many professionals develop an interest in measurement through academic work involving measurement applications, such as education, the behavioral sciences, medicine, or business. Approximately 80 graduate schools in the United States offer advanced degrees in educational measurement or a related field.

1. Find the English equivalents in the text:

Достовірна та надійна оцінка, бути вирішальним, точно інтерпретувати, використовувати належним чином, необхідність (нагальна потреба), програми у навчальному плані, суміжні галузі.

2. Translate the following terms and terminological expressions:

Licensing, certification, psychometrics, psychometrician, measurement professional, psychology, sociology, mathematics, health-related fields, educational psychology, behavioral sciences.

3. Answer the following questions:

1. What is educational measurement?
2. How is it called?
3. What is critical as to the assessment?
4. What is educational background of a measurement professional?
5. What is a popular route to a career in psychometrics?

4. Make a summary of the text.

5. Make an annotation of the article:

Melvin R. Novick (1932-1986)

By Angoff, William H.
American Psychologist, Vol 42(7), Jul 1987, 754.

Melvin Robert Novick was born in Chicago, Illinois, September 21, 1932, and died in Princeton, New Jersey, May 20, 1986. His degrees were B.A., 1957, B.S., 1959, and M.A., 1959, all at Roosevelt University, and Ph.D., University of North Carolina, 1963. Novick's positions included the Educational Testing Service (ETS), 1963-1970, and the University of Iowa from 1970 to his death. From 1970 to 1974 he had a joint appointment with the American College Testing Program (ACT). At Iowa he was professor of education and statistics.

Mel Novick's contributions to psychology and measurement are well known and numerous. He was a scholar who insisted that theory must influence practice, and he committed himself to that end. Novick was frequently called on for his advice in measurement and in statistics generally and was known nationally and internationally as a person of exceptional competence in this field. He coauthored books on test theory, statistical methods for psychological research, and Bayesian statistics. His crowning achievement, however, was the production of the 1985 Standards for Educational and Psychological Testing. Bayesian statistics was seen as a powerful scientific tool that allows educational researchers to have a better understanding of their data.

Melvin R. Novick Award in Educational Measurement and Statistics is presented annually to a doctoral student who has shown outstanding academic performance and promise of the highest level of achievement in research in the field of educational measurement and research.

6. Make an annotation of the article:

Thomas Bayes

McGrayne, Sharon Bertsch. (2011). The Theory That Would Not Die p. 10

Thomas Bayes (1701-1761) was an English statistician, philosopher and Presbyterian minister, known for having formulated a specific case of the theorem that bears his name: Bayes' theorem. Bayes never published what would eventually become his most famous accomplishment; his notes were edited and published after his death by Richard Price.

Thomas Bayes was the son of London Presbyterian minister Joshua Bayes, and was possibly born in Hertfordshire. He came from a

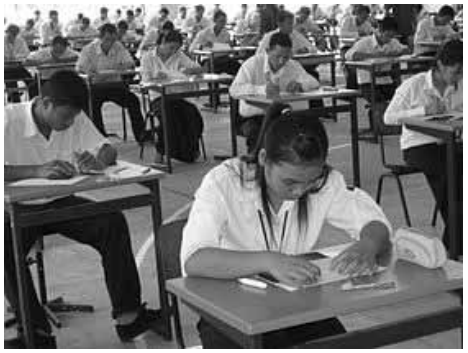
prominent nonconformist family from Sheffield. In 1719, he enrolled at the University of Edinburgh to study logic and theology. On his return around 1722, he assisted his father at the latter's chapel in London before moving to Tunbridge Wells, Kent, around 1734. There he was minister of the Mount Sion chapel, until 1752.[

It is speculated that Bayes was elected as a Fellow of the Royal Society in 1742 on the strength of the *Introduction to the Doctrine of Fluxions*, as he is not known to have published any other mathematical works during his lifetime.

In his later years he took a deep interest in probability. Professor Stephen Stigler, historian of statistical science, thinks that Bayes became interested in the subject while reviewing a work written in 1755 by Thomas Simpson, but George Alfred Barnard thinks he learned mathematics and probability from a book by Abraham de Moivre. His work and findings on probability theory were passed in manuscript form to his friend Richard Price after his death.

Lesson 6

Test and Assessment



A test or examination (informally, exam) is an assessment intended to measure a test-taker's knowledge, skill, aptitude, physical fitness, or classification in many other topics (e.g., beliefs). A test may be administered orally, on paper, on a computer, or in a confined area that requires a test taker to physically perform a set of skills. Tests vary in style, rigour and requirements. For example, in a closed book test, a test taker is often required to rely upon memory to respond to specific items whereas in an open book test, a test taker may use one or more supplementary tools such as a reference book or calculator when responding to an item.

A test may be administered formally or informally. An example of an informal test would be a reading test administered by a parent to a child. An example of a formal test would be a final examination administered by a teacher in a classroom or an I.Q. test administered by a psychologist in a clinic. Formal testing often results in a grade or a test score. A test score may be interpreted with regards to a norm or criterion, or occasionally both. The norm may be established independently, or by statistical analysis of many participants.

1. Find the English equivalents in the text:

Виміряти (оцінювати) знання, обмежена територія, суворість, вимоги, покладатися на пам'ять, відповідати на специфічні пункти, додаткові засоби, довідник, стосовно норми чи критерію.

2. Translate the following terms and terminological expressions:

To measure skill, to perform a set of skills, test requirements, supplementary tools, reference book, a test score, to be interpreted with regards to a norm or criterion, statistical analysis.

3. Answer the following questions:

1. What is a test intended to measure?
2. How may a test be administered?
3. How do tests vary?
4. What is an example of an informal test?
5. What does formal testing result in?
6. How may a test score be interpreted?

4. Make a summary of the text.

5. Ask your partner about his experience of writing tests and tell him about yours.

6. Make an annotation of the article.

E-assessment

Laumer, S., Stetten, A. & Eckhardt, A. (2009) E-Assessment. Business & Information Systems Engineering

In its broadest sense, **e-assessment** is the use of information technology for any assessment-related activity. This definition embraces a wide range of student activity ranging from the use of a word processor to on-screen testing. Due to its obvious similarity to e-learning, the term e-assessment is becoming widely used as a generic term to describe the use of computers within the assessment pro computerized classification testing.

E-assessment can be used not only to assess cognitive and practical abilities but anxiety disorders, such as social anxiety disorder, i.e. SPAI-B. Cognitive abilities are assessed using *e-testing* software, while practical abilities are assessed using *e-portfolios* or *simulation* software.

An e-testing system designed to focus on lower level associations comprises two components: (1) an assessment engine; and (2) an item bank. An *assessment engine* comprises the hardware and software required to create and deliver a test. Most e-testing engines run on standard hardware so the key characteristic is the software's functionality. There is a wide range of software packages. The software does not include the questions themselves; these are provided by an *item bank*. Once created, the engine uses the item bank to generate a test. Traditional paper-

and-pencil testing is similar, but the test is pulled from the bank at only one time, when it is sent to publishing.

The creation of the item bank is more costly and time consuming than the installation and configuration of the assessment engine. This is due to the fact that assessment engines can be bought "off the shelf," whereas an item bank must be developed for each specific application.

An e-assessment system designed to focus on more sophisticated forms of knowledge requires some sort of interactive activity and a system for inviting students to reason or solve problems around that activity. One influential program of research is known as Evidence Centered Design, or ECD. ECD involves the use of Bayesian Inference Nets to create a sophisticated model of student cognition , and a set of activities or problems that students work on that allow the system to estimate the individuals understanding of the particular domain.

Lesson 7

Education History

This trend began to influence the method of examination in British universities from the 1850s, where oral examination had been the norm since the Middle Ages. There was a rapid switchover to a written style of examination from the mid-century. In the US, the transition happened under the influence of the educational reformer Horace Mann. This shift decisively helped to move education into the modern era, by standardizing expanding curricula in the sciences and humanities, creating a rationalized method for the evaluation of teachers and institutions and creating a basis for the streaming of students according to ability.

This examination system was later applied to primary and secondary education and it started to influence other parts of the world as it became a prominent standard (e.g. regulations to prevent the markers from knowing the identity of candidates), of delivering standardized tests.

Both World War I and World War II demonstrated the necessity of standardized testing and the benefits associated with these tests. Tests were used to determine the mental aptitude of recruits to the military. The US Army used the Stanford-Binet Intelligence Scale to test the IQ of the soldiers.

After the War, industry began using tests to evaluate applicants for various jobs based on performance. In 1952, the first Advanced Placement (AP) test was administered to begin closing the gap between high schools and colleges.

1. Find the English equivalents in the text:

Усний екзамен, швидке переключення, розширення навчальної програми, оцінювання вчителів, розподіл студентів на потоки, запобігати, особистість кандидата, переваги, визначити розумові (психічні) здібності, оцінити претендентів, бути основаним на результатах.

2. Translate the following terms and terminological expressions:

The method of examination, oral examination, a written style of examination, the educational reformer, the evaluation of teachers, primary and secondary education, delivering standardized tests.

3. Answer the following questions:

1. What form of examination was a norm since the Middle Ages?
2. Who had an influence upon the transition to a written style of examination in the US?
3. How did the shift to written examination help to move education into the modern era?
4. What did the US army use to test the IQ of the soldiers?

4. Make a summary of the text.

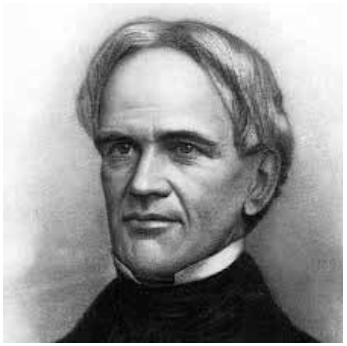
5. Discuss with your partner the advantages of the written form of an examination.

6. Make an annotation of the article.

Horace Mann

Educator, U.S. Representative (1796–1859)

By Stanley Millwood



Horace Mann was an American politician and education reformer, best known for promoting universal public education and teacher training in "normal schools."

Education reformer Horace Mann was born on May 4, 1796 in Franklin, Massachusetts. Mann served in the Massachusetts House of Representatives and Senate before his appointment as the Massachusetts secretary of education. Mann went on to the U.S. House of Representatives, promoting an agenda of public education and "normal schools" to train teachers.

Horace Mann was born into poverty in Franklin, Massachusetts, in 1796. Chiefly self-taught, Mann was 20 years old when he was admitted to the sophomore class at Brown University.

There he took an interest in politics, education and social reform, and upon graduation he gave a speech on the advancement of the human race through which education, philanthropy, and republicanism could combine to benefit mankind.

After Brown, Mann practiced law before winning a seat in the Massachusetts House of Representatives, where he served from 1827 to 1833. From 1835 to 1837, he served in the Massachusetts Senate, spending time as the majority leader and aiming his sights at infrastructure improvements via the construction of railroads and canals, among other projects.

While Mann served in the Senate, the Massachusetts education system, with a history going back to 1647, was suffering, and the quality of education was deteriorating. Soon a vigorous reform movement arose, and in 1837 the state created the nation's first board of education, with Mann as its secretary.

With funds for the board's activities at a minimum, the position required more moral leadership than anything else, and Horace Mann proved himself up to the role. He started a biweekly journal, *Common School Journal*, in 1838 for teachers and lectured on education to all who would listen.

At this time he also developed his hugely influential, although at the time controversial, main principles regarding public education and its troubles: (1) Citizens cannot maintain both ignorance and freedom; (2) This education should be paid for, controlled, and maintained by the public; (3) This education should be provided in schools that embrace children from varying backgrounds; (4) This education must be nonsectarian; (5) This education must be taught using tenets of a free society; and (6) This education must be provided by well-trained, professional teachers.

Mann's words angered groups across the social and political spectrum - from clergymen to educators to politicians -- but his ideas prevailed and still do today.

Mann served in the U.S. House of Representatives from 1848 to 1853 and then became the president of Antioch College. A commencement speech he gave two months before his death served as a clarion call, asking students to embrace his influential worldview: "I beseech you to treasure up in your hearts these my parting words: Be ashamed to die until you have won some victory for humanity."

Lesson 8

Modern-Day Use of Test

Some countries such as the United Kingdom and France require all their secondary school students to take a standardized test on individual subjects such as the General Certificate of Secondary Education as a requirement for graduation. These tests are used primarily to assess a student's proficiency in specific subjects such as mathematics, science, or literature.

In contrasts, high school students in other countries such as the United States may not be required to take a standardized test to graduate. Moreover, students in these countries usually take standardized tests only to apply for a position in a university program, which are used primarily to measure a student's reasoning skill. High school students in the United States may also take Advanced Placement tests on specific subjects to fulfill university-level credit.

Grades or test scores from standardized test may also be used by universities to determine if a student applicant should be admitted into one of its academic or professional programs. For example, universities in the United Kingdom admit applicants into their undergraduate programs based primarily or solely on an applicant's grades on pre-university qualifications such.

1. Find the English equivalents in the text:

Вимагати, вимога, закінчення (навчального закладу), здавати (проходити) тест, оцінити знання, на відміну, використовуватися, визначати, абітурієнт, бути зарахованим.

2. Translate the following terms and terminological expressions:

Secondary school, standardized test, to assess a student's proficiency, specific subjects, to apply for a position, to measure a student's reasoning skill, to fulfill university-level credit, academic or professional programs, pre-university qualifications.

3. Answer the following questions:

1. What do some countries require all their secondary school students?
2. What are these tests used for?
3. Are high school students in the USA required to take tests?
4. What may grades or test scores from standardized test be used for?

4. Read the text. Put 4 questions on it. Discuss it with a partner.

Standardized tests are sometimes used by certain countries to manage the quality of their educational institutions. For example, the No Child Left Behind Act in the United States requires individual states to develop assessments for students in certain grades. In practice, these assessments typically appear in the form of standardized tests. Test scores of students in specific grades of an educational institution are then used to determine the status of that educational institution, i.e., whether it should be allowed to continue to operate in the same way or to receive funding.

Finally, standardized tests are sometimes used to compare proficiencies of students from different institutions or countries. For example, the Organisation for Economic Co-operation and Development (OECD) uses Programme for International Student Assessment (PISA) to evaluate certain skills and knowledge of students from different participating countries.

5. Make an annotation of the article.

Types of Tests: Written Tests

From Educational Journal

Written tests are tests that are administered on paper or on a computer. A test taker who takes a written test could respond to specific items by writing or typing within a given space of the test or on a separate form or document.

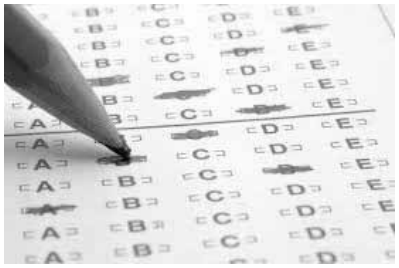
In some tests; where knowledge of many constants or technical terms is required to effectively answer questions, like Chemistry or Biology - the test developer may allow every test taker to bring with them a cheat sheet.

A test developer's choice of which style or format to use when developing a written test is usually arbitrary given that there is no single invariant standard for testing. Be that as it may, certain test styles and format have become more widely used than others. Below is a list of those formats of test items that are widely used by educators and test developers to construct paper or computer-based tests. As a result, these tests may consist of only one type of test item format (e.g., multiple choice test, essay test) or may have a combination of different test item formats (e.g., a test that has multiple choice and essay items).

Lesson 9

Multiple choice

In a test that has items formatted as multiple choice questions, a candidate would be given a number of set answers for each question, and the candidate must choose which answer or group of answers is correct. There are two families of multiple choice questions. The first family is known as the True/False question and it requires a test taker to choose all answers that are appropriate. The second family is known as One-Best-Answer question and it requires a test taker to answer only one from a list of answers.



There are several reasons to using multiple choice questions in tests. In terms of administration, multiple choice questions usually requires less time for test takers to answer, are easy to score and grade, provide greater coverage of material, allows for a wide range of difficulty, and can easily diagnose a test taker's difficulty with certain concepts.

As an educational tool, multiple choice items test many levels of learning as well as a test taker's ability to integrate information, and it provides feedback to the test taker about why distractors were wrong and why correct answers were right.

Nevertheless, there are difficulties associated with the use of multiple choice questions. In administrative terms, multiple choice items that are effective usually take a great time to construct. As an educational tool, multiple choice items do not allow test takers to demonstrate knowledge beyond the choices provided and may even encourage guessing or approximation due to the presence of at least one correct answer.

1. Find the English equivalents in the text:

Питання множинного вибору; вибрати всі відповіді, які підходять; перелік відповідей, вимагати менше часу, забезпечити охоплення більшої частини матеріалу; забезпечити зворотній зв'язок, навчальний інструмент, заохочувати здогадку.

2. Translate the following terms and terminological expressions:

Multiple choice questions, True/False question, One-Best-Answer question, distractors, to demonstrate knowledge, correct answer.

3. Answer the following questions:

1. What would a candidate be given in a multiple choice questions test?
2. What are the types of MCQ?
3. What are the advantages of MCQ?
4. What are the disadvantages of MCQ?

4. Make a summary of the text.

5. Make an annotation of the article.

TEST TYPES

From Education Measurement Journal

Alternative response

True/False questions present candidates with a binary choice - a statement is either true or false. This method presents problems, as depending on the number of questions, a significant number of candidates could get 100% just by guesswork, and should on average get 50%.

Matching type

A matching item is an item that provides a defined term and requires a test taker to match identifying characteristics to the correct term.

Completion type

A fill-in-the-blank item provides a test taker with identifying characteristics and requires the test taker to recall the correct term. There are two types of fill-in-

the-blank tests. The easier version provides a word bank of possible words that will fill in the blanks. For some exams, all words in the word bank are exactly once. If a teacher wanted to create a test of medium difficulty, they would provide a test with a word bank, but some words may be used more than once and others not at all. The hardest variety of such a test is a fill-in-the-blank test in which no word bank is provided at all. This generally requires a higher level of understanding and memory than a multiple-choice test. Because of this, fill-in-the-blank tests [with no word bank] are often feared by students.

Lesson 10

Essay

Items such as short answer or essay typically requires a test taker to write a response to fulfill the requirements of the item. In administrative terms, essay items take less time to construct. As an assessment tool, essay items can test complex learning objectives as well as processes used to answer the question.

The items can also provide a more realistic and generalizable task for test. Finally, these items make it difficult for test takers to guess the correct answers and require test takers to demonstrate their writing skills as well as correct spelling and grammar.

The difficulties with essay items is primarily administrative. For one, these items take more time for test takers to answer. When these questions are answered, the answers themselves are usually poorly written because test takers may not have time to organize and proofread their answers. In turn, it takes more time to score or grade these items. When these items are being scored or graded, the grading process itself becomes subjective as non-test related information may influence the process.

Thus, considerable effort is required to minimize the subjectivity of the grading process. Finally, as an assessment tool, essay questions may potentially be unreliable in assessing the entire content of a subject matter.

1. Find the English equivalents in the text:

Виконати вимоги, здогадатися правильну відповідь, авички письма, правильне написання, коригувати відповіді, процес градації, інструмент оцінювання, бути ненадійним.

2. Translate the following terms and terminological expressions:

Essay, to write a response, complex learning objectives, to score items, non-test related information, to minimize the subjectivity, assessing the content.

3. Answer the following questions:

1. What does an essay require?
2. Is it easy to construct an essay items?

3. What skill does an essay require to demonstrate?
4. What are the difficulties with essay items?

4. Make a summary of the text.

5. Make an annotation of the article.

Mathematical questions

Most mathematics questions, or calculation questions from subjects such as chemistry, physics or economics employ a style which does not fall in to any of the above categories, although some papers, notably the Maths Challenge papers in the United Kingdom employ multiple choice. Instead, most mathematics questions state a mathematical problem orexercise that requires a student to write a freehand response. Marks are given more for the steps taken than for the correct answer. If the question has multiple parts, later parts may use answers from previous sections, and marks may be granted if an earlier incorrect answer was used but the correct method was followed, and an answer which is correct (given the incorrect input) is returned.

Higher level mathematical papers may include variations on true/false, where the candidate is given a statement and asked to verify its validity by direct proof or stating acounter example.

Unit IV
INFORMATION TECHNOLOGIES

Lesson I

SYSTEM ADMINISTRATOR

A **system administrator**, **IT systems administrator**, **systems administrator**, or **sysadmin** is a person employed to maintain and operate a computer system and/or network.

The duties of a system administrator are wide-ranging, and vary widely from one organization to another. Sysadmins are usually charged with installing, supporting and maintaining servers or other computer systems, and planning for and responding to service outages and other problems. Other duties may include scripting or light programming, project management for systems-related projects, supervising or training computer operators, and being the consultant for computer problems beyond the knowledge of technical support staff. To perform his or her job well, a system administrator must demonstrate a blend of technical skills and responsibility.

Many organizations staff other jobs related to system administration. In a larger company, these may all be separate positions within a computer support or Information Services (IS) department. In a smaller group they may be shared by a few sysadmins, or even a single person.

- A database administrator *(DBA) maintains* a database system, and is responsible for the integrity of the data and the efficiency and performance of the system.
- A network administrator maintains network infrastructure such as switches and routers, and diagnoses problems with these or with the behaviour of network-attached computers.
- A security administrator is a specialist in computer and network security, including the administration of security devices such as firewalls, as well as consulting on general security measures.
- A web administrator maintains web server services (such as Apache or IIS) that allow for internal or external access to web sites. Tasks include managing multiple sites, administering security, and configuring necessary components and software. Responsibilities may also include software change management.
- Technical support staff responds to individual users' difficulties with computer systems, provides instructions and sometimes training, and diagnoses and solves common problems.
- A computer operator performs routine maintenance and upkeep, such as changing backup tapes or replacing failed drives in a RAID. Such tasks usually require physical presence in the room with the computer; and while less skilled than sysadmin tasks require a similar level of trust, since the operator has access to possibly sensitive data.

- A postmaster is the administrator of a mail server.

In some organizations, a person may begin as a member of technical support staff or a computer operator, then gain experience on the job to be promoted to a sysadmin position.

1. Find the English equivalents in the text:

Бути зайнятим, широкі обов'язки, дуже відрізнятися, бути відповідальним за, перебій у роботі, добре виконувати роботу, поєднання технічних навичок і відповідальності, укомлектовувати (штати), заходи безпеки, налаштування компонентів, персонал, відповідати за, вирішувати загальні проблеми, поточний ремонт та утримання, заміна резервних стрічок, набути досвіду.

2. Translate the following terms and terminological expressions:

To maintain and operate a computer system and network; installing, supporting and maintaining servers; database administrator; network infrastructure; security devices; web server services; internal or external access; software change management; replacing failed drives.

3. Match the definitions with the notions and discuss them with your friends:

Apache	the comprehensive process that leads from an original formulation of a computing problem to executable programs
IIS	a small program written for a command interpreter or another scripting language
RAID	redundant array of independent disks - a storage technology that combines multiple disk drive components into a logical unit
Script	Internet Information Services - a Microsoft web server software application and set of feature extension modules created by Microsoft for use with Microsoft Windows
Prgramming	a web server software program notable for playing a key role in the initial growth of the World Wide Web

4. Answer the following questions:

1) What is a sytem administrator?
2) What are the duties of sysadmins?
3) What is a database administrator responsible for?
4) What does a network administrator maintain?
5) What specialist is a security administrator?
6) What does a web administrator maintain?
7) What does technical support staff respond to?
8) What does a computer operator perform?
9) What is a postmaster?

5. Tell your friends about the main responsibilities of a system administrator.

6. Read the article and put five questions to it.

The Apache HTTP Server, commonly referred to as Apache is a web server software program notable for playing a key role in the initial growth of the World Wide Web. In 2009, it became the first web server software to surpass the 100 million website milestone. Apache was the first viable alternative to the Netscape Communications Corporation web server (currently named Oracle iPlanet Web Server). Typically Apache is run on a Unix-like operating system, and was developed for use on Linux.

Apache is developed and maintained by an open community of developers under the auspices of the Apache Software Foundation. The application is available for a wide variety of operating systems, including Unix, FreeBSD, Linux, Solaris, Novell NetWare, OS X, Microsoft Windows, OS/2, TPF, and eComStation. Released under the Apache License, Apache is open-source software.

Apache was originally based on NCSA HTTPd code. The NCSA code has since been removed from Apache, due to a rewrite.

Since April 1996 Apache has been the most popular HTTP server software in use. As of June 2013, Apache was estimated to serve 54.2% of all active websites and 53.3% of the top servers across all domains.

According to the FAQ in the Apache project website, the name Apache was chosen out of respect to the Native American tribe Apache and its superior skills in warfare and strategy.

7. Make an annotation of the article.

Brian Behlendorf

"2003 Young Innovators Under 35". Technology Review. *2003.* *Retrieved August 15, 2011.*

Brian Behlendorf (born March 30, 1973) is a technologist, computer programmer, and an important figure in the open-source software movement. He was a primary developer of the Apache Web server, the most popular web server software on the Internet, and a founding member of the Apache Group, which later became the Apache Software Foundation. Behlendorf served as President of the Foundation for three years. Behlendorf has served on the board of the Mozilla Foundationsince 2003.

Behlendorf, raised in Southern California, became interested in the early development of the Internet while he was a student at the University of California,

Berkeley in the early 1990s. One of his first projects was an electronic mailing list and online music resource, SFRaves, which a friend persuaded him to start in 1992. Behlendorf was an early participant and the chief technology guru for the Burning Man festival, and also founded a large online resource devoted to electronic music and related subcultures.

In 1993, Behlendorf, Jonathan Nelson, Matthew Nelson and Cliff Skolnick co-founded Organic, Inc., the first business dedicated to building commercial web sites. While developing the first online, for-profit, media project — the HotWired web site for Wired Magazine — in 1994, they realized that the most commonly used web server software at the time (developed at the National Center for Supercomputing Applications at the University of Illinois at Urbana-Champaign) could not handle the user registration system that the company required. So, Behlendorf patched the open-source code to support HotWired's requirements.

It turned out that Behlendorf wasn't the only one busy patching the NCSA code at the time, so he and Cliff Skolnick put together an electronic mailing list to coordinate the work of the other programmers. By the end of February 1995, eight core contributors to the project started Apache as a fork of the NCSA codebase. Working loosely together, they eventually rewrote the entire original program as the Apache HTTP Server. In 1999, the project incorporated as the Apache Software Foundation.

Behlendorf is currently the CTO of the World Economic Forum and a Director of CollabNet, a company he co-founded with O'Reilly & Associates (now O'Reilly Media) in 1999 to develop tools for enabling collaborative, distributed software development. CollabNet used to be the primary corporate sponsor of the open source version control system Subversion, before it became a project of the Apache Software Foundation. He continues to be involved with electronic music community events such as Chillits, and speaks often at open source conferences worldwide.

In 2003, he was named to the MIT Technology Review TR100 as one of the top 100 innovators in the world under the age of 35.

Lesson 2

NETWORK ADMINISTRATOR

A Network administrator is an individual that is responsible for the maintenance of computer hardware and software systems that make up a computer network including the maintenance and monitoring of active data network or converged infrastructure and related network equipment.

Network administrators are generally mid-level support staff within an organization and don't typically get involved directly with users. Network administrators focus upon network components within a company's LAN/WAN infrastructure ensuring integrity. Depending on the company and its size, the network administrator may also design and deploy networks.

The actual role of the network administrator will vary from place to place, but will commonly include activities and tasks such as network address assignment, management and implementation of routing protocols such as RIPv2, HSRP, routing table configurations and certain implementations of authentication (e.g: challenge response, etc). It can also include maintenance of certain network servers: file servers, VPN gateways, intrusion detection systems, etc.

In smaller organisations, network administrators may also be technically involved in the maintenance and administration of servers, desktop computers, printers, routers, switches, firewalls, phones, IP Phones, personal digital assistants, smartphones, software deployment, security updates and patches as well as a vast array of additional technologies inclusive of both hardware and software.

The role of the network administrator can vary significantly depending on an organizations size, location and socio-economic considerations. Some organizations work on a user-to-technical support ratio, whilst others implement many other strategies.

Generally, in terms of reactive situations (i.e: unexpected disruptions to service, or service improvements), IT Support Incidents are raised through an Issue tracking system. Typically, these issues work their way through a Help desk and then flow through to the relevant technology area for resolution. In the case of a network related issue, an issue will be directed towards a network administrator. If a network administrator is unable to resolve an issue, a ticket will be escalated to a more senior network engineer for restoration of service or a more appropriate skill group.

1. Find the English equivalents in the text:

Складати мережу, зосереджуватися на, проектувати та розгортати мережі, широкий спектр додаткових технологій, співвідношення "користувач-технічна підтримка", реалізовувати стратегії, несподівані збої.

2. Translate the following terms and terminological expressions:

Converged infrastructure; network equipment; network address assignment; routing protocols; implementations of authentication; intrusion detection systems; software deployment; security updates and patches.

3. Match the definitions with the notions:

LAN	a virtual private network extends a private network across a public network, such as the Internet
WAN	hot Standby Router Protocol - a Cisco proprietary redundancy protocol for establishing a fault-tolerant default gateway
RIP	routing Information Protocol - a distance-vector routing protocol, which employs the hop count as a routing metric. RIP prevents routing loops by implementing a limit on the number of hops allowed in a path from the source to a destination

HSRP	a network that covers a broad area (i.e., any telecommunications network that links across metropolitan, regional, or national boundaries) using private or public network transports
VPN	a computer network that interconnects computers in a limited area such as a home, school, computer laboratory, or office building using network media

4. Answer the following questions:

1) What is a network administrator responsible for?

2) Do network administrators get involved directly with users?

3) What do they focus upon?

4) What activities and tasks will the actual role of the network administrator include?

5) What may network administrators be technically involved in smaller organisations?

5. Tell your friends about the main tasks and activities of network administrators.

6. Read the article and put five questions to it.

Wi-Fi

Wi-Fi is a popular technology that allows an electronic device to exchange data wirelessly (using radio waves) over a computer network, including high-speed Internet connections. The Wi-Fi Alliance defines Wi-Fi as any "wireless local area network (WLAN) products that are based on the Institute of Electrical and Electronics Engineers' (IEEE) 802.11 standards". However, since most modern WLANs are based on these standards, the term "Wi-Fi" is used in general English as a synonym for "WLAN". Only Wi-Fi products that complete Wi-Fi Alliance interoperability certification testing successfully may use the "Wi-Fi CERTIFIED" trademark.

A device that can use Wi-Fi (such as a personal computer, video-game console, smartphone, digital camera, tablet or digital audio player) can connect to a network resource such as the Internet via a wireless network access point. Such an access point (or hotspot) has a range of about 20 meters (65 feet) indoors and a greater range outdoors. Hotspot coverage can comprise an area as small as a single room with walls that block radio waves or as large as many square miles — this is achieved by using multiple overlapping access points.

Vic Hayes has been called the "father of Wi-Fi" by some, due to his involvement in negotiating the initial standards within the IEEE while chairing the workgroup.

The term *Wi-Fi*, commercially used at least as early as August 2000, was coined by a brand-consulting firm called Interbrand Corporation. The Wi-Fi

Alliance had hired Interbrand to determine a name that was "a little catchier than 'IEEE 802.11b Direct Sequence'". Belanger also stated that Interbrand invented *Wi-Fi* as a play on words with Hi-Fi (high fidelity), and also created the Wi-Fi logo.

The key technologies behind Wi-Fi were developed by the radioastronomer John O'Sullivan as a by-product in a research project, "a failed experiment to detect exploding mini black holes the size of an atomic particle".

7. Make an annotation of the article.

Victor Hayes

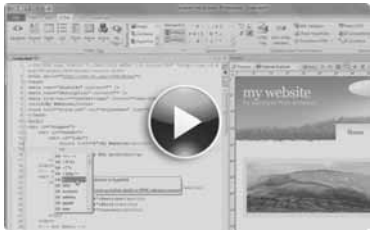
IEEE Computer Society Awards

Victor "Vic" Hayes (born July 31, 1941 Surabaya, Dutch East Indies) is a Senior Research Fellow at the Delft University of Technology. His role in establishing and chairing the IEEE 802.11 Standards Working Group for Wireless Local Area Networks has led to him being referred to by some as the "Father of Wi-Fi"

Victor Hayes, nicknamed “the Father of Wi-Fi”, was born in Surabaya, Netherlands-Indies at that time, on July 31, 1941. He repatriated with his family in 1950 to the Netherlands and received his B.E. degree from the “HTS Amsterdam” in Amsterdam, the Netherlands in 1961. After military service in the Dutch Air Force, he joined Friden Holland, later called Singer Business Machines, a company making Flexowriters (paper-tape oriented typewriters, often used as input/output machines for computers) and electro-mechanical billing and accounting machines. His first assignment was customer programmer for the latter. Eventually he played a key roll in engineering the first commercially available billing and accounting machine with integrated circuits.

In 1974 he joined Agere Systems, Utrecht, the Netherlands, when the group was still a part of NCR. He authored various NCR Corporate Engineering Standards on data communications, including HDLC and X.25 packet level protocols and represented the company in various standards bodies such as the Dutch Standards Institute NNI and the European Computer Manufacturers Association ECMA. As the Chair of the NNI JTC 1/SC 6 committee he often headed the Dutch delegation to the ISO/IEC JTC 1/SC6 committee. As the Chair of the LAN Task Group of the ECMA he was its delegate to the International Telecommunications Union.

Lesson 3



WEB ARCHITECT

A webmaster, also called a web architect, web developer, site author, or website administrator, is a person responsible for maintaining one or many websites. The duties of the webmaster may include ensuring that the web servers, hardware and software are operating correctly, designing the website,

generating and revising web pages, A/B testing, replying to user comments, and examining traffic through the site. As a general rule, professional webmasters "must also be well-versed in Web transaction software, payment-processing software, and security software." Due to the RFC 822 requirement for establishing a "postmaster" email address for the single point of contact for the email administrator of a domain, the "webmaster" address and title were unofficially adopted by analogy for the website administrator.

Webmasters may be generalists with HTML expertise who manage most or all aspects of Web operations. Depending on the nature of the websites they manage, webmasters typically know scripting languages such as JavaScript, PHP and Perl. They may also be required to know how to configure web servers such as Apache HTTP Server (Apache) or Internet Information Services(IIS) and be a server administrator. Further, webmasters may also act as website designers on smaller-scale sites.

Core responsibilities of the webmaster may include the regulation and management of access rights of different users of a website, the appearance and setting up website navigation. Content placement can be part of a webmaster's numerous duties, though content creation may not be.

1. Find the English equivalents in the text:

Формування (розвиток) і перегляд веб-сторінки, відповіді на коментарі користувачів, бути прийнятим за аналогією, вимоги для встановлення, основні обов'язки.

2. Translate the following terms and terminological expressions:

Traffic through the site, Web transaction software, payment-processing software, security software, scripting languages, to configure web servers, content placement.

3. Match the definitions with the notions:

Software testing	a family of high-level, general-purpose, interpreted, dynamic programming languages
RFC	Personal Home Page Tools, Hypertext Preprocessor - a server-side scripting language designed for web development but also used as a general-purpose programming language
JS	JavaScript - an interpreted computer programming language
PHP	a Request for Comments - a publication of the Internet Engineering Task Force (IETF) and the Internet Society, the principal technical development and standards-setting bodies for the Internet
Perl	an investigation conducted to provide stakeholders with information about the quality of the product or service under test

4. Answer the following questions:

1) What is a webmaster?
2) What may the duties of the webmaster include?
3) What may the webmaster be required to know?
4) What is the core respomsibilities of the webmaster?
5) Can content placement be part of a webmaster's numerous duties?

5. Tell your friends about the main responsibilities of a web architect.

6. Read the article and put five questions to it.

JavaScript

JavaScript (JS) is an interpreted computer programming language. It was originally implemented as part of web browsers so that client-side scripts could interact with the user, control the browser, communicate asynchronously, and alter the document content that was displayed. More recently, however, it has become common in both game development and the creation of desktop applications.

JavaScript is a prototype-based scripting language that is dynamic, is type safe, and has first-class functions. Its syntax was influenced by the language C. JavaScript copies many names and naming conventions from Java, but the two languages are otherwise unrelated and have very different semantics. The key design principles within JavaScript are taken from the Self and Scheme programming languages. It is a multi-paradigm language, supporting object-oriented imperative, and functional programming styles.

JavaScript's use in applications outside of web pages—for example, in PDF documents, site-specific browsers, and desktop widgets—is also significant. Newer and faster JavaScript VMs and frameworks built upon them (notably Node.js) have also increased the popularity of JavaScript for server-side web applications.

JavaScript was formalized in the ECMAScript language standard and is primarily used as part of a web browser (client-side JavaScript). This enables programmatic access to computational objects within a host environment.

Brendan Eich (born 1961) is an American computer programmer and creator of the JavaScript scripting language. He is the chief technology officer at the Mozilla Corporation.

Eich started his career at Silicon Graphics, working for seven years on operating system and network code.

Eich is best known for his work on Netscape and Mozilla. He started work at Netscape Communications Corporation in April 1995, working on JavaScript (originally called Mocha, then called LiveScript) for the Netscape Navigator web browser.

He then helped found mozilla.org in early 1998, serving as chief architect. When AOL shut down the Netscape browser unit in July 2003, Eich helped spin out the Mozilla Foundation.

In August 2005, after serving as Lead Technologist and as a member of the Board of Directors of the Mozilla Foundation, Eich became CTO of the newly founded Mozilla Corporation.

7. Make an annotation of the article.

PHP

"History of PHP". *php.net.*

PHP is a server-side scripting language designed for web development but also used as a general-purpose programming language. PHP is now installed on more than 244 million websites and 2.1 million web servers. Originally created byRasmus Lerdorf in 1995, the reference implementation of PHP is now produced by The PHP Group. While PHP originally stood for *Personal Home Page*, it now stands for *PHP: Hypertext Preprocessor*, a recursive acronym.

PHP code is interpreted by a web server with a PHP processor module which generates the resulting web page: PHP commands can be embedded directly into an HTML source document rather than calling an external file to process data. It has also evolved to include a command-line interface capability and can be used in standalone graphical applications.

PHP is free software released under the PHP License, which is incompatible with the GNU General Public License (GPL) due to restrictions on the usage of the term *PHP*. PHP can be deployed on most web servers and also as a standaloneshell on almost every operating system and platform, free of charge

PHP development began in 1994 when the developer Rasmus Lerdorf wrote a series of Common Gateway Interface (CGI) Perl scripts, which he used to maintain his personal homepage. The tools performed tasks such as displaying his résumé and recording his web traffic. He rewrote these scripts in C for performance reasons, extending them to add the ability to work with web forms and to communicate with databases and called this implementation "Personal Home Page/Forms Interpreter" or PHP/FI. PHP/FI could be used to build simple, dynamic web applications. Lerdorf initially announced the release of PHP/FI as "Personal Home Page Tools (PHP Tools) version 1.0" publicly to accelerate bug location and improve the code, on the comp.infosystems.www.authoring.cgi Usenet discussion group on June 8, 1995. This release already had the basic functionality that PHP has today. This included Perl-like variables, form handling, and the ability to embed HTML. The syntax was similar to Perl but was more limited and simpler, although less consistent. A development team began to form and, after months of work and beta testing, officially released PHP/FI 2 in November 1997.

Zeev Suraski and Andi Gutmans rewrote the parser in 1997 and formed the base of PHP 3, changing the language's name to the recursive acronym *PHP: Hypertext Preprocessor*. Afterward, public

testing of PHP 3 began, and the official launch came in June 1998. Suraski and Gutmans then started a new rewrite of PHP's core, producing the Zend Engine in 1999. They also founded Zend Technologies in Ramat Gan, Israel.

Lesson 4

COMPUTER OPERATOR

Computer operators oversee the running of computer systems, ensuring that the machines are running and physically secured and free of any bugs. The former role of a computer operator was to work with mainframe computers which required a great deal of management day-to-day, however nowadays they often work with a variety of different systems and applications. The computer operator normally works in a server room or a data centre, but can also work remotely so that they can operate systems across multiple sites. Most of their duties are taught on the job, as their job description will vary according to the systems and set-up they help manage.

The role also includes maintaining records and logging events, listing e.g. each backup that is run, each machine malfunction and program abnormal termination. Operators assist system administrators and programmers in testing and debugging of new systems and programs prior to their becoming production environments.

Modern-day computing has led to a greater proliferation of personal computers, with a rapid change from older mainframe systems to newer self-managing systems. This is reflected in the operator's role. Tasks may include managing the backup systems, cycling tapes or other media, filling and maintaining printers. Overall the operator fills in as a lower level system administrator or operations analyst. Most operations departments will work 24x7.

A computer operator also has knowledge of disaster recovery and business continuity procedures. Formerly this would have meant sending physical data tapes offsite, but now the data is more than likely transmitted over computer networks.
A computer operator can work inside the home on the network editing domains and nets or they can work on the road or part of a company.

1. Find the English equivalents in the text:

Наглядати над функціонуванням комп'ютерних систем, забезпечувати (гарантувати), без будь-яких помилок, колишня роль, працювати дистанційно, ведення обліку, реєстрація подій, несправності машини, аварійне завершення програми, налагодження нових систем, виробниче середовище, поширення персональних комп'ютерів, відображатися у, аварійне відновлення,

2. Translate the following terms and terminological expressions:

Set-up, backup, to be run, the backup systems, disaster recovery, business continuity procedure, to be transmitted, the network editing domains.

3. Answer the following questions:

1) What was the former role of a computer operator?
2) What does a computer operator work with nowadays?
3) Where does he work?
4) What does his role also include?
5) Whom do operators assist?
6) What knowledge does a computer operator also have?
7) Where can a computer operator work?

4. Tell your friends about the role of a computer operator.

5. Read the article and put five questions to it.

Perl

Perl is a family of high-level, general-purpose, interpreted, dynamic programming languages. The languages in this family include Perl 5 and Perl 6. Though Perl is not officially an acronym, there are various backronyms in use, such as: *Practical* Extraction *and Reporting Language*. Perl was originally developed by Larry Wall in 1987 as a general-purpose Unix scripting language to make report processing easier. Since then, it has undergone many changes and revisions. The latest major stable revision of Perl 5 is 5.18, released in May 2013. Perl 6, which began as a redesign of Perl 5 in 2000, eventually evolved into a separate language. Both languages continue to be developed independently by different development teams and liberally borrow ideas from one another.

The Perl languages borrow features from other programming languages including C, shell scripting (sh), AWK, and sed. They provide powerful text processing facilities without the arbitrary data-length limits of many contemporary Unix tools, facilitating easy manipulation of text files. Perl 5 gained widespread popularity in the late 1990s as a CGI scripting language, in part due to its parsing abilities.

In addition to CGI, Perl 5 is used for graphics programming, system administration, network programming, finance, bioinformatics, and other applications. It's nicknamed "the Swiss Army chainsaw of scripting languages" because of its flexibility and power and possibly also because of its perceived "ugliness". In 1998, it was also referred to as the "duct tape that holds the Internet together", in reference to its ubiquity and perceived inelegance.

6. Make an annotation of the article.

Larry Wall

from Linux Journal
by Marjorie Richardson

Larry Wall (born September 27, 1954) is a computer programmer and author, most widely known for his creation of the Perl programming language in 1987.

Wall grew up in south Los Angeles and then Bremerton, Washington before starting higher education at Seattle Pacific University in 1976, majoring in chemistry and music and later Pre-med with a hiatus of several years working in the university's computing center before being graduated with a self-styled bachelor's degree in Natural and Artificial Languages.

While in graduate school at UC Berkeley, Wall and his wife were studying linguistics with the intention afterwards of finding an unwritten language, perhaps in Africa, and creating a writing system for it. They would then use this new writing system to translate various texts into the language, among them the Bible. Due to health reasons these plans were cancelled, and they remained in the U.S., where Larry instead joined the NASA Jet Propulsion Laboratory after he finished graduate school.

Wall developed the Perl interpreter and language while working for System Development Corporation, which later became part of Unisys. He is the co-author of Programming Perl (often referred to as the *Camel Book* and published by O'Reilly), which is the definitive resource for Perl programmers; and edited the Perl Cookbook. He then became employed full-time by O'Reilly Media to further develop Perl and write books on the subject.

Wall's training as a linguist is apparent in his books, interviews, and lectures. He often compares Perl to a natural language and explains his decisions in Perl's design with linguistic rationale. He also often uses linguistic terms for Perl language constructs, so instead of traditional terms such as "variable", "function", and "accessor" he sometimes says "noun", "verb", and "topicalizer".

Wall's Christian faith has influenced some of the terminology of Perl, such as the name itself, a biblical reference to the "pearl of great price" (Matthew 13:46). Similar references are the function name *bless*, and the organization of Perl 6 design documents with categories such as apocalypse and exegesis. Wall has also alluded to his faith when he has spoken at conferences, including a rather straightforward statement of his beliefs at the August 1997 Perl Conference and a discussion of Pilgrim's Progress at the YAPC (Yet Another Perl Conference) in June 2000.

Lesson 5

POSTMASTER

In computers and technology, **postmaster** is a term used to identify the administrator of a mail server. Nearly every domain will have the e-mail address postmaster@example.com where errors in e-mail processing are directed. Error e-mails automatically generated by mail servers' MTAs usually appear to have been sent to the postmaster address.

Every domain that supports the SMTP protocol for electronic mail is required by RFC 5321 and, as early as 1982, by RFC 822, to have the postmaster address. The rfc-ignorant.org website used to maintain a list of domains that do not comply with the RFC based on this requirement, but was shut down in November 2012.

Quoting from the RFC:

Any system that includes an SMTP server supporting mail relaying or delivery MUST support the reserved mailbox "postmaster" as a case-insensitive local name. This postmaster address is not strictly necessary if the server always returns 554 on connection opening. The requirement to accept mail for postmaster implies that RCPT commands which specify a mailbox for postmaster at any of the domains for which the SMTP server provides mail service, as well as the special case of "RCPT TO:<Postmaster>" (with no domain specification), MUST be supported.

SMTP systems are expected to make every reasonable effort to accept mail directed to Postmaster from any other system on the Internet. In extreme cases (such as to contain a denial of service attack or other breach of security) an SMTP server may block mail directed to Postmaster. However, such arrangements SHOULD be narrowly tailored so as to avoid blocking messages which are not part of such attacks.

Since most domains have a postmaster address, it is commonly targeted by spamming operations. Even if not directly spammed, a postmaster address may be sent bounced spam from other servers that mistakenly trust fake return-paths commonly used in spam.

1. Find the English equivalents in the text:

Помилки, бути спрямованим, виконуватися, посилання (цитування), ретрансляція або доставка, очікується, відмова, заходи, бути витриманим, бути спрямованим,

2. Translate the following terms and terminological expressions:

To identify the administrator of a mail server, e-mail processing, postmaster address, reserved mailbox, breach of security, spamming operation

3. Match the definitions with the notions:

MTA	a method of exchanging digital messages from an author to one or more recipients
SMTP	the use of electronic messaging systems to send unsolicited bulk messages, especially advertising, indiscriminately
RFC	a Request for Comments - a publication of the Internet Engineering Task Force (IETF) and the Internet Society, the principal technical development and standards-setting bodies for the Internet
Spam	Simple Mail Transfer Protocol - an Internet standard for electronic mail (e-mail) transmission across Internet Protocol (IP) networks
e-mail	Message transfer agent or mail transfer agent, software that transfers e-mail between computers

4. Answer the following questions:

1) What meaning does a term postmaster have?
2) What is required by RFC 5321?
3) When is this postmaster address not strictly necessary?
4) What does the requirement to accept mail for postmaster imply?
5) What are SMTP systems expected to make?
6) What is a postmaster address commonly targeted by?

5. Tell your friends about the main aspects of postmaster.

6. Read the article and put five questions to it.

An Email Address

An email address identifies an email box to which email messages are delivered. This article covers modern internet email, but many earlier email systems used different address formats.

An email address such as *John.Smith@example.com* is made up of a local part, an @ sign, then a domain part. The domain part is is not case-sensitive but local-parts normally are. In practice, the mailsystem at *example.com* may chose to treat *John.Smith* as equivalent to *john.smith* or even *johnsmith*. Mailsystem often limit their users' choice of name to a subset of the technically valid characters, and may in some cases also limit which addresses it is possible to send mail to.

Ongoing internationalization efforts are underway to allow non-ASCII characters to be used in both the local and domain parts of an email address, allowing addresses such as: *Pelé@example.com* and *甲斐@黒川.日本* but these are still constrained by the current generation of email servers and clients.

The format of email addresses is local-part@domain where the local-part may be up to 64 characters long and the domain name may have a maximum of 255 characters – but the maximum 256 characters length of a forward or reverse path restricts the entire email address to be no more than 254 characters. The formal definitions are in RFC 5322 (sections 3.2.3 and 3.4.1) and RFC 5321 – with a more readable form given in the informational RFC 3696 and the associated errata.

7. Make an annotation of the article.

John O'Sullivan

The Australian Broadcasting Corporation (Melbourne). 1 April 2012.

John O'Sullivan is an Australian electrical engineer whose work in the application of Fourier transforms to radio astronomy led to his invention with colleagues of a core technology that made wireless LAN fast and reliable. This technology was patented by CSIRO and forms part of the 802.11a, 802.11g and 802.11n Wi-Fi standards.

In 2009 O'Sullivan was awarded both the CSIRO Chairman's Medal and the Australian Prime Minister's Prize for Science.

He is currently working on the design of the Australian Square Kilometre Array Pathfinder telescope, a step towards the proposed Square Kilometre Array telescope.

In 1977 John O'Sullivan co-authored a paper in the Journal of the Optical Society of America titled "*Image sharpness, Fourier optics, and redundant-spacing interferometry*" with J. P. Hamaker, and J. E. Noordam. In this paper, they presented a technique for sharpening and improving picture clarity in radio astronomy pictures.

In 1999, IEEE ratified 802.11a standard. O'Sullivan was not a member of the working group and did not contribute to the standard.

In the early 1990s, O'Sullivan led a team at the CSIRO which patented in 1996 the use of a related technique for reducing multipath interference of radio signals transmitted for computer networking. This technology is a part of all recent WiFi implementations. As of April 2012, the CSIRO has earned over $430 million in royalties and settlements arising from the use of this patent as part of the 802.11 standards with as much as a billion dollars expected after further lawsuits against other parties.

Unit V

Lesson 1

IT SPECIALIST

An information technology specialist applies technical expertise to the implementation, monitoring, or maintenance of IT systems. Specialists typically focus on a specific computer network, database, or systems administration function. Specialty areas include network analysis, system administration, security and information assurance, IT audit, database administration, web administration, and more.

Education requirements vary depending on the IT specialty. While some IT specialists work their way up with professional certifications, most experts begin their careers with an information technology degree at the associate or bachelor level. IT certifications are useful for building specialist expertise and staying up to date on the latest advances in a specific area of information technology. Job outlook is excellent for IT specialist positions; network analysts, for example, can expect 53 percent job growth, making this the fastest-growing occupation in the U.S.

An information technology (IT) degree is a degree offered at the associate's, bachelor's, master's, and PhD levels. The degree focuses on the branch of engineering that pertains to the use of computers to collect, store, and share and protect information.

At the associate's degree level, typical courses include project-based information systems, Website database implementation, introduction to DHTML and Java Script, as well a mathematics based curriculum. The master's level of education in Information Technology typically spans two years and offers a more focused and advanced field study. Courses at this level range from principles of software engineering to advanced algorithms and program language. The PhD in IT is the highest degree level offered, and is often focused on research.

An Information technology degree differs from computer science in that one is expected to understand and explore management and information theory.

1. Find the English equivalents in the text:

Застосовувати технічні знання, зосереджуватися на функції, освітні вимоги, рівень бакалавра, перспективи роботи, посада спеціаліста з IT, рівень магістра, відноситися до використання комп'ютерів, навчальна програма на основі математики, охоплювати два роки, пропонувати навчання, зосереджуватися на науковому дослідженні.

2. Translate the following terms and terminological expressions:

Maintenance of IT systems, network analysis, system administration, security and information assurance, IT audit, database administration, web administration, network analyst, to protect information, project-based information system, Website database implementation.

3. **Match the definitions with the notions:**

DHTML	a postgraduate academic degree awarded by universities
IT	an academic degree granted to individuals who have undergone study demonstrating a mastery or high-order overview of a specific field of study or area of professional practice
Bachelor's degree	an academic degree earned for an undergraduate course of study or major that generally lasts four years
Master's degree	the study, design, development, application, implementation, support or management of computer-based information systems
PhD	an umbrella term for a collection of technologies used together to create interactive and animated web sites by using a combination of a static markup language (such as HTML), a client-side scripting language (such as JavaScript), a presentation definition language (such as CSS), and the Document Object Model

4. Ask your friends to answer the following questions:

1) What does an information technology specialist apply technical expertise to?
2) What do specialists typically focus on?
3) What do specialty areas include?

4) What does information technology degree focus on?
5) What does the master's level of education offer?

5. Tell your friends about the main aspects of IT specialty.

6. Read the article and put five questions to it. Discuss it with your friends.

The *business value* of information technology lies in the automation of business processes, provision of information for decision making, connecting businesses with their customers, and the provision of productivity tools to increase efficiency.

The field of *information ethics* was established by mathematician Norbert Wiener in the 1940s. Some of the ethical issues associated with the use of information technology include:

- Breaches of copyright by those downloading files stored without the permission of the copyright holders
- Employers monitoring their employees' emails and other Internet usage
- Unsolicited emails
- Hackers accessing online databases
- Web sites installing cookies or spyware to monitor a user's online activities

7. Make an annotation of the article.

Norbert Wiener (November 26, 1894 – March 18, 1964) was an American mathematician. He was Professor of Mathematics at MIT.

A famous child prodigy, Wiener later became an early researcher in stochastic and noise processes, contributing work relevant to electronic engineering, electronic communication, and control systems.

Wiener is considered the originator of cybernetics, a formalization of the notion of feedback, with many implications for engineering, systems control, computer science, biology, philosophy, and the organization of society.

Wiener was born in Columbia, Missouri, the first child of Leo Wiener and Bertha Kahn, Jews of Polish and German origin, respectively. Norbert Wiener became a famous child prodigy. Leo had educated Norbert at home until 1903, employing teaching methods of his own invention, except for a brief interlude when Norbert was 7 years of age. Earning his living teaching German and Slavic languages, Leo read widely and accumulated a personal library from which the young Norbert benefited greatly. Leo also had ample ability in mathematics, and tutored his son in the subject until he left home. In his autobiography, Norbert described his father as calm and patient, unless he (Norbert) failed to give a correct answer, at which his father would lose his temper.

After graduating from Ayer High School in 1906 at 11 years of age, Wiener entered Tufts College. He was awarded a BA in mathematics in 1909 at the age of 14, where upon he began graduate studies of zoology at Harvard. In 1910 he transferred to Cornell to study philosophy.

"Information is information, not matter or energy."

—Norbert Wiener, *Cybernetics: Or the Control and Communication in the Animal and the Machine*

Wiener is regarded as the originator of cybernetics, a formalization of the notion of feedback, with many implications for engineering, systems control, computer science, biology, philosophy, and the organization of society.

Wiener's work with cybernetics influenced Gregory Bateson and Margaret Mead, and through them, anthropology, sociology, and education.

Lesson 2

SOFTWARE ARCHITECT

Software architect is a computer programmer who makes high-level design choices and dictates technical standards, including software coding standards, tools, and platforms.

With the popularity of multi-tier application development, the choices of how an application can be built have also increased. Given that expansion, the risk that a software development project may inadvertently create a "new" end product that, in essence, already existed has grown markedly. A new 'software architect' role has become necessary during software development.

The software architect concept began to take hold when object-oriented programming (OOP) was coming into more widespread use (in the late 1990s and early years of the 21st century). OOP allowed ever-larger and more complex applications to be built, which in turn required increased high-level application and system oversight.

The main responsibilities of a software architect include:

1. Limiting choices available during development by
   - choosing a standard way of pursuing application development
   - creating, defining, or choosing an application framework for the application
   - Recognizing potential reuse in the organization or in the application by
   - observing and understanding the broader system environment
   - creating the component design
   - having knowledge of other applications in the organization
2. Subdivide a complex application, during the design phase, into smaller, more manageable pieces
   - Grasp the functions of each component within the application
   - Understand the interactions and dependencies among components
   - Communicate these concepts to developers

In order to perform these responsibilities effectively, software architects often use tools or standardized model and symbol sets such as Unified Modeling

Language and OOP to represent systems or develop artifacts. UML has become an important tool for software architects to use in communicating the overall system design to developers and other team members, comparable to the drawings made by building architects.

1. Find the English equivalents in the text:

Вибір дизайну високого рівня, інструменти, підвищуватися, ненароком, по суті, помітно зрости, система контролю, головні обов'язки, проводити (здійснювати) розробку додатків, розуміти функції, взаємодія і залежність, ефективно виконувати обов'язки.

2. Translate the following terms and terminological expressions:

Software coding standards, multi-tier application development, software architect, object-oriented programming, an application framework, system environment, Unified Modeling Language.

3. Match the definitions with the notions:

OOP	activities through the application and development of novel concepts and techniques in computing
UML	all the computer software that causes a computer to perform useful tasks (compare with Computer viruses) beyond the running of the computer itself
Environment	the combination ofhardware and software in a computer
Application	a standardized (ISO/IEC 19501:2005), general-purpose modeling language in the field of software engineering
Design	a programming paradigm that represents concepts as "objects" that have data fields (attributes that describe the object) and associated procedures known as methods

4. Answer the following questions:

1) What is software architect?

2) What did OOP allow?

3) What do software architects often use to perform their responsibilities effectively?

4) What has become an important tool for software architects?

5. Tell your friends about the main responsibilities of software architects.

6. Read the article and put five questions to it. Discuss it with your friends.

Programmers' Day is an international professional holiday, recognized in many technology companies and programming firms, that is celebrated on the

256th (hexadecimal 100th, or the 2^8th) day of each year (September 13 during common years and on September 12 in leap years). It is also officially recognized in Russia and observed in several other countries, including Israel, Bangladesh, Chile, Brazil, Mexico, Austria, Germany, Canada, China, Croatia, France, Guatemala, India, Belgium, Australia, New Zealand, Poland, Slovenia, the United Kingdom, the United States and Uruguay.

The number 256 (2^8) was chosen because it is the number of distinct values that can be represented with an eight-bit byte, a value well-known to programmers. 256 is the highest power of two that is less than 365, the number of days in a common year.

This particular day was proposed by Valentin Balt, an employee of Parallel Technologies a web design company. As early as 2002, he tried to gather signatures for a petition to the government of Russia to recognize the day as the official programmers' day.

On July 24, 2009, the Ministry of Communications and Mass Media (Russia) issued a draft of an executive order on a new professional holiday, Programmers' Day. On September 11, 2009, Prime Minister of Russia Dmitry Medvedev signed the decree.

7. Make an annotation of the article.

Ada Lovelace

from Women in Computing
by A. Phillips

Augusta Ada King, Countess of Lovelace (10 December 1815 – 27 November 1852), born Augusta Ada Byron and now commonly known as Ada Lovelace, was an English mathematician and writer chiefly known for her work on Charles Babbage's early mechanical general-purpose computer, the Analytical Engine. Her notes on the engine include what is recognized as the first algorithm intended to be processed by a machine. Because of this, she is often considered the world's first computer programmer.

She was born 10 December 1815 as the only legitimate child to the poet Lord Byron and his wife Anne Isabella Byron – all of his other children were born out of wedlock. Byron separated from his wife a month after Ada was born and left England forever four months later, eventually dying of disease in the Greek War of Independence when Ada was eight years old. Ada's mother remained bitter at Lord Byron and promoted Ada's interest in mathematics and logic in an effort to prevent her from developing what she saw as insanity in her father, but she remained interested in him despite this (and was, upon her eventual death, buried next to him at her request).

She referred to herself as a "poetical scientist" and "an analyst (& metaphysician)". As a young adult, her mathematical talents led her to an ongoing working relationship and friendship with fellow British mathematician Charles

Babbage, and in particular Babbage's work on the analytical engine. Between 1842 and 1843, she translated an article by Italian military engineer Luigi Menabrea on the engine, which she supplemented with an elaborate set of notes of her own, simply called *Notes*. These notes contain what is considered the first computer program – that is, an algorithm encoded for processing by a machine. Lovelace's notes are important in the early history of computers. She also developed a vision on the capability of computers to go beyond mere calculating or number-crunching while others, including Babbage himself, focused only on those capabilities.

Lesson 3

SOFTWARE TESTING

Software testing takes place during software engineering. It is done before the release to the final audience.

Software testing is meant to see how the software works under different conditions. These conditions might be different depending on what the audience is. Testing is done to understand if it will work correctly, partially fail to work properly, or totally fail to work properly. Each test may be used to see how one, or many, parts of the software work at a point in its development.

Proper performance may be based on specific (written) requirements or standards (which might, for example, be usability). Bad performance, or poor quality, might cause an unhappy audience. This could cause more work needing to be done on the software and higher costs.

A review of the results of tests may show that some parts of the software system may need to be done again, or may work well. Some bad performances or software bugs may need to be fixed. After more work on the software, testing may be done again.

For larger software systems, tracking may take place checking completeness of the set of tests, test results, and how quickly any problems are fixed. All this information can be used for decision making about how ready the software is, and when it could be released to the final audience.

Software testing may be done with separate parts of the software, with a group of these parts, or with the entire software. Software testing may be done by allowing the software to be used by a small number of people who the software is meant for, under controlled settings. It is then tested with a larger group of people under less controlled settings (beta testing).

Some related terms are unit testing, white box testing, black box testing, regression testing, manual testing, automated testing, testing tools, test plan, test case, test data and test coverage.

1. Find the English equivalents in the text:

Вихід до кінцевої аудиторії, за різних умов, працювати належним чином, у момент розробки, належне виконання, спеціальні вимоги, низька якість, вищі витрати, перевірити повноту (завершеність), призначатися, контрольовані параметри.

2. Translate the following terms and terminological expressions:

Software testing usability, bad performances, software bugs, the set of tests, separate parts of the software, the entire software, unit testing, white box testing, black box testing, regression testing, manual testing, automated testing, testing tools, test plan, test case, test data and test coverage.

3. Match the definitions with the notions:

Unit testing	any type of software testing that seeks to uncover new software bugs, or regressions, in existing functional and non-functional areas of a system after changes
White box testing	the process of manually testing software for defects
Black box testing	a method of software testing that examines the functionality of an application (e.g. what the software does) without peering into its internal structures or workings
Manual testing	a method of testing software that tests internal structures or workings of an application, as opposed to its functionality
Regression testing	a method by which individual units of source code, sets of one or more computer program modules together with associated control data, usage procedures, and operating procedures, are tested to determine if they are fit for use

4. Answer the following questions:

1) When does software testing take place?
2) What is software testing meant to see?
3) What may a review of the test results show?
4) When may tracking take place for larger software systems?
5) Is software testing done with the entire software?
6) What is beta testing?

5. Tell your friends about the main aspects of software testing.

6. Read the article and put five questions to it.

Smoke testing refers to physical tests made to closed systems of pipes to detect cracks or breaks. By metaphorical extension, the term is also used for the first test made after assembly or repairs to a system, to provide some assurance that the system under test will not catastrophically fail. After a *smoke test* proves that "the pipes will not leak, the keys seal properly, the circuit will not burn, or the software will not crash outright," the system is ready for more robust testing.

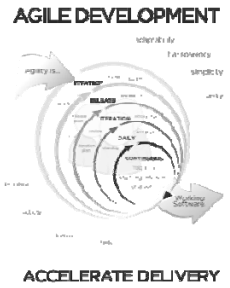
The term *smoke testing* is used in several fields, including electronics, software development, plumbing, woodwind repair, infectious disease control, and the entertainment industry.

The plumbing industry started using the smoke test in 1875. Later this usage seems to have been forgotten, leading some to believe the term originated in the electronics industry: "The phrase *smoke test* comes from [electronic] hardware testing. You plug in a new board and turn on the power. If you see smoke coming from the board, turn off the power. You don't have to do any more testing."

7. Make an annotation of the article.

Agile Software Development

from A Process for the Development of Software
by E. A. Edmonds



`**Agile software development** is a group of software development methods based on iterative and incremental development, where requirements and solutions evolve through collaboration between self-organizing, cross-functional teams. It promotes adaptive planning, evolutionary development and delivery, a time-boxed iterative approach, and encourages rapid and flexible response to change. It is a conceptual framework that promotes foreseen interactions throughout the development cycle. The *Agile Manifesto* introduced the term in 2001.

Incremental software development methods have been traced back to 1957. In 1974, a paper by E. A. Edmonds introduced an adaptive software development process. Concurrently and independently the same methods were developed and deployed by the New York Telephone Company's Systems Development Center under the direction of Dan Gielan. In the early 1970s, Tom Gilb started publishing the concepts of Evolutionary Project Management (EVO), which has evolved into Competitive Engineering. During the mid to late 1970s Gielan lectured extensively throughout the U.S. on this methodology, its practices, and its benefits.

So-called *lightweight* agile software development methods evolved in the mid-1990s as a reaction against the *heavyweight* waterfall-oriented methods, which were characterized by their critics as being heavily regulated, regimented, micromanagedand overly incremental approaches to development.

Proponents of lightweight agile methods contend that they are a return to development practices that were present early in the history of software development.

Early implementations of agile methods include Rational Unified Process (1994), Scrum (1995), Crystal Clear, Extreme Programming (1996), Adaptive Software Development, Feature Driven Development, and Dynamic Systems Development Method(DSDM) (1995). These are now collectively referred to as agile methodologies, after the Agile Manifesto was published in 2001

There are many specific agile development methods. Most promote development, teamwork, collaboration, and process adaptability throughout the life-cycle of the project.

Lesson 4

WEB DESIGN

Web design encompasses many different skills and disciplines in the production and maintenance of websites. The different areas of web design include web graphic design; interface design; authoring, including standardised code and proprietary software; user experience design; and search engine optimization.

Often many individuals will work in teams covering different aspects of the design process, although some designers will cover them all. The term web design is normally used to describe the design process relating to the front-end (client side) design of a website including writing mark up. Web design partially overlaps web engineering in the broader scope of web development. Web designers are expected to have an awareness of usability and if their role involves creating mark up then they are also expected to be up to date with web accessibility guidelines.

Web designers use a variety of different tools depending on what part of the production process they are involved in. These tools are updated over time by newer standards and software but the principles behind them remain the same. Web graphic designers use vector and raster graphics packages for creating web formatted imagery or design prototypes. Technologies used for creating websites include standardised mark-up, which could be hand-coded or generated by WYSIWYG editing software.

There is also proprietary software based on plug-ins that bypasses the client's browsers versions. These are often WYSIWYG but with the option of using the software's scripting language. Search engine optimisation tools may be used to check search engine ranking and suggest improvements.

Other tools web designers might use include mark up validators and other testing tools for usability and accessibility to ensure their web sites meet web accessibility guidelines.

1. Find the English equivalents in the text:

Різні навички, технічне обслуговування веб-сайтів, працювати у команді, частково охоплювати, у ширшій сфері, патентоване програмне забезпечення, пропонувати удосконалення.

2. Translate the following terms and terminological expressions:

Web design; web graphic design; interface design; authoring; user experience design; search engine optimization; web accessibility guidelines; vector and raster graphics packages; standardised mark-up; plug-in; to bypass the client's browsers versions.

3. Match the definitions with the notions:

Markup language	an information retrieval system designed to help find information stored on a computer system
Plug-in	a system in which content (text and graphics) displayed onscreen during editing appears in a form closely corresponding to its appearance when printed or displayed as a finished product, which might be a printed document, web page, or slide presentation (an acronym for "What You See Is What You Get")
Computer system validation	the documented process of assuring that a computer system does exactly what it is designed to do in a consistent and reproducible manner.

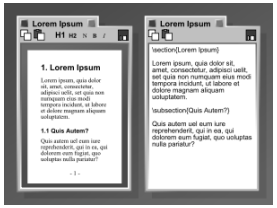
(CSV)	
WYSIWYG editor	a software component that adds a specific feature to an existing software application
Search engine	a coding system, such as HTML and SGML, used to structure, index, and link text files.

4. Answer the following questions:

1) What does web design encompass?
2) What areas does web design include?
3) What is the term web design used for?
4) What do web designers use?
5) What do web graphic designers use?
6) What do technologies used for creating websites include?
7) What tools might web designers use?

5. Tell your friends about the main aspects of web design.

6. Read the article and put five questions to it.



WYSIWYG implies a user interface that allows the user to view something very similar to the end result while the document is being created. In general WYSIWYG implies the ability to directly manipulate the layout of a document without having to type or remember names of layout commands. The actual meaning depends on the user's perspective, e.g.

- In presentation programs, compound documents and web pages, WYSIWYG means the display precisely represents the appearance of the page displayed to the end-user, but does not necessarily reflect how the page will be printed unless the printer is specifically matched to the editing program, as it was with the Xerox Star and early versions of the Apple Macintosh.
- In word processing and desktop publishing applications, WYSIWYG means that the display simulates the appearance and represents the effect of fonts and line breaks on the final pagination using a specific printer configuration, so that, for example, a citation on page 1 of a 500-page document can accurately refer to a reference three hundred pages later.

7. Make an annotation of the article.

Makintosh

The Macintosh, marketed as Mac, is a line of personal computers (PCs) designed, developed, and marketed by Apple Inc. It is targeted mainly at the home, education, and creative professional markets.

The line includes the descendants of the first commercially successful personal computer that was sold

without a programming language package and instead introduced a desktop publishing package, a mouse and a graphical user interface, all three novelties at the time.

It also includes descendants of the entry-level Mac mini desktop model, the Mac Pro tower graphics workstation, and the MacBook Air and MacBook Pro laptops. Its Xserve server was discontinued on January 31, 2011.

Apple Inc.'s then-chairman Steve Jobs introduced the first Macintosh on January 24, 1984. It became The Macintosh product line, and saw success through the end of the decade, though popularity dropped in the 1990s as the personal computer market shifted toward the "Wintel" platform: IBM PC compatible machines running MS-DOS and Microsoft Windows with an Intel processor. In 1998, Apple consolidated its multiple consumer-level desktop models into the all-in-one iMac, which proved to be a sales success and saw the brand revitalized.

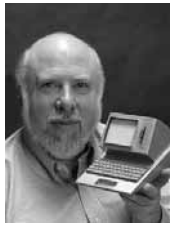
Production of the Mac is based on a vertical integration model. Apple facilitates all aspects of its hardware and creates its own operating system that is pre-installed on all Mac computers, unlike most IBM PC compatibles, where multiple sellers create and integrate hardware intended to run another company's operating software. Apple exclusively produces Mac hardware, choosing internal systems, designs, and prices. Apple uses third party components, however, such as graphics subsystems from Nvidia, Intel, and AMD. Current Mac CPUs use Intel's X86-64 architecture. The earliest models (1984–1994) used Motorola's 68k, and models from 1994 until 2006 used the AIM alliance's PowerPC. Apple also develops the operating system for the Mac, OS X, currently on version 10.8 "Mountain Lion". The modern Mac, like other personal computers, is capable of running alternative operating systems such as Linux, OpenBSD, and, in the case of Intel-based Macs,Microsoft Windows. However, Apple does not license OS X for use on non-Apple computers.

8. Make an annotation of the article.

Jef Raskin

The Little Engine That Could

The New York Times



Jef Raskin (March 9, 1943 – February 26, 2005) was an American human–computer interface expert best known for starting the Macintosh project for Apple in the late 1970s.

Raskin was born in New York City to a secular Jewish family. He received a BA in mathematics and a BS in physics with minors in philosophy and musicfrom the State University of New York at Stony Brook. In 1967, he received a master's degree in computer science (after switching from mathematical logic due to differences of opinion with his advisor) from Pennsylvania State University. Even though he had completed work for his PhD, the university was not accredited for a PhD in computer science. His first computer program, a music program, was part of his master's thesis.

Raskin later enrolled in a graduate music program at the University of California, San Diego, but stopped to teach art, photography and computer science there, working as an assistant professor in the Visual Arts dept from 1968 until 1974. He was awarded a National Science Foundation grant to establish a Computer and Humanities center which used a 16 bit Data General Nova computer and graphic display terminals rather than the teletypes which were in use at that time.

Along with his undergraduate student Jonathan Collins, Jef developed the Flow Programming Language for use in teaching programming to the art and humanities students. The language was first used at the Humanities Summer Training Institute held in 1970 at the University of Kansas in Lawrence, Kansas. The language had only 6 instructions (get it, print it, print "text", jump to, if it is ' ' then & stop) and could not manipulate numbers. The language utilized "typing amplification" in which only the first letter was typed and the computer provided the balance of the instruction eliminating typing errors. It was also the basis for programming classes taught by Jef and Jon in the UCSD Visual Arts Dept.

He curated several art shows including one featuring his collection of unusual toys. It was during this period that Jef changed the spelling of his name from Jeff to Jef after meeting Jon and liking the lack of extraneous letters.

He occasionally wrote for computer publications, such as Dr. Dobb's Journal.

Lesson 5

TECHNICAL SUPPORT

Technical support or tech support refers to a range of services by which enterprises provide assistance to users of technology products such as mobile phones, televisions, computers, software products or other electronic or mechanical goods. In general, technical support services attempt to help the user solve specific problems with a product-rather than providing training, customization, or other support services.

Most companies offer technical support for the products they sell, either freely available or for a fee. Technical support may be delivered over the telephone or online by e-mail or a website or a tool where users can log a call/incident.

Larger organizations frequently have internal technical support available to their staff for computer related problems. The internet is also a good source for freely available tech support, where experienced users may provide advice and assistance with problems. In addition, some fee-based service companies charge for premium technical support services.

Technical support may be delivered by different technologies depending on the situation. For example, direct questions can be addressed using telephone calls, SMS, Online chat, Support Forums, E-mail or Fax; basic software problems can be addressed over the telephone or, increasingly, by using remote access repair services; while more complicated problems with hardware may need to be dealt with in person.

1. Find the English equivalents in the text:

Набір послуг, забезпечувати (надавати) допомогу, намагатися допомогти, безкоштовно, за плату, доставляти (передавати), надавати пораду (консультацію), стягувати плату.

2. Translate the following terms and terminological expressions:

Providing training, customization and support services; internal technical support; remote access repair services.

3. Match the definitions with the notions:

SMS	the place to share your experience with experts and with other users, report bugs and generally join in discussions.
Online chat	the telephonic transmission of scanned printed material (both text and images), normally to a telephone number connected to a printer or other output device
E-mail	a method of exchanging digital messages from an author to one or more recipients
Fax	any kind of communication over the Internet that offers a real-time transmission of text messages from sender to receiver
Forum	a text messaging service component of phone, web, or mobile communication systems, using standardized communications protocols that allow the exchange of short text messages between fixed line or mobile phone devices (Short Message Service)

4. Answer the following questions:

1) What does technical support refer to?
2) Do companies offer technical support for the products freely?
3) How may technical support be delivered?
4) What do larger organizations have?
5) What is a good source for freely available tech support?
6) How can direct questions be addressed?

5. Tell your friends about the main aspects of technical support.

6. Read the article and put five questions to it.

Xerox Corporation /□z□ər□ks/ is an American multinational document management corporation that produces and sells a range of color and black-and-white printers, multifunction systems, photo copiers, digital production printing presses, and related consulting services and supplies. Xerox is headquartered in Norwalk, Connecticut (moved from Stamford, Connecticut in October 2007), though its largest population of employees is based around Rochester, New York, the area in which the company was founded. On September 28, 2009, Xerox announced the intended acquisition

of Affiliated Computer Services for $6.4 billion. The deal closed on February 8, 2010. Xerox holds a Royal Warrant from Queen Elizabeth II and the Prince of Wales.

Researchers at Xerox and its Palo Alto Research Center invented several important elements of personal computing, such as the desktop metaphor GUI, the computer mouse and desktop computing. These features were frowned upon by the then board of directors, who ordered the Xerox engineers to share them with Apple technicians. The features were taken on by Apple and, later, Microsoft. Partly thanks to these features, these two firms would then go on to duopolize the personal computing world

7. Make an annotation of the article.

Charles Peter McColough

from Fumbling the Future
by Smith, Douglas K.; Alexander, Robert C.

Charles Peter Philip Paul McColough (August 1, 1922 – December 13, 2006) was one of the joint creators and founders of the Xerox Corporation (along with Joseph C. Wilson), and was a former Chief Executive Officer and Chairman of the Boardat Xerox. He retired in the late 1980s, after serving over fourteen years as CEO. Aside from building Xerox to the corporate empire it is today, McColough was treasurer of the Democratic National Committee between 1974 and 1976, was Chairman ofUnited Way of America, and served on the Board of Trustees at the Council on Foreign Relations, New York Stock Exchange, Bank of New York, Wachovia, Citigroup, Knight Ridder, and Union Carbide Corporation.

C. Peter McColough is also the namesake of the C. Peter McColough Roundtable Series on International Economics, part of the Council on Foreign Relations. This program was enacted and funded by the Council on Foreign Relations upon McColough's retirement as a Director on the Council's Board for nine years. McColough also served as Treasurer between 1985-87, Chairman of the Finance and Budget Committee between 1981-87, and served as Chairman of the Campaign for the Council between 1983-85.

He resided with his wife, Mary Virginia White McColough, in Greenwich, Connecticut, and Palm Beach, Florida.

McColough worked initially for Lehigh Navigation Coal Sales Company in the USA before making the switch in 1954 to Xerox, then a little known manufacturer of industrial photocopiers and still known as the Haloid Company. Five years after that career move, his new firm introduced its first office photocopier. As one of the first companies to step into the lucrative arena and potential growth market, Xerox's annual revenues soared from $40 million in 1960 to almost $3 billion in the early 1970s.

After taking over the presidency of the firm in 1966, McColough significantly changed and altered the direction and goals of Xerox Corporation. By 1979, McColough had built up Xerox revenues to $7 billion a year and its annual earnings to $563 million. The company's chief scientist told Forbes Magazine in

1980 that "in the late 1960s, Peter McColough redefined our company." From 1970 through to the mid-1980s he has held several directorships and in 1970, was honoured by his former alma mater, Dalhousie University, with an Honorary Doctorate.

8. Make an annotation of the article.

Ursula Burns

from "An Historic Succession At Xerox". *Business Week*
by Byrnes, Nanette; Crockett, Roger O

Ursula M. Burns (born September 20, 1958) serves as Madam Chairman and CEO of Xerox. She is the first African American woman CEO to head a Fortune 500 company. She is also the first woman to succeed another woman as head of aFortune 500 company. In 2009, Forbes rated her the 14th most powerful woman in the world.

Burns was raised by a single mother in the Baruch Houses, a New York city housing project. Both of her parents were Panamanian immigrants. She attended Cathedral High School, a Catholic all-girls school on East 56th Street in New York. She went on to obtain a bachelor of science degree in Mechanical Engineering from Polytechnic Institute of NYU in 1980 and a master of science in Mechanical Engineering from Columbia University a year later.

In 1980, Burns first worked for Xerox as a summer intern, permanently joining a year later, in 1981, after completing her master's degree. She worked in various roles in product development and planning in the remainder of the 1980s throughout her 20s.

In January 1990, her career took an unexpected turn when Wayland Hicks, then a senior executive, offered Burns a job as his executive assistant. She accepted and worked for him for roughly nine months when she was ready to go back home because she was about to be married Lloyd Bean. ranks. In June 1991, she became executive assistant to then chairman and chief executive Paul Allaire. In 1999, she was named vice president for global manufacturing.

In 2000, Burns was named a senior vice president and began working closely with soon to be CEO Anne Mulcahy, in what both women have described as a true partnership. Nine years later, in July 2009, she was named CEO, succeeding Mulcahy, who remained as chairwoman until May 2010.

Burns has served on numerous professional and community boards, including Exxon Mobil Corporation, American Express, Boston Scientific, FIRST, National Association of Manufacturers, University of Rochester, the MIT Corporation, the Rochester Business Alliance, and the RUMP Group. She will serve as Vice Chairman of the Executive Committee of The Business Council in 2013 and 2014. She was the Commencement speaker at MIT's 2011 Commencement, which was also the conclusion of MIT's 150th anniversary celebration. She delivered the 2011 Commencement address at the University of Rochester. She was the 2012 Commencement speaker for Xavier University of Louisiana's May 12 Commencement ceremony, where she also received an honorary degree, one of the institution's highest honors.

VIII. ГРАМАТИЧНІ ЗАВДАННЯ

Passive Voice

1. Choose the right form of the verb.

1. This house (to build) by my great-grandfather in 1790.
2. As a result of an earthquake the house (to burn down) there.
3. The door of this house (to close) for you tomorrow.
4. He (to recognize) by the policeman two days ago.
5. The Paris newspapers declared that the child (to call) Juliet.
6. That building (to paint) yellow some years ago.

2. Use an appropriate tense of the verb in brackets.

1. He ____ just ____ (offer) a well-paid job with Radio Four.
2. The ceremony ____ (report) in the news last night.
3. I think cinema ____ (replace) gradually by TV and computers in the next century.
4. This program became very popular after the main presenter ____ (vote) the most interesting TV personality of the year.
5. Her latest series of articles ____ (publish) in a national newspaper every month.
6. Some films should ____ (not watch) by children and they ____ (show) on TV before 22.00.

3. Transform the Active Voice into Passive:

1. They sent for a doctor.
2. They looked for the book everywhere.
3. They listened to the lecture with great interest.
4. They always look at this picture.
5. They will look through these letters tomorrow.
6. They often laughed at him.

4. Change the following into the Passive Voice. Leave out the subject of the action.

1. The girls water the flowers every day.
2. They publish this magazine in Paris.
3. We do not discuss such questions at our meeting.
4. Somebody built this castle in the 16th century.
5. They did not show this film last week.
6. They will not finish this work tomorrow.
7. We shall invite him to take part in the concert.
8. The workers repaired this road last year.
9. They write compositions regularly.
10. The travellers made camp not far from the village.

5. Change the following into the Passive Voice, without leaving out the subject of the action.

1. My sister teaches me English.
2. Peter drives the car.
3. The fascists killed her father.
4. His assistant will meet the delegation.
5. Alan opened the door.
6. He put the letter in the envelope.
7. The hunter killed the bear.
8. The guide showed us the monuments of Lviv.
9. The waitress offered me a cup of tea.
10. He showed me the way to the railway station.

6. Fill in the blanks with the necessary verb form:

1. A huge housing program … (to carry out) now.
2. Something important … (to announce) over the radio now.
3. Don't enter the room. It is … (to clean) now.
4. What question … (to discuss) when you came to the meeting.
5. Your papers … (to type) from 5 till 6 tomorrow.
6. He … (to wait for) downstairs.

7. Translate into English:

1) Переклад вже закінчено. 2) Лист щойно відправлено. 3) За останні роки в нашому місті побудовано багато нових будинків. 4) Стаття ще не опублікована. 5) Це запитання вже обговорено? 6) Мене тільки що запитали про це. 7) Делегацію вже зустріли? 8) Вчора до цього часу робота вже була завершена. 9) Ми зрозуміли, що наш лист ще не отримали. 10) До того часу, коли вони приїхали, питання було вже вирішено.

8. Change these sentences into the Passive. Make the underlined words subjects of the passive sentences.

1. The police fined <u>the driver</u> for speeding.
2. People have sent <u>her</u> lots of birthday cards this year.
3. The lights went out when they were serving <u>the meal</u>.
4. Journalists asked <u>the prime minister</u> a lot of difficult questions.
5. Nobody has told <u>me</u> what to do.
6. The police were following <u>him</u> until he got to the office.

9. Choose the correct verb form.

1. The news ____ by James Cook tomorrow (will read, was read, will be read).
2. Three men ____ now about last month's bank robbery in Weymouth (are questioned, are being questioned, were being questioned).
3. According to a report, hundreds of people ____ in the streets every day (attack, are attacked, were attacked).

4. The law about TV stations ____ in parliament today (was passed, has passed, has been passed).
5. The scandal ____ by two reporters from *The Washington Post* (was uncovered, covered, was being uncovered).

10. Translate the sentences, using Passive Voice.

a)

1. Цю статтю написав англійський журналіст.
2. Переклад буде закінчено вчасно.
3. Наш будинок зараз ремонтують.
4. Обід варили, коли я прийшов додому.
5. Цей театр було побудовано до того, як ми приїхали сюди.
6. Про вас щойно говорили.
7. Твори англійських письменників публікуються у всьому світі.

b)

1. Грабіжника було заарештовано на місці злочину.
2. Пацієнта було прооперовано одразу після нещасного випадку.
3. Машину щойно вкрали.
4. Скульптуру перефарбовували весь вечір.
5. Це рішення вже прийнято міністром Бертрандом Осборном.
6. Нове попередження було надано вченими вулканічної обсерваторії до 5 години вчора.

11. Use the verbs in brackets in the Active or Passive Voice:

1. Nobody (to see) him yesterday.
2. The telegram (to receive) tomorrow in the evening.
3. He (to give) me this book next week or in a week.
4. The answer to this question can (to find) in the encyclopaedia.
5. We (to show) the historical monuments of the capital to the delegation.
6. You can (to find) interesting information about the life in the USA in this book.
7. Budapest (to divide) by the Danube into two parts: Buda and Pest.
8. Yuri Dolgoruki (to found) Moscow in 1147.
9. Moscow University (to found) by Lomonosov.
10. We (to call) Zhukovski the father of Russian aviation.

12. Translate into English using Passive Infinitive after modal verbs:

1. Руки треба мити перед кожною їжею.
2. Кімнати треба регулярно провітрювати.
3. Кішку слід годувати рибою.
4. Собаку можна годувати м'ясом та овочами.
5. Дітям треба регулярно давати фрукти ти овочі.
6. Книги треба класти в шафу або на книжкову поличку.

7. Цю картину можна повісити над каміном.
8. Як можна перекласти це слово?
9. Куди можна поставити валізи?
10. На що потрібно звернути увагу?
11. Треба записати твій номер телефону про всяк випадок.
12. Потрібно виміряти ваш кров'яний тиск та температуру.
13. Його треба запросити на мій день народження.
14. Їй можна запропонувати нову посаду або нову роботу.

The Infinitive

13. Transform the sentences using the Infinitive instead of Subordinate Clauses:

1. He was sorry *when he heard of your disappointment*. 2. Do you understand *what you have to do?* 3. He hopes *that he will get the information tomorrow.* 4. We should be sorry *if we heard bad reports of him.* 5. The candidate did not expect *that he would pass the interview.* 6. Do not promise *that you will do it,* if you are not sure of success. 7. He was annoyed *when he heard* that the Conservative party got in again. 8. She was sorry *that she had missed the beginning of the lecture.* We must wait *till we hear* the examination results before we make any plans. 10. She is happy *that she has found such a simple solution to this difficult problem.*

14. Find the Objective Infinitive Construction and translate into Ukrainian:

1. I consider them to be good specialists. 2. He heard them discuss their plan. 3. I heard him mention my name. 4. We expect writers to deal with the issues of the modern world. 5. They believed him to be honoured by the invitation to the international congress. 6. We assume these truths to be self-evident. 7. They find the experience of this conference to have been a remarkable one.

15. Translate the sentences paying attention to the Objective Infinitive Construction:

1. We know industrial electronic equipment to play a very significant role in the modern world. 2. We often watched the operator adjust the apparatus. 3. They wanted this device to be installed immediately. 4. Faraday expected electrochemistry to be widely used for peaceful construction. 5. We know electrochemistry to owe its birth to the discoveries of Volta.

16. Transform the sentences using the Objective Infinitive Construction:

1. I've never heard how he spoke about his life in India. 2. The two sides expect that negotiations will be long and difficult. 3. We expect that a scientist or a scholar will keep an open mind. 4 One can hardly expect that a true scientist will keep within the limits of one's narrow field. 5. They thought that he was an eminent scholar. 6. We expected that the partners would agree on a number of

issues. 7. We assume that these errors are of no importance. 8. We suppose that his discovery is accidental. 9. We consider that he is a real genius. 10. They estimate that the number of casualties will be much higher.

17. Translate the sentences paying attention to the Objective Infinitive Construction:

1. Вона часто спостерігала, як він годинами працював над цим експериментом. 2. Члени наукового товариства вимагають, щоб цей пристрій було спочатку протестовано. 3. Дослідники вважатимуть цей регіон єдиним джерелом мінеральних ресурсів та енергії. 4. Він знав, що ці дані використовуються в їх дослідженнях. 5. Автор змусив їх переписати два розділи. 6. Ми б хотіли, щоб ви мали свою власну думку щодо цього експерименту. 7. Вчений вважає, що це явище досить рідкісне. 8. Вони очікували, що ця спроба виявиться вдалою.

18. Translate the sentences paying attention to the Subjective Infinitive Construction:

1. Some theories, which seemed to be perfectly reasonable even a short time ago, have proved to be absolutely wrong. 2. It was hoped that this experimental method would help to solve the problem, but it proved to be quite useless. 3. The discussion proved to be very useful in helping to approach the problem in a new way. 4. The new evidence proved to confirm the theory. 5. Facts that seem insignificant at first often prove later to be of vital importance. 6. He seems to know little about research work. 7. All our efforts proved to be useless. 8. The computer is expected to save the scientist a lot of time. 9. This discovery is considered to be the result of a long and thorough investigation. 10. These phenomena are believed to be interdependent.

19. Translate the sentences keeping in mind:

1) The verbs using with the Subjective Infinitive Construction in Passive form: a) *to believe, to consider, to hold, to think, to suppose (вважати, думати); b) to expect (очікувати), to estimate (оцінювати), to say (говорити), to report (повідомляти).*

2) The verbs using with the Subjective Infinitive Construction in Active form:

to seem, to appear (здаватися), to prove, to turn out (виявлятися), to happen (траплятися, виявлятися).

3) The expressions using with the Subjective Infinitive Construction: *to be likely (ймовірно), to be sure, to be certain (напевно), to be unlikely (навряд).*

1. Його знали як дуже чутливого до будь-якої критики. 2. Вважають, що атомна енергія стане головним джерелом постачання енергії. 3. Кажуть, що наша лабораторія отримала нові прилади. 4. Відомо, що напівпровідники знайдуть різноманітне застосування в майбутньому. 5. Вважається, що водень складає половину поверхні землі, води та повітря. 6. Очікується, що

він поновить випробування на наступному тижні. 7. Ймовірно, ці вчені опублікують результати своїх досліджень. 8. Навряд чи він візьме участь у дискусії. 9. Напевно, він представить свою доповідь наприкінці конгресу. 10. Виявилося, що він усвідомлює всі наслідки експерименту.

20. Transform the following sentences, using the Subjective Infinitive Construction and the verb in brackets according to the model:

History repeats itself. – History is known to repeat itself.

1. Leonardo da Vinci discovered and laid down immortal principles in the theory of art (to know). 2. Leonardo da Vinci designed the first parachute (to suppose). 3. Leonardo denied himself meat out of an aversion to the killing of animals (to say). 4. Applied science will produce a vast increase in entirely new synthetic products of all kinds (to expect). 5. Rapid expansion of industrialization leads to an exhaustion of natural resources (to believe). 6. Close cooperation between scientists and scientific institutions all over the world is one of the most striking characteristics of modern science (to consider). 7. Charles Spencer Chaplin made more people laugh than any other human being in the history of the world (to know).

21. Translate the following sentences into Ukrainian:

1. Leonardo da Vinci is considered to be a pioneer in physiology and botany. 2. The Earth is said to have been part of the Sun. 3. The delegation is reported to have arrived in the capital already. 4. Moral perfection is considered to be one of the ideals of mankind. 5. Leonardo da Vinci is known to have studied optics. 6. His painting and sculpture are supposed to have opened up few fields of enquiry. 7. He is known to have studied the structure of the bones and muscles of the human body.

22. Translate the following sentences into English:

1. Відомо, що наука значно змінила умови життя сучасної людини. 2. Вважається, що Леонардо да Вінчі сконструював перший ліфт. 3. Кажуть, що цей політичний діяч досяг великих успіхів. 4. Очікується, що протиріччя між цими країнами будуть залагоджені. 5. Відомо, що Леонардо да Вінчі створив проект реконструкції Мілана. 6. Кажуть, що він достатньо розумний, щоб правильно оцінити ситуацію. 7. Очікується, що вони поновлять випробування наступного тижня. 8. Повідомляють, що президент вже прибув до столиці.

23**. Translate the sentences paying attention to the Object and Subjective Infinitive Constructions:**

1. We consider radioactive atoms to be very valuable in all sorts of ways. 2. An atom is known has been proved to hold a tremendous force, hidden in its tiny body. 3. Everything around us is known to be composed of atoms. 4. The common articles in the laboratory are known to be made of plastics. 5. In general, plastics

are known to be classified according to their behaviour when they are heated. 6. The plastics have proved to be satisfactory alternatives to many other materials. 7. The 19th century is often considered to be the century of steam and electricity. 8. We know the molecules of substances to be in continual motion.

24. Translate the sentences paying attention to the Object and Subjective Infinitive Construction:

1. Відомо, що атомній енергії належить майбутнє. 2. Кажуть, що наша лабораторія отримала нові прилади. 3. Відомо, що розчин – це однорідна суміш двох або декількох речовин. 4. Ми виявили, що ці експерименти відповідали раніше прийнятим нормам. 5. Учні очікували, що магніт притягне цей предмет. 6. Відомо, що біля полюсів магніту магнітне поле сильніше.

25. Translate the sentences with Prepositional Infinitive Construction into Ukrainian:

1. It is desirable for you to know it. 1. He waited for the papers to be published. 3. There is only one thing for you to do. 4. For the experiment to be successful he had to do much work. 5. Have you got anything for me to read? 6. For the meeting to be a success much preliminary work must be done. 7. No efforts are large enough for the research to be completed. 8. We are waiting for the jury to announce their verdict. 9. It will take several years for the two sides to come to an agreement. 10. It will be expedient for them to postpone the visit. 11. It will be convenient for all of us to have the examination on Tuesday.

26. Complete the following sentences:

1. It is necessary for her … 2. It is advisable for them … 3. They waited for us … 4. It was important for them … 5. There was no reason for him … 6. It will be dangerous for him … 7. It was high time for them … 8. It is better for her … 9. The best thing for me was … 10. She will wait for me …

27. Make up sentences using "For … to + Infinitive" construction:

Necessary	journalists	take a different view
Important	economists	take some interest in politics
Essential	politicians	confront reality / face facts
Impossible	philosophers	deny the progress of science

28. Translate the following sentences into English:

1. Не існує серйозних перешкод тому, щоб ці країни жили у мирі. 2. Він дав нам декілька статей, щоб ми використали його дані у нашому дослідженні. 3. Лектор говорив достатньо голосно, щоб всі могли чути його. 4. Вкрай важливо, щоб ви прочитали його біографію. 5. Всі ми повинні вчитися на власному досвіді. 6. Необхідно, щоб ця проблема була вирішена негайно.

IX. ГРАМАТИЧНИЙ ДОВІДНИК

PASSIVE VOICE

1. **The Passive is formed** by using the appropriate tense of the verb ***to be*** + ***Past Participle***.

Tense	Active Voice	Passive Voice
Present Simple	They **repair** cars.	Cars **are repaired**.
Past Simple	They **repaired** the car.	The car **was repaired**.
Future Simple	They **will repair** the car.	The car **will be repaired**.
Present Continuous	They **are repairing** the car.	The car **is being repaired.**
Past Continuous	They **were repairing** the car.	The car **was being repaired**.
Present Perfect	They **have repaired** the car.	The car **has been repaired**.
Past Perfect	They **had repaired** the car.	The car **had been repaired**.
Future Perfect	They **will have repaired** the car.	The car **will have been repaired**.
Modals + be+ Past Part.	You **must repair** this car.	This car **must be repaired**.

2. **The Passive is used**:
   - When the agent (the person who does the action) is unknown, unimportant or obvious from the context.
     *My car **was stolen** yesterday. (Unknown agent)*
     *The road repairs **were completed** last week. (Unimportant agent)*
     *The kidnappers **have been arrested**. (By the police – obvious agent)*
   - To make statement more polite or formal.
     *My new suit **has been burnt**. (It is more polite than saying "You've burnt my new suit".)*
   - When the action is more important than the agent – as in news reports, formal notices, instructions, processes, headlines, advertisements etc.
     *Taking pictures **is not allowed.** (Written notice)*
     *The local bank **was robbed** this morning. (News report)*
     *Bread **is baked** in an oven for about 45 minutes. (process)*
   - To put emphasis on the agent.
     *The Tower of London **was built** by William the Conqueror.*

INFINITIVE

Infinitive forms	Active Voice	Passive Voice
Indefinite	to offer	to be offered
Continuous	to be offering	-------
Perfect	to have offered	to have been offered
Perfect Continuous	to have been offering	-------

1. The **Indefinite Infinitive** refers to the present or future: *I would like **to go** for a walk.*
2. The **Continuous Infinitive** is used with *appear, claim, seem, pretend, must, cannot, happen, should, would etc* to describe an action happening now: *He must **be working** in the garden now.*
3. The **Perfect Infinitive** is used with *appear, happen, pretend, seem etc* to show that the action of the infinitive happened before the action of the verb: *He claims **to have met** the Queen.*
4. The **Perfect Continuous Infinitive** with *appear, seem, pretend etc* to put emphasis on the duration of the action of the infinitive, which happened before the action of the verb: *She seems **to have been working** all morning.*

The *to*-infinitive is used:

1. to express purpose: *She went out **to buy** some milk.*
2. after certain verbs (*advise, agree, appear, decide, expect, hope, promise, refuse etc):*
   *He promised **to be** back at 10 o'clock.*
3. after certain adjectives (*angry, happy, glad etc): She was glad **to see** him.*
4. after question words (*where, how, what, who, which, but not after why): Has she told you where **to meet** them?* But: *I don't know why he left so early?*
5. after *would like/would love/would prefer* to express specific preference): *I'd love to go for a walk.*
6. after nouns: *It's a pleasure **to work** with you.*
7. after *too/enough* constructions: *He's too short **to reach** the top shelf. He isn't tall enough **to reach** the top shelf.*
8. with *it + be + adj (+ of + object): It was nice of him **to remember** my birthday.*
9. with *only* to express unsatisfactory result: *He called me only **to say** that he would be late.*

The infinitive without *to* is used:

1. after modal verbs (*must, can, may, will etc): You must **be** back at 12 o'clock.*
2. after *had better/would rather: I'd rather **had stayed** in last night.*
3. after *make/let/see/hear/feel* + object: *Mum let me **watch** TV. I made him **apologise.***

But: in the passive form: *be made/be heard/be seen + to*-infinitive: *He was made **to apologise.***

Note: *help* is followed by a *to*-infinitive or an infinitive without *to: She helped me **(to) wash** the dress.*

The Objective Infinitive Complex

The Objective Infinitive Complex consists of a noun in the Common Case or a personal pronoun in the Objective Case and the infinitive. The nominal part of the complex denotes the subject or the object of the action expressed by the infinitive.

In the sentence this complex has the function of a complex object.

The Objective Infinitive Complex is used:

a) after the verbs denoting perceptions of senses (***to see, to hear, to feel, to watch, to observe, to notice)***; infinitive without *to* is used after these verbs, e.g.: *They all watched* ***him walk*** *up the hill.*
b) after the verbs denoting wish, intention, emotions (***to want, to wish, to desire, to like, to dislike, to hate, to intend, should/would like)***, e.g.: *He intended* ***me to go*** *with him to the theatre.*
c) after the verbs denting mental activity (***to consider, to believe, to think, to find, to know, to expect, to suppose)*** , e.g.: *We consider* ***him to be*** *an interesting person.*
d) after the verbs denoting request, permission, advice, compulsion (***to order, to ask, to request, to allow, to permit, to advise, to recommend, to cause, to force, to make, to let);*** infinitive without *to* is used after ***to make*** and ***to let***, e.g.: *We made* ***George work***.

The Subjective Infinitive Complex

The Subjective Infinitive Complex consists of a noun in the Common Case or a personal pronoun in the Nominative Case and the infinitive.

The nominal part of the complex may denote both the subject and the object of the action expressed by the infinitive.

The Subjective Infinitive Complex is used:

a) with the verbs ***to say*** and ***to report*** (in the Passive Voice), e.g.: ***The delegation*** *is reported* ***to have arrived*** *in Geneva.*
b) with the verbs (in the Passive Voice) denoting mental activity (***to consider, to believe, to think, to know, to expect, to suppose)*** , e.g.: ***The meeting*** *is expected* ***to begin*** *this morning.*
c) with the verbs (in the Passive Voice) denoting sense perceptions (***to see, to hear, to feel, to watch, to observe, to notice***), e.g.: ***He*** *was seen* ***to enter*** *the house.*
d) with the verbs (in the Passive Voice) denoting request, permission, advice, compulsion (***to order, to ask, to request, to allow, to permit, to advise, to recommend, to cause, to force, to make, to let);*** e.g.: ***They*** *were ordered* ***to leave*** *the hall.*
e) with the verbs ***to seem, to appear, to happen, to chance, to turn out, to prove,*** e.g.: ***She*** *seemed not* ***to listen*** *to him.*
f) with the expressions ***to be sure, to be certain, to be likely, to be unlikely,*** e.g.: ***He*** *is certain* ***to be sleeping***.

The Prepositional Infinitive Complex

The infinitive complex preceded by the preposition ***for*** is called the Prepositional Infinitive Complex. It may be used in the functions of a subject, predicative, object, attribute and adverbial modifier of result and purpose.

It is time ***for us to go****. He waited* ***for her to speak****. There's nobody here* ***for him to play with.*** *It was too dark* ***for her to see him***.

X. ЛІТЕРАТУРА

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