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INFORMATION TECHNOLOGY

The Binary Code

1 The presence and operation of the binary code in a modern computer are not apparent to the user. Personal computers may be used for a variety of functions - playing music, editing photos, writing documents, or performing financial accounting. The user performs each of these activities by entering unrelated commands into different software programs. Yet, each of these applications uses the same components in the computer to perform its functions. In order to achieve this, the functions of each program must be converted to the binary code used by the computer's processor, memory, and storage hardware.

2 The binary code is a type of binary number system. Instead of using the decimal system with digits from zero to nine, it has only zeros and ones. Just as decimal numbers can be grouped to form larger numbers, binary ones and zeros can be combined as well. Computer designers have developed different binary codes, although ASCII and Unicode are the most common. While ASCII groups binary digits into groups of eight, Unicode uses groups of sixteen. For example, the number 123 in ASCII binary is 00110001.00110010.00110011. Although this looks difficult, it is much easier to read than decimals for electronic technology in which everything has only on or off states.

3 The genius of computer processor design is that the central processing unit (CPU) is only required to perform a very limited set of actions. It does mathematical calculations, including basic arithmetic, as well as some higher math. It also performs logical functions like comparisons. The processor does not need to know how to play music, edit photos, and so on. The few functions it must perform are simplified into machine code. That code remains very simple by using the basic language of binary numbers. In this manner, the processor simply performs the functions on the numbers. This simplification allows a processor to perform millions of actions per second.

4 Since the job of the processor is very basic, using it to perform a complicated function, such as photo editing, must be done through programming. The first programmers actually wrote binary code. To have the computer add two numbers, the programmers had to write a machine code string of ones and zeros that contained the numbers to be added. Not surprisingly, the first programs were extremely time-consuming and not very complicated. Fortunately, by the 1950s, computer engineers had written translation programs that harnessed the power of the computer to convert a number or function into binary code. This still required the programmer to write in an assembly language that was nothing like spoken language, but it was a tremendous improvement. Another level was introduced with the FORTRAN programming language in 1954, bringing programming closer to human language. Since then, hundreds of programming languages have further advanced this trend.

5 While the processor is performing programmed instructions, various pieces of information must be stored, including commands that have not yet been executed or data that still needs further functions performed on it. The multiple storage systems in the computer also employ the binary code. Just as with the processor, the storage elements are not required to know whether the data being stored is music or photos or words. Instead, all data is changed to small segments made up of binary code groups of ones and zeros. There are no functions associated with the binary digits when they are stored. They represent something, like a picture, only after they are retrieved by memory functions and interpreted by a program.

6 Over time, computers have improved in speed, capacity, and usefulness. Much of this can be attributed to hardware design improvements. The invention of creative new applications that extend computing power to new arenas is another source. Many of these improvements have depended upon the advancement of programming languages that provide more efficient ways to organize commands or give programmers the ability to code more complex ideas. The binary code continues to provide an effective foundation for these ongoing advancements.

Adapted from
Extensive Reading for Academic Success Advanced D. Compass Publishing

A) READING COMPREHENSION

1) Read the text and match the following titles to the paragraphs. There is one extra title which you DO NOT need to use.

…… A) The binary code is present in all the functions performed on a computer.

…… B) The binary code paves the way to the multitasking.

…… C) The binary code: a pioneer in state-of–the–art technology.

…… D) Defining the binary code.

…… E) The history of hardware design.

…… F) Storing information in binary code.

…… G) Programming in aid of the binary code.

2) Complete the table below to summarize the article about the binary code.

COMPUTER PARTS	STATEMENTS
Central Processing Unit	* * *
Storage	* *

B) VOCABULARY

1) The words in this chart appear in the article. Complete the chart with the family words.

NOUN	ADJECTIVE	VERB	ADVERB
storage	X	……	X
……	mathematical	X	……
power	……	……	……
usefulness	……	……	……
……	efficient	X	……

2) Now, complete the sentences with words from the chart.

1. Arranging and reading bits in groups is what makes binary exceptionally .....for storing and transmitting huge amounts of information.
2. Computers ..... data in binary code.
3. Many applications such as calculators, video games and graphical applications are compelled to the use of .....
4. The length of the binary code depends on coding ....., which is governed by the entropy of the source data.
5. The amount of information conveyed by a message can .....be equated to the number of binary digits in a string optimally encoding the message.
6. The microprocessor chips inside computers are only capable of performing very basic ..... operations.

3) Watch the video and complete the sentences with the missing words.
https://www.youtube.com/watch?v=LpuPe81bc2w

BASE TEN OR DECIMAL ON UPPER LETTERS ADDITION DIVIDE TEN FINGERS VERY LARGE NUMBER LOWER MULTIPLICATION OFF

1. Electricity inside a microchip is turned …… or …… represented by the symbols one and zero.
2. Numbers one and zero are used and reused in a system called ……
3. Binary codes consist of operations of …… and ……
4. We probably use the 'Base Ten' system because we have ……..
5. Base eight and base twelve systems are simpler than base ten because they are easier to ……
6. If we need to represent numbers higher than nine we resort to …… which is called *alphanumeric system*.
7. URL shorteners used in social media sites represent a ……
8. Base 62 consists of using …… and …… cases.

INFORMATION TECHNOLOGY

DIGITAL CRIME

As computers are becoming ubiquitous, new opportunities arise for criminals. Usually changes offer new means to access information. The main information system-based crimes include theft of the information system itself, piracy and forgery, and distribution of banned texts and images. Crimes also include vandalism and terrorism of infrastructure and content of eavesdropping. These types of crimes are typically anonymous, untraceable, global, and rapid. Oceans likely separate the victim and perpetrators. Legal systems may also separate the perpetrator and victim as global definitions of digital crimes vary, particularly in areas of piracy and copyright protection.

Overall, computer-related crime is on the increase, having doubled every year from 1999 to 2004. These crimes can be divided into two general victim types. Most media attention has been on consumer crimes. There are a variety of techniques to gather information from individuals. Personal information such as passwords or social security numbers is sought in identity theft. Criminals establish false credit or access the victims' accounts in what is now the largest and fastest growing type of crime against individuals, growing over 300 percent per year. Annual worldwide damages are estimated in the trillions of dollars. Criminals can also utilize stolen computer access to launch other crimes, such as infiltrating a network or sending spam email from a victim's computer.

While crimes committed against consumers continue to extend and grow, targeting corporations is even more widespread because corporations own the majority of computers and networks worldwide as well as most assets. Exact numbers are difficult to estimate, however, since people fail to report these crimes. Companies fear that they will lose business if they go public with the information. Common corporate digital crimes include piracy, financial fraud, espionage, and theft of services.

Piracy is the unauthorized use of copyrighted material. Pirates usually target music, movies, or software, although visual designs are also pirated. Piracy includes the production of counterfeit products and re-branding or modification of the products. Another crime is the sale of demo or promotional materials such as the DVDs used for Academy Award screenings. Unlike physical theft, most people do not feel guilty about downloading pirated music or movies. Yet, the music and film industries believe that 25 billion dollars per year are lost in the United States alone by consumers pirating content.

U.S. government sources found over 20 countries engaged in industrial espionage. They estimated the total loss at 200 billion dollars per year. France has admitted that its secret service passed data enabling French companies to secure billions of dollars in international contracts. Data is gained through breaches in secure networks, insiders selling data, and even communication links. Electronic communications, like cell phones and email, provide easy access

to data that previously would have been locked in a safe. Companies cannot risk losing commercial advantage by not spying on their competition. This has resulted in 82 percent of large companies creating intelligence divisions. Israel's largest telecom and satellite companies have been accused of running extended spying operations. Over 60 firms may have used software purchased specifically for this purpose. The software was inserted into a sales demo. Once in a place, it allowed the spies to view all the information wanted.

The third large area of electronic crime includes theft of corporate services. Individuals may log into their neighbour's wireless network or share cable television. Organized crime syndicates resell stolen cell phone and satellite access. Altogether, billions of dollars flow from the legitimate companies. Wired and wireless networks can also be hijacked to post political messages or for criminal activities.

While the number of digital crimes is staggering, they will only expand as computer technologies spread into a wider variety of devices. Already, car manufacturers are working to prevent unauthorized access of their software. Programs that control everything from engine performance to the look of the dashboard are at risk. The future may bring hackers using pirated software to monitor a car's GPS output or even to convert a Chrysler into a Mercedes.

Adapted from
Extensive Reading for Academic Success Advanced D. Compass Publishing

A) READING COMPREHENSION

1) Ask and answer about the text.

1. What ……..?

They are typically anonymous, untraceable, global, and rapid.

2. Why is corporate crime increasing so fast?

……..……

3. Which content is often pirated?

……..……

4. How ……..?

Data is gained through breaches in secure networks, insiders selling data or communication links.

5. Where did competitors in Israel insert the spying software?

……..……

2) Choose the correct option.

1. Consumer targeted crimes …….

A) cause trillions of dollars in losses every month.
B) are increasing more quickly than any other crime.
C) always use a victim's computer to commit crime.

2. Which option is true about piracy?

A) Piracy of visual designs is not as bad as pirating music, movies, and software.
B) Piracy is considered a type of theft.
C) Most piracy occurs within the United States.

3. Israel is set as an example in the article to ….

A) emphasize that industrial criminals will be caught.
B) correct the impression that only the USA is involved in industrial espionage.
C) give an example of a case of industrial espionage.

3) Complete the following chart.

COMPUTER-BASED CRIME		
AREAS		
1) ……	2) ……	3) ……
Examples:	Examples:	Examples:

B) VOCABULARY

1) Find synonyms and antonyms in the text.

	SYNONYMS		ANTONYMS
expand (p.3)		decline (p.2)	
enormous (p.6)		innocent (p.4)	
astonishing (p.7)		gain (p. 5)	

2) Find words in paragraph 1 to match the following definitions.

Definitions	Words
1. Existing or being everywhere at the same time	
2. The crime of falsely making or altering a writing, a coin or a work of art	
3. Prohibited / forbidden	
4. The act of listening secretly to a private conversation	
5. People who commit an illegal, criminal or evil act	

C) GRAMMAR: Linking words

Linking words, also called *linkers* or *connectors*, are used to join words, phrases or sentences. They help the reader to progress from one idea to the next idea, helping to build coherent relationships within the text.

1) Read the underlined linking words in the text. Choose the best translation for them according to the context.

1. AS (p. 1):	a) Debido a	b) En consecuencia	c) Al final
2. OVERALL (p. 2):	a) En conclusión	b) En general	c) Sobretodo
3. SUCH AS (p. 2/4):	a) Por ejemplo	b) Tanto como	c) Como ser
4. WHILE (p. 3/7):	a) Debido a	b) Consecuentemente	c) Mientras que
5. AS WELL AS (p. 3):	a) Así también como	b) Tan bien como	c) Tanto como
6. UNLIKE (p. 4):	a) A pesar de	b) A diferencia de	c) Diferente de
7. YET (p. 4):	a) Todavía	b) Ya	c) Aun así
8. LIKE (p. 5):	a) Como	b) A gusto	c) Similar
9. ALTOGETHER (p. 6):	a) Todo junto	b) En total	c) Todos juntos
10. ALREADY (p. 7):	a) Ya	b) En este momento	c) Aún

CHEMISTRY

The periodic table of elements

The periodic table provides a method for arranging chemical elements. Elements are substances that contain only one type of atom and cannot, therefore, be broken down into simpler substances. Oxygen, for example, is an element, as are hydrogen, carbon, sodium, and nitrogen. The periodic table organizes the 103 known chemical elements by the increasing atomic number. The atomic number of an element is defined as the number of protons, or positively charged particles, in an atom's nucleus, or **core**.

All atoms of a single element have the same number of protons. Therefore, they share the same atomic number. Furthermore, the atomic number of each element is unique, meaning that no two atoms of differing elements have an equal number of protons. The nuclei of an atom may also contain neutrons, or particles with no charge. Although two atoms of the same element must have the same number of protons, they may have differing numbers of neutrons. Such atoms are called the element's isotopes. In addition to protons and neutrons, all atoms have electrons, or negatively charged particles, which revolve around the nucleus. To be electrically balanced, an atom must have the same number of electrons as it does protons. Electrons **revolve** at different interval distances from the nucleus depending on the amount of energy they contain. Each of the seven possible distances is called a **shell**. Each consecutive shell, starting with the one closest to the nucleus, can hold an increasing number of electrons. Shells 1, 2, 3, 4, 5, 6, and 7 can respectively hold a maximum of 2, 8, 18, 32, 50, 72, and 98 electrons.

The periodic table is first arranged according to the atomic number of an element. The table reads horizontally from left to right. It starts with hydrogen, which has one proton, then lists helium, which has two protons, then lithium, which has three, then beryllium, which has four, and so on, ending with lawrencium, which has 103 protons. The elements of each group share some of the same chemical properties. These similarities in chemical behaviour result from a similarity in electronic structure. In most groups, for example, the outer shells of elements in the same group contain the same number of electrons. Because the electrons in the **outer** shells control the chemical behaviour of an atom, the elements of a group are particularly similar in how they combine with other elements to make **compounds**.

There are 18 vertical columns in the periodic table. These numbered groups can be further divided into two lettered groups, categorized A and B. The chemical reactions of elements in group A are more accurately predictable than those of the elements found in group B. Each vertical column is thus designated with a number and letter. Chemists also classify elements into classes based on other similar properties. Such classifications include metals, non-metals, alkali metals, and others. These classes are distinguished by colour on the periodic table. The tendency of elements with similar properties to occur at regular intervals and within visual grouping on the periodic table is known as *the periodic law*.

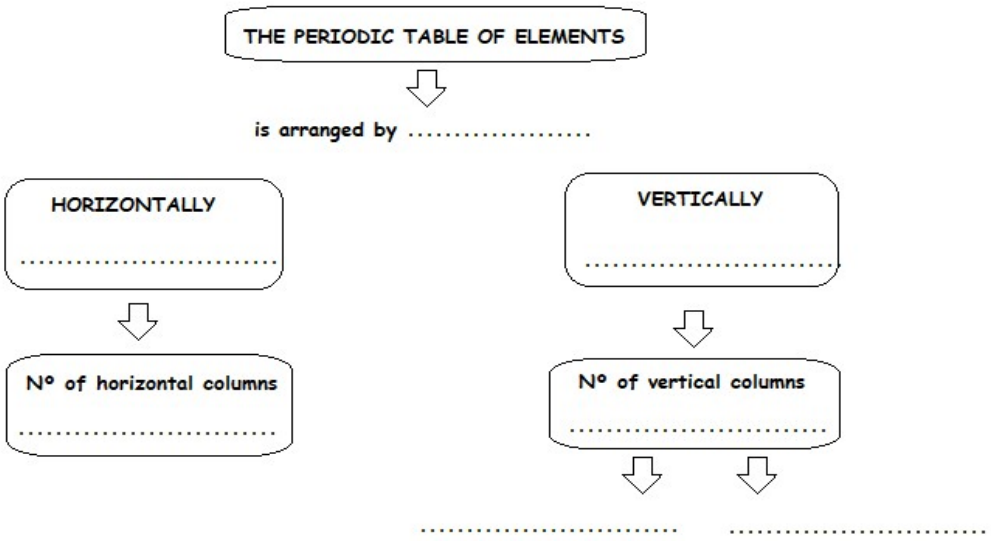
The periodic table allows students and scientists to more easily compare the chemical behaviour and properties of the elements. For example, the elements of group 8 and category A, labeled

group 8A, are helium, neon, argon, krypton, xenon, and radon. This group also falls under the colour-coded classification of noble gases. None of the elements in this class easily combines with other elements to form compounds. This behaviour is particularly interesting when one observes that the elements of **neighbouring** groups form compounds extremely easily. Furthermore, the atoms of elements one atomic number higher or one atomic number lower than a noble gas often change their electronic structure to match that of the nearest noble gas atom.

Adapted from
Extensive Reading for Academic Success Advanced B. Compass Publishing

A) READING COMPREHENSION

1) Complete the following table according to the information in the text.



2) These words are underlined in the text. What do they refer to in this context?

1. THEY: ……
2. SUCH: ……
3. THESE: ……
4. THOSE: ……
5. NONE: ……

3) These words are in bold in the text. Translate them into Spanish taking into account the instantial meaning.

CORE	
SHELL	
OUTER	
COMPOUNDS	
NEIGHBOURING	
REVOLVE	

4) Write TRUE or FALSE. Justify your answers.

1. Each consecutive element in the periodic table has more protons than the element preceding it.
2. The presence of atomic isotopes makes the electron revolve around the nucleus at varying distances.
3. Each horizontal column is arranged in a certain way so that together with the vertical column make compounds.
4. The periodic table of elements has different colours to categorize the different elements.
5. It is difficult to make compounds with the elements included in the 8A category.

5) Put the sentences in order to make a brief summary of the text.

..... a) Colours designate the class of the element shown.

..... b) An element is listed according to the number of protons in its nucleus.

..... c) The periodic table arranges elements into columns according to their atomic structure and chemical similarities.

..... d) The elements in each vertical column form compounds in similar ways.

..... e) So, by understanding the periodic table of elements, it is easy for students and scientists to compare the chemical behaviour and properties of the elements.

B) GRAMMAR: Passive Voice

1) Underline five sentences in the Passive Voice form in the text. Then, answer the questions and complete the rule.

- Can you transcribe these sentences into the ACTIVE VOICE form? Yes / No? Why?
  ……..
- Why are the sentences in the text expressed in the passive voice form?
  ……..

RULE: subject + ……. + ……

2) Put the verbs in the correct form of the Passive Voice.

1. The periodic table ..... (use) by scientists to compare the chemical behaviour and properties of the elements.
2. The chemical properties of an element ..... (predict) according to its location on the table.
3. The periodic table ..... (devise) in 1869 by the Russian chemist Dmitri Mendeleev.
4. The layout of the table ..... (refine) over time.
5. New theoretical models ..... (develop) to explain chemical behaviour.