digiTITANS 6

ICT ESSENTIALS FOR THE FUTURE

4TH EDITION

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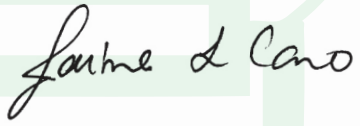
Foreword

As an essential productivity tool, the computer is something that everyone should be familiar with. But as they say, it's hard to teach old dogs new tricks, so it's better to learn computers beginning at a young age. TechFactors (TFI) recognizes the need to do this, especially when it comes to integrating information and communication technology (ICT) into the curriculum of the Department of Education (DepEd).

The DigiTITANS elementary education courseware program of TFI provides computer education from Grade 1 to Grade 6, giving students a learning experience that they can be proud of later in life. It equips them with the essential competencies, both in Microsoft-based and open source applications, that will make them more effective students in high school. They gain practical know-how on productivity tools and discover pertinent facts and concepts that give them a better grasp of ICT in general. It's the DigiTITANS way of preparing and empowering Filipino grade school students for success in a wholly ICT-dominated future.

The convenience of having a DigiTITANS book, teacher's guide, and a ready access to interactive activities using server-network and online resources provide a handy way for students to actively learn computer skills even through the simple task of going through the accessing process. It's this hands-on dynamic manner of learning that makes DigiTITANS a valuable teaching tool adaptable to the needs of the teachers and gets the nod of parents.

Versatility, together with the plain and simple delivery of lessons that comprise a stair-step system based on current software use, access, and trends, makes the DigiTITANS courseware an ideal system for schools looking to supplement their DepEd curriculum with a structured ICT-based learning system.



Dr. Jaime D.L. Caro

About the Authors

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Aimee has been teaching at the Philippine Science High School as Special Science Teacher in the Computer Science and Technology Unit since 1997. She is currently finishing her Master's degree in Computer Science at the Ateneo de Manila University. She graduated from the University of the Philippines Diliman with a degree in Computer Science, and has taken units in the Certificate in Professional Education program. She has conducted several seminars in Java and has handled classes in Application Software, Programming, HTML, Macromedia Flash, Authorware, and Computer Systems.

Kin L. Enriquez, M.S.

Kin studied History at the University of the Philippines and Interdisciplinary Studies in Ateneo de Zamboanga University. He served for two terms as the editor-in-chief of The Beacon, the student publication of Ateneo de Zamboanga. He also worked as a news writer for Radio Veritas 846. His interests range from astronomy to computers. Kin completed his MS in Information Management at the Ateneo de Manila University. He is also working as a technical writer for a Fortune 500 firm.

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Juno is a graduate of the University of the Philippines Diliman, with a major in Computer Science. She has taken up several programming courses and has done programming mostly in Java and C. She currently works as a software developer.

Avonn C. Nova, MIT

Avonn C. Nova, MIT has more than 10 years of teaching experience in the field of Computer Science and Information Technology. He received his Masters in Information Technology degree at Technological University of the Philippines in 2006 and Bachelor of Science in Computer Science (cum laude) at Cavite State University in 2001. He already earned units for Doctor of Philosophy major in Education Administration at Manila Central University and served the institution as Dean of the College of Computer Studies for more than 5 years where he pioneered the specialization in Biomedical Informatics. He is currently the Trustee-In-Charge for Membership of the Philippine Society of Information Technology Educators – National Capital Region.

About the Series Editor

Jaime D.L. Caro, Ph.D.

Jaime D. L. Caro, Ph.D. has more than 20 years of experience in education and research in the areas of Computer Science, Information Technology, and Mathematics. He received the degrees of Bachelor of Science major in Mathematics (cum laude) in 1986, Master of Science in Mathematics in 1994, and Doctor of Philosophy in Mathematics in 1996, all from the University of the Philippines, Diliman. He spent a year as a post doctorate research fellow at the University of Oxford from 1997 to 1998. He is presently Assistant Vice President for Development of the University of the Philippines, Program Director of the UP Information Technology Development Center (UP ITDC), and a professor of Computer Science in UP Diliman. He is an honorary member of the Philippine Society of Information Technology Education (PSITE), President of the Computing Society of the Philippines (CSP), and a member of the Technical Panel on Information Technology Education of the Commission on Higher Education (CHED). Dr. Caro is a recognized expert on Complexity Theory, Combinatorial Network Theory, Online Communities, and e-Learning.

Table of Contents

Learning Goals

Through this book, you should be able to…

1. identify and solve routine hardware and software problems that occur during everyday computer use;
2. demonstrate ethical use of computers;
3. select and use proper tools and technology resources to accomplish different tasks and solve problems;
4. explain basic concepts on hardware, software and connectivity;
5. discover networking concepts; and
6. explore programming using Scratch.

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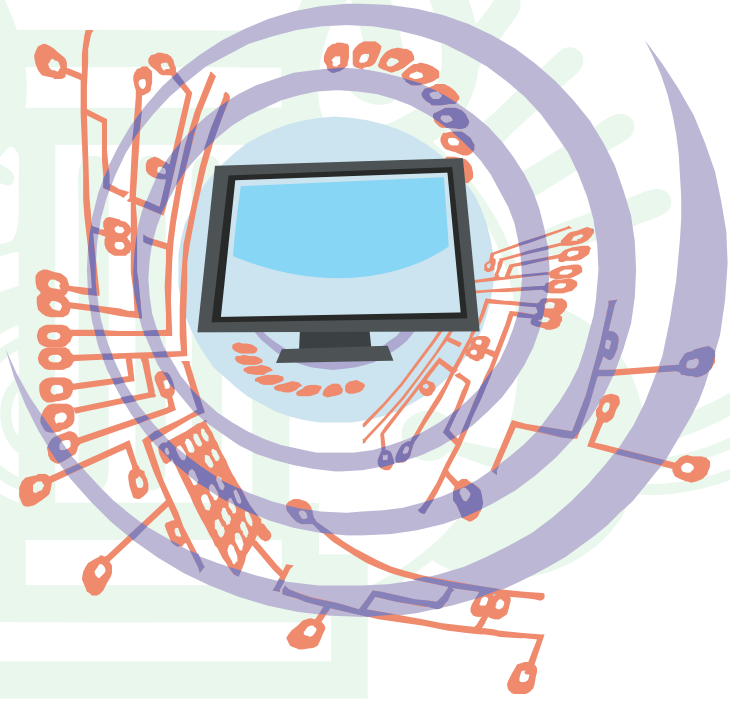
Section 1

The Growth of Technology

In history, people have always sought out ways to make things easier to do and to understand. This is the reason why, after so many thousands of years, a simple tool like the wheel is now more than just a wooden disk that rolls on the ground. It is also the reason why a conversation is now possible between people who are on opposite sides of the world; and why information, which used to be found only in books, can now be accessed through the Internet with a computer.

Technology makes possible what was once impossible, and it is a process that will continue for as long as there are people with the desire to make things better. This section allows you to discover the reason why you need to study information technology.



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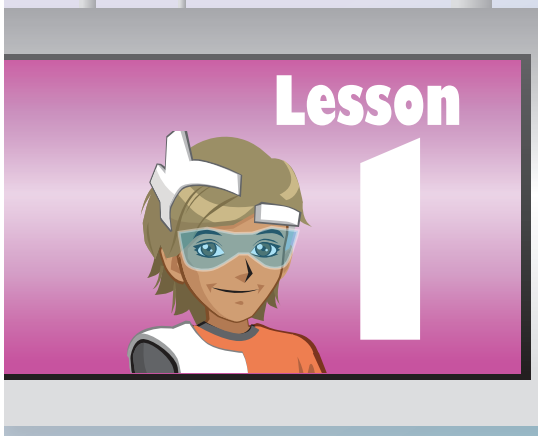


Technology Through the Years

Life Before Computers

Before the arrival of computers, men had come up with creative ways to do tasks. Let's try to learn more about what happened.

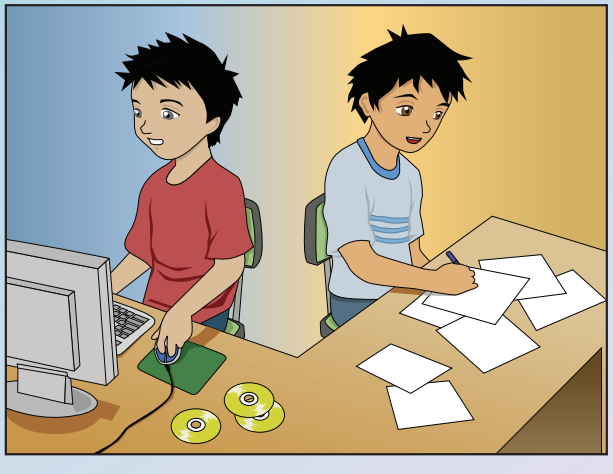
- Identify some technology trends
- Explain how these technology trends are changing people's lives
- Outline significant facts that led to the first computer

1. The Number System

When there were no machines for computing yet, man used what was most reasonable and available for him—his ten fingers. Our present number system, the decimal system, was based on this old practice.

The **decimal system** utilized ten digits: zero through nine, same as the number of fingers human beings have. The name decimal comes from the Latin *decem* meaning "ten." The symbols for the ten digits were originally from the Hindus. They were later acquired by the Arabs who brought them to Europe around the thirteenth century.

The decimal system is said to be base-10 or radix-10 because it is based on 10 digits. The term radix comes from the Latin word meaning "root." At present, the base-10 numerical system is most widely used: in counting money, keeping basketball scores, and many others. Computers, on the other hand, process numbers using the binary (base-2), the octal (base-8), and the hexadecimal (base-16) number systems.



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2. Computation Tools (30000 BC - 20000 BC)

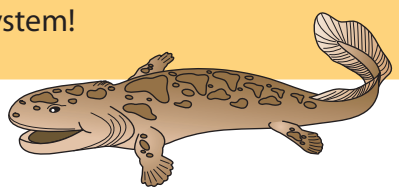
Humans needed to count more items, and so aside from fingers, they started using other tools for computation. Small stones or pebbles were used to count values that exceeded the number of toes and fingers.

Bones with scratches were also used to represent numbers. These bones were discovered in Western Europe some twenty to thirty thousand years ago, almost the same time as the first appearance of the Cro-Magnon Man.

Do you know?

Human beings belong to the family tree of tetrapods, together with dinasours and hippopotamuses. A tetrapod is an animal which has hips and shoulders, fingers and toes, and has four limbs. The earliest tetrapod known is the *Acanthostega*, approximately 350 million years old.

Acanthostega had eight fingers on each hand, which meant that if evolution didn't give us ten fingers, we would probably be using the hexadecimal system instead of the decimal system!



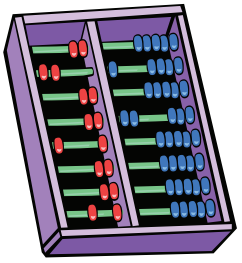
3. The First Place-Value Number System (1900 BC)

The first known place-value number system is the Babylonians' **sexagesimal system** (base-60), which appeared around 1900 to 1800 BC. It is still used in measuring time (60 seconds, 60 minutes) and in dividing circles (360 degrees).

In a place-value number system, the value of a particular digit in a number depends both on the digit itself and on its position within the number. For example, in the number 25, 2 is in the tens place while 5 is in the ones, that is, 2x10 + 5x1 = 25.

4. The Invention of the Abacus (1000 BC - 500 BC)

The **abacus** is the first actual calculating machine known to us. Some claim the Babylonians invented it sometime between 1000 BC and 500 BC. Others say that the Chinese invented it around 1300 AD. There are several versions of the abacus. The most popular one is based on the **biquinary system**, which uses a combination of two bases (base-2 and base-5) to represent decimal numbers.



The abacus is not considered a mechanical calculator, but it is one of the first mechanical aids.

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5. More Major Developments

After the abacus, quite a number of mechanical machines and mathematical systems were invented, the most prominent being the following (arranged according to date):

Do you know?

The word *abacus* is Latin, derived from the Greek *abakos*, which means a "board strewn with dust on which to draw or write." This was how the original abacus looked like. The word abacus is related to the Hebrew *abaq*, or "dust."

Aristotle and the Tree of Porphyry (383 BC - 322 BC)

Aristotle, the great Greek philosopher and scientist, used a tree figure (just like a family tree) to represent the relationships between (and subdivisions of) things such as species. This diagram is known as the Tree of Porphyry.

John Napier's Bones (1600 AD)

John Napier was a Scottish politician and mathematician. His device, called Napier's Bones, was used in the multiplication and division of large numbers.

Wilhelm Schickard's Calculating Clock (1625 AD)

Wilhelm Schickard (1592-1635), from Tuebingen, Wuerttemberg (now in Germany), made the Calculating Clock. He used wheels to carry out addition and subtraction of numbers up to 6 digits.

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Pascal's Arithmetic Machine (1640 AD)

Blaise Pascal was a French mathematician who was tired of manually adding all the data in his father's tax collection office. He then built a mechanical adding machine called the Pascaline. The Pascaline performed up to 8-digit calculations. This device, the first mechanical calculator, became well-known, and around a dozen were even sold.

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Gottfried Wilhelm von Leibniz's Stepped Reckoner (1671)

Another contributor to the pre-computer era was Gottfried Wilhelm von Leibniz, a German mathematician who designed a machine that can perform all four of the basic arithmetic operations. It was called the Stepped Reckoner. This machine could multiply numbers of up to 5 and 12 digits to give a 16-digit operand.

Joseph-Marie Jacquard's Loom (1804)

Joseph-Marie Jacquard, a French weaver, developed a weaving device that could produce intricate designs. In 1804, he perfected this automatic loom by controlling it with punched cards, a technology for storing data that was used in later computers.

Charles Babbage's Machines (1822)

Also known as the Father of Modern Computers, Charles Babbage invented two machines: the Difference Engine (1822) and the Analytical Engine (1833).

The Difference Engine performed multiplication and division. Babbage himself never finished building his design, but a group of British engineers did in 1991.

The Analytical Engine, on the other hand, had similarities with the modern electronic digital computer. This machine could add, subtract, multiply, and divide. It had a mill and a store, which corresponded to the current processor and memory, respectively. It used punch cards to print results and to serve as memory. Babbage didn't finish building this as well.

Binary Arithmetic (1840)

Another mathematician working with Babbage developed **binary arithmetic**—using only two numbers, 0 and 1, for computation. She was Lady Augusta Ada Lovelace, daughter of Lord Byron. She is considered as the first programmer.

Boolean Logic (1847)

George Boole, adopting the binary arithmetic of Lady Ada, developed the Boolean Algebra, a system of symbolic logic. The system used the two values, 1 and 0, or the conditions *false* and *true* for mathematical or logical problems.

Hollerith's Tabulating Machine (1890)

For the 1890 US census, a competition was held to try to find a better method for tabulation. A census department employee named Herman Hollerith won. Hollerith developed a tabulating machine that used cards wherein data was punched. In

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1896, Hollerith founded the Tabulating Machine Company, which later became IBM (International Business Machines Corporation).

Technology Trends

It's amazing how technology has drastically changed the way our world communicates, spreads and retrieves information. What's even more amazing is how technology can evolve in such a quick pace. While you're still drooling over the latest gadget or technological advancement, a new innovation is already being talked about in the market.

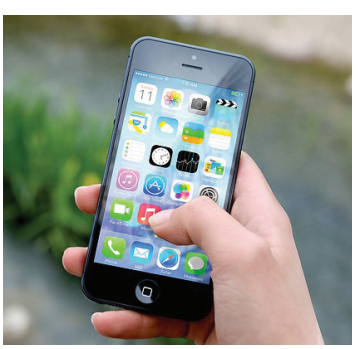
Let us take a closer look at some of the significant advances and innovations in various fields of technology in our world today.

Do you know?

The rapid development of computer technology was not without problems. In 1945, the first computer "bug" bugged computer users.

The term "bug" originated in Harvard University in 1945, when a moth was extracted from a computer and was blamed to be the cause of a hardware problem. "From then on," US Navy officer Grace Murray Hopper was quoted, "when anything went wrong with a computer, we said it had bugs in it."

Touch Screen



Touch screen refers to a computer monitor that functions both as a display screen and an input device, replacing the traditional keyboard or keypad. How does it work? Basically, the monitor of a touch screen device is made to be sensitive to pressure so that it will follow a command at a user's touch. There is still a lot of ongoing research and development on touch screen technology but it is already being used in various applications, creating a buzz particularly in the world of mobile devices.

One of the pioneers of the infusion of touch screen technology in mobile phones is Apple, the company that created the highly successful iPhone.

Gestural Interfaces

The next big development after touch screens has been **gestural interface technology** which allows a user to give commands to the computer without touching it. Earlier gestural interfaces have used controllers like wands, rings, gloves, or colored tags to detect the user's movements. An example is the system used in the Nintendo Wii, a popular video game console.

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This comes with a sensor bar and reads a player's actions with the use of the Wii remote and Nunchuck controllers.

The design of more recent gestural interfaces allows players to dispense with controllers and instead command computers solely with their bodies. The Microsoft Kinect for Xbox One has adopted this technology, enabling users to control the game console using gestures and spoken commands. Using a 3D vision system, the computer can sense depth through several techniques, including structured light where an infrared pattern is projected onto objects.

Future real-world applications of gestural interfaces may include gaze-tracking heads-up controls for automobiles, touchless interactive displays for shopping malls and airports, and televisions that may be operated without a remote control.

3D

3D (Three-Dimensional) technology refers to visual technology that showcases a real-life 3D appearance. This can be viewed on a computer, in print, on TV, or in the movies. During the 1980s, early 3D technology was almost exclusive to computer gaming because it cost too much. 3D technology has come a long way since then and is now used in applications far beyond computer gaming, such as for film and television.

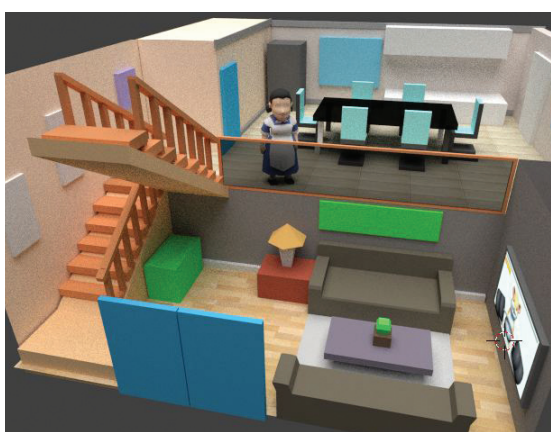

Image from: MathTek Game 2015, TechFactors, Inc.

3D Film

3D films have existed in some form since the 1890s. But in the past few years, we have seen a worldwide resurgence of 3D films that use the latest technologies such as high-definition video and more advanced polarized 3D glasses for the audience, not to mention the computer animation graphics that already appear to be 3D in films like Toy Story, Up, and other such popular movies. The more common 3D technology systems now used in cinemas are IMAX, RealD, Dolby, and XPand D. Using polarization systems or active shutter glasses, these technologies create images that seem to pop out of the screen. Frozen and Big Hero 6 were two of the Walt Disney movies which were available in IMAX and allowed you to experience visually that you were inside of the movie.

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3D TV

The latest in 3D technology is **3D TV** which lets us enjoy 3D movies, video games, and television programs from the comfort of our own homes. While TV specials and episodes have been produced in 3D or partly in 3D since the 1990s, 3D as a home entertainment system is yet to become a standard. Companies like Sony, Philips, and Samsung have already released 3D products such as 3D-capable TVs and 3D Blu-ray Disc players. Normally, viewers need 3D glasses to enjoy 3D effects on their screen, but recent advances in 3D technology have made possible glasses-free 3D in full-sized televisions. It is predicted that 3D TV will become mainstream in the next three to four years.

3D Virtual Worlds for Learning

3D virtual worlds are currently being used as a medium for distance education and as an extension of traditional classroom learning. 3D virtual worlds are basically a combination of three main features: a 3D visual illusion, avatars that represent the users, and an interactive chat environment that allows users to communicate with each other. One example of a 3D virtual world program used for learning is Adobe Atmosphere.

Motion Capture in Filmmaking

Motion capture refers to the process of recording movement and translating that movement into a digital model. It is used in a variety of applications such as video and TV, sports, computer gaming, military, and even medical applications. Motion capture in filmmaking is done by recording the actions of human actors and using these actions to animate digital character models in 3D animation.

Traditional motion capture techniques use cameras inside studios to record the actors' movements. But the latest in motion capture technology now makes use of body-mounted cameras that capture motions outdoors, like running outside or swinging on ropes in trees. Lightweight cameras are mounted on the subject's limbs and trunks to analyze movements.

Mobile Devices

Mobile computing is definitely one technology trend we cannot deny, with the latest computers now becoming smaller and lighter. Mobile devices are pocket-sized or handheld computers and the most popular of these are the smartphone and tablet.

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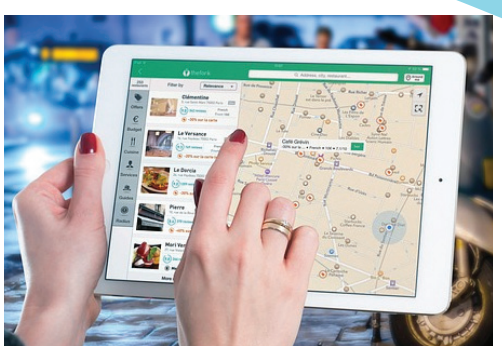
Smartphone

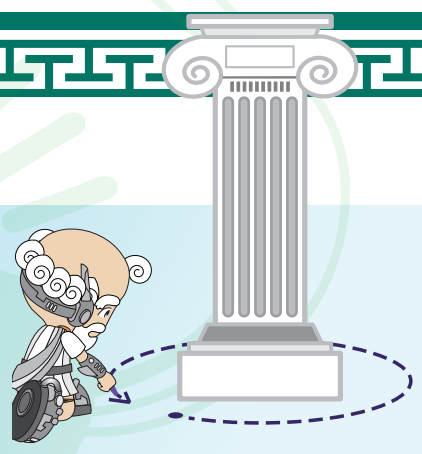
A **smartphone** is a mobile phone used for sending and receiving text messages and calls, but with advanced multimedia and computing capabilities that allow it to function like a miniature computer. Smartphones have Internet connectivity and use an independent operating system to install and run applications such as e-mail, e-book reader, camera, video, MP3 player, television, organizer, file editor, mobile games, and more.

Tablet



The **tablet** is an Internet-enabled portable personal computer that is usually larger than a smartphone and can be used as an alternative to media consumption device to desktop and notebook computers. Some tablets offer Wi-Fi and mobile internet access. Its screen comes in the form of a thin slate with a flat touch screen that functions as a virtual keyboard. Because of its screen size that is larger than a smartphone, it is easier to use for surfing the Web, playing multimedia files and games, and reading e-book files. Tablets also perform slightly better than smartphones and generally have more battery life.

ROUND UP



Modern civilization is possible because of the devices that were invented hundreds of years ago. They were made for specific needs and to make tasks easier. In the past fifty years, computers evolved to become faster and able to store more. Technology trends continue to evolve and revolutionize our world as we are perpetually introduced to ground-breaking innovations.

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NAME: _____

GRADE/SECTION: _____

DATE: _____

SCORE

A. Match column A with column B. Write your answer on the space before each number.

_____ 1.	device invented by John Napier that can multiply and divide large numbers	a.	IBM
_____ 2.	a weaving device that can produce intricate designs	b.	decimal system
_____ 3.	a machine that had a mill and store	c.	Jacquard's Loom
_____ 4.	Tabulating Machine Company	d.	Charles Babbage
_____ 5.	Father of Modern Computers	e.	Analytical Engine
_____ 6.	number system that utilizes ten digits	f.	abacus
_____ 7.	the first programmer	g.	Lady Augusta Ada Lovelace
_____ 8.	the first calculating machine	h.	William Schickard
_____ 9.	invented a machine that used wheels to carry out addition and subtraction of numbers up to 6 digits	i.	Napier's Bones
_____10.	a figure used by Aristotle that represents relationships between things	j.	Tree of Porphyry

B. Fill in the blanks. Choose which of the given words after each sentence goes to the appropriate blank.

1. Motion capture is the _____of recording _____and translating it into a _____ model.

digital movement process

2. Smartphones and _____ are _____ devices with advanced _____ and computing capabilities that use an independent _____ system to install and run _____.

applications multimedia mobile operating tablets

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3. The_____system that we normally use is called the _____ system.

number decimal

4. The decimal system uses the numbers from _____to _____.

nine zero

5. The word "_____" has _____ origins and means "_____."

radix root Latin

6. Computers use the binary (_____), _____ (_____), and the _____ (_____) number systems.

hexadecimal base-16 octal base-2 base-8

7. The _____ system is what's used to measure _____ and divide _____ into _____.

time degrees circles sexagesimal

8. The _____, the most popular version of which uses the _____ system, is said to have been invented first by the _____, and then by the _____.

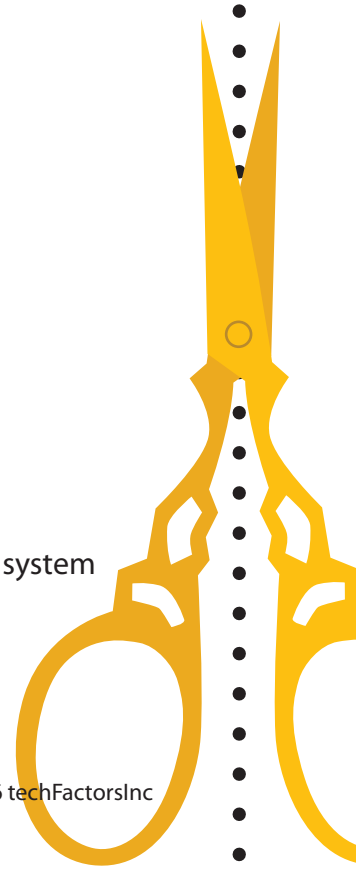
abacus Babylonians Chinese biquinary

9. _____ interface _____ allows the user to give _____ to the _____ without touching it.

technology gestural commands computer

10. The _____ math of _____ was used by George _____ to develop the Boolean _____, which is a system of symbolic _____.

logic binary Boole Algebra Lovelace



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Making Sense of Data

- Define data and information
- Explain how data is organized

Data and Information

Consider a pile of old history books which might be used as references for a report on the 1970s or the 1980s. The text you might read in them may at first appear to be just a heap of facts. Reporting about the contents of the books one by one would only lead to repeating yourself and jumping from topic to topic. Unless you organize the data in these books, you might come up with one messy report.

In a way, the facts in the books are like data. You, as a person, are like a computer which processes and organizes the data from all the books into meaningful information that your classmates could easily understand. This is how data processing works.

Data are raw information. **Information** is processed data. The computer processes raw data into useful and meaningful information. For example, a series of thirty numbers is raw data, but when encoded in the computer, it may become a list of scores of thirty students for a quiz.

Data and information are stored in the memory. There are two types of memory: main or primary memory and secondary memory. The **primary memory** allows data and instructions to be stored temporarily, that is, only when the computer is turned on. In **secondary memory**—diskettes, flash drives, CDs, and hard disks—data remains stored even if the computer is off.

Instructions refer to commands that run the computer. Instructions are also considered data by the computer. When these "data" are interpreted, they are then identified properly as instructions.

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Data Organization

Data and instructions are stored as bits of 0s and 1s. Computers work with a specific number of bits or collection of bits.

Bit

The **bit** is the smallest unit of storage. The word bit comes from the term binary digit. It stores one of only two possible values: 0 or 1. Grouped together, bits can represent any number, such as 123 and 98765. They can also represent the colors red and blue or the position of the cursor on the screen. Everything in the computer has a bit value or representation.

The term bit is usually encountered on the Internet when data are transferred in bits per second. If a modem has a speed of 56 kbps, it transfers 56 kilobits (kb) of data per second. A kilobit is equivalent to around 1000 bits. Groups of four bits are called **nibbles**.

Byte

A **byte** is a collection of 8 bits. The **octet** is a term used to refer to eight-bit bytes. A byte can represent 256 or 2^8 distinct values, usually within the range 0 to 255 or -128 to +127. The smallest item that can be accessed in the memory is an eight-bit value.

Word

A **word** is a group of 16 bits. With 16 bits, 2^{16} or 65,536 different values may be represented. These values fall within the range of 0 to 65,535 or -32,768 to +32,767. Words represent Unicode characters, which will be discussed later.

Groups of 32 bits are called double words or dwords and groups of 64 bits are called quad words or qwords.

Character

Character is a unit of information that is a written symbol of a natural language, such as a letter, a numeral, or a punctuation mark. It may also be a control character like those found in the keyboard — CTRL, PageDown, etc.

To represent a character, a character-encoding system matches each character with an integer value. It is this integer value that is stored and computed. Examples of these systems are the **ASCII**, which stands for American Standard Code for Information Interchange, and the Unicode encoding system.

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Record

A **record** is a group of several items, possibly of different types. These items are called **fields**. Each field is identified or indexed by **field labels**.

The fields in a record are related, each describing properties of a single object. For example, an employee record may have a sequence of characters (string field) with the label (name), another string field (idnumber), and an integer field (age). There are usually a number of objects grouped together with the same structure. If we were in a company, for example, information about each employee (name, ID number, age) would be stored in separate records.

Different programming languages have different names for records. Object-oriented languages such as Java, Smalltalk, and C++ keep their records hidden inside objects. The C language calls a record a struct or structure, while other languages such as Pascal and COBOL simply call them records. COBOL was the first language that used records.

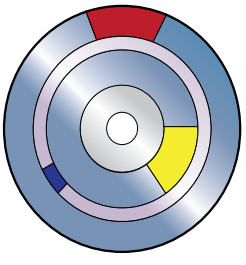
Below is a sample employee record or class in Java:

```
class Employee
{
   String  name;
   String idnumber;
   int  age;
};
```

File

A **file** is a stream or sequence of bits stored as a single unit. It is saved or stored in a file system on disk or magnetic tape. Although a file is considered a single stream of bits, it may be stored as fragments of data at different locations in a disk or even in several disks.

A file is created by a program. Operating systems such as MS-DOS® or Windows® organize files in a file system by placing them in folders or directories. Several files may belong logically to one folder, but physically, they are not necessarily together. They may be stored in the hard disk at different locations.



Fragments of a file can be stored in different locations on a disk.

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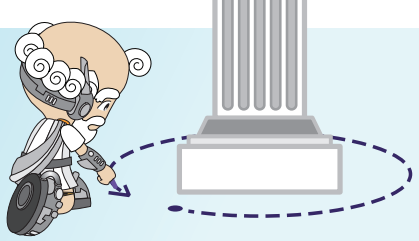
A text file is a sequence of characters often organized into lines separated by line breaks. Other types of files other than text files are generally referred to as "binary" files.

Database

A **database** is any set of information with a defined structure. A database is a good example of data hierarchy in computers. It was first developed in the 1960s with Charles Bachman as its main proponent. Databases are handled by a database management system or DBMS. A DBMS software may handle small and single-user databases or large and multiple-user databases. Multiple-user databases are used in big offices where there are several client computers accessing data. These **clients** are concerned with data entry, inquiry, and reporting. This is known as the DBMS front-end. On the other end, data are stored in a single computer called the **server**. The server or back-end has the set of programs that control data storage and respond to requests by the front-end.

ROUND UP

Data are used by computers, but these are meaningless to a computer user if they are not processed first. Processing changes data to information that people can use, such as pictures or words. Data and information are stored in a manner that makes it easy for computers to access them.



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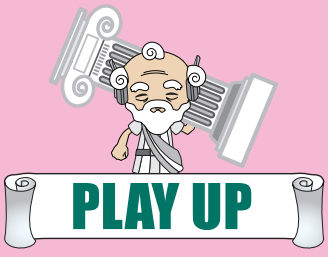

A. How do the pairs of words below differ from one another? Write your answer on the blank beside each word.

1. data - _____

   information - _____

2. client - _____

   server - _____

3. primary storage - _____

   secondary storage - _____

4. bit - _____

   byte - _____

5. database - _____

   database management system - _____

   _____

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B. Fill in the blanks for each sentence. Choose your answers from the words in the box below.

word	**instructions**	**record**	**bit**	**nibbles**
character	**file**	**octet**	**database**	**fields**

1. The term _____ is usually encountered on the Internet.

2. A _____ is a group of 16 bits.

3. _____is the unit of information that is a written symbol of a natural language.

4. Commands that run the computer are called _____.

5. A _____ is a stream or sequence of bits stored as a single unit.

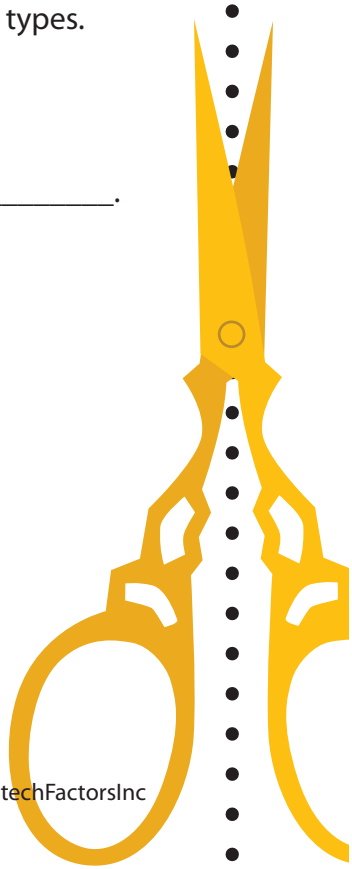
6. A _____ is a group of several items of possibly different types.

7. Eight-bit bytes are referred to as an _____.

8. Any set of information with a defined structure is called a _____.

9. The items in a record are called _____.

10. Groups of four bits are called _____.



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Section 2

Establishing Computer Essentials

As ubiquitous as the computer has become, it is now essential that anyone who wants to be functional in society be able to know how to use it. While it is easy to learn how to work a few things on a computer just by tinkering with one for a while, it is always better to learn about the fundamentals in a formal setting to avoid mistakes and ruin things unintentionally.

You will find adequate information in this section for you to be able to see how computers have come in different shapes and sizes in its young history. You will also know the operations that take place in a computer and how data is used and processed for specific operations.

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The Computer Has Many Faces

- Classify different computers according to size, purpose, data processed, or storage capacity
- Identify other ways of classifying computers

Computers vary in shape, size, weight, purpose, and in many other aspects. Computers may be classified according to size, purpose, data processed, storage capacity, and how they are operated.

Computers According to Size

A computer may fall under any of the following classifications according to size:

- microcomputers
- minicomputers
- mainframes
- supercomputers

Microcomputers

Microcomputers are the most numerous among all the computer types. They may come as a tablet or smartphone, a laptop or netbook, or a desktop computer.

Handhelds and laptops are light and easy to carry around. Their portability makes it possible for users to work anywhere. The desktop computer, as its name implies, is usually placed on top of a desk. Desktops are found mostly in homes, offices, and schools.

Microcomputers are also used for other systems such as in a workstation or in a local area network (LAN). The computers you find in an Internet/gaming café are examples of these.

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Minicomputer

The **minicomputer** is medium-sized compared to the microcomputer. It is used by small businesses and organizations for business and office work. It can serve several users at the same time and is faster than the microcomputer.

Mainframes

Mainframes are big, powerful, fast, and expensive. They can serve hundreds of users at the same time. They can run more instructions at a time than the microcomputer and the minicomputer. Large businesses and organizations use mainframes for high-volume data processing, like maintaining databases and managing networks. They are capable of accessing and retrieving billions of data for airline reservation companies, hospitals, and other big companies quickly.

Supercomputers are extremely fast. They can process trillions of instructions per second.

The supercomputer is used for heavy scientific calculations and other very difficult tasks. Some supercomputers are used by weather forecasters. Others are used by governments and really big companies.

Computers According to Purpose

Some computers perform jobs different from others. Some computers are for specific uses, while others serve many purposes, like those in an office or a bank. Thus, computers are classified according to purpose or use.

Special Purpose Computers

A **special purpose computer** is designed to perform a specific task. It lacks versatility. Examples are computers for aircraft navigation, satellite tracking, and traffic control.

They are called special purpose computers because they are programmed just once in the factory. They are seldom reprogrammed. The program that controls this kind of computer is stored in a ROM (read-only memory) chip, which has to be replaced if the program has to be changed.

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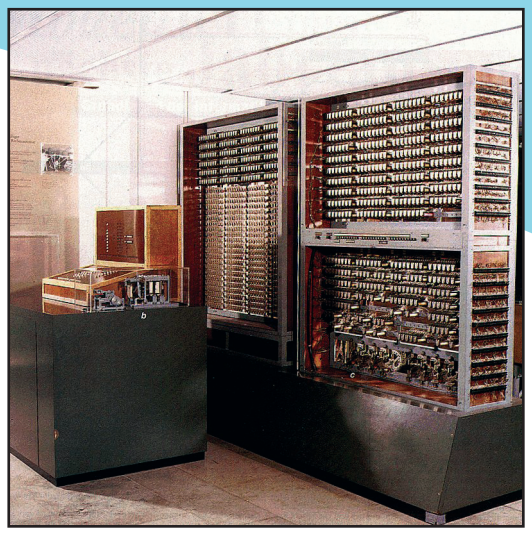
At present, devices for household use such as refrigerators, microwave ovens, and industrial machines used in factories, contain special purpose computers. The computers are called **microcontrollers** or **embedded computers**. Other devices such as mobile telephones and video cameras, also contain special purpose computers.

General Purpose Computers



To deal with a variety of problems and to store a number of different programs, **general purpose computers** are used. This has resulted in software development, the creation of different programs for different uses.

A computer software or program is used to perform various tasks for the general purpose computer. A **program** is a set of written instructions executed by the computer. To work, it only has to consider the storage capacity of the computer, its size, the speed of program execution, and the reliability of the machine.

The first computer considered as a general purpose computer is the Z3, developed by Konrad Zuse in 1941. In the 1930s and 1940s many computers were developed, and all claimed to be the first real computer. These are the Atanasoff Berry Computer (ABC), Electronic Numerical Integrator and Calculator/Computer (ENIAC), Harvard Mk I, Colossus, etc. Each one had limitations as a general purpose problem-solving device. The designs were never used for the computers we have at present.

Computers Classified According to Data Processed

Analog computers are used for scientific, engineering, and process-control purposes. They process continuous data signals like in a speedometer or watch.

Digital computers handle data as bits of 1s and 0s. They process "discrete numeric" or "symbolic values."

Hybrid computers are a combination of digital and analog computers. Examples are those used for traffic control and those used in the intensive care units (ICUs) of hospitals.

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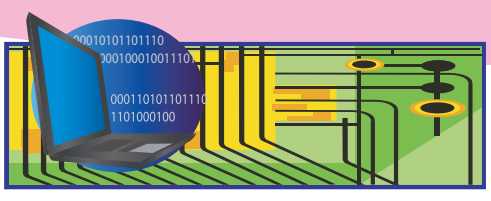
Stored Program Computers

Data processed in a computer have to be saved for later access or retrieval. Computer performance is measured by the speed in which data is stored or read from its memory. Some computers are used to store personal user data. Others contain entire databases of bank accounts.

The computer memory is where data and instructions are stored for later use.

The design for stored program computers was developed in the late 1940s at the Moore School of Electrical Engineering at the University of Pennsylvania. It is known as Von Neumann Architecture, after John Von Neumann. This design is characterized by the storage of the computer's program in its own memory and the capability to run different types of instructions. It also supports changes in computer programs. These features are similar to how modern computers work.

Other Classifications



Computers may be classified according to the way they are operated by users. The two main types are batch processing and interactive processing.

Most of the first electronic digital computers, with their large size and cost, were used for scientific calculations and for military objectives. The ENIAC was originally designed to calculate the ballistics of firing tables and the hydrogen bomb. The Colossus, built during World War II, was used to help decode the German military's encrypted codes.

Computers can also be classified according to implementation technology. The first computing devices such as the Difference Engine and the Pascaline were purely mechanical.

Electro-mechanical components were introduced in the 1930s and were used mainly in the telecommunications industry.

In the 1940s the first purely electronic computers were constructed from vacuum tubes. But transistors replaced vacuum tubes in the 1950s and 1960s. The late 1960s and early 1970s were the beginning of the era of microcomputers. In this period, silicon microchips and semiconductor integrated circuits started to become the main technology for computers. Nowadays, the challenge is to make the microchips even smaller.

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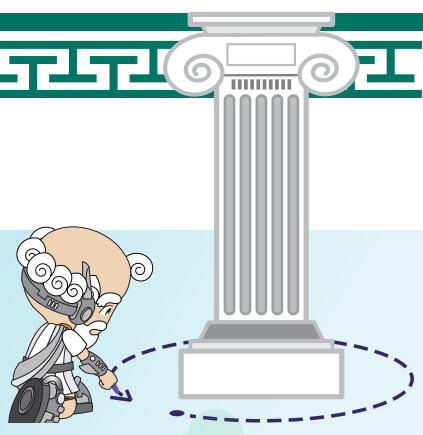
There are works that attempt to develop optical computers that use light rather than electricity. The possibility that deoxyribonucleic acid (DNA) can be used for computing is also being explored. Quantum computing is another area in future development.

ROUND UP



Computers are classified according to size, use, kind of data processed, and capacity to store data. People are more familiar with the general purpose computers that can be loaded with specific programs. These are more commonly known as personal or desktop computers.

In the future, computers will be harder to classify as they will most likely include technology that integrates biology and quantum physics. An example is the DNA computer which uses genetic structures to store and process data.

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NAME: _____

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SCORE

A. According to which classification will the following types of computers fall under? Write the name of each computer type on the appropriate column of classification in the given table.

microcomputer	**mainframe**
optical computer	**general purpose computer**
special purpose computer	**hybrid computer**
digital computer	**analog computer**
quantum computer	**supercomputer**

SIZE	DATA PROCESSED	PURPOSE	HOW IT IS OPERATED

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B. Write T on the blank if the statement is True and F if it is False.

_____ 1. Microcomputers are the most numerous among all the computer types.

_____ 2. The first computer considered as general-purpose is the ABC.

_____ 3. ENIAC was used to help decode the German military's encrypted codes.

_____ 4. A program is a set of written instructions executed by the computer.

_____ 5. The Pascaline is an electro-mechanical device.

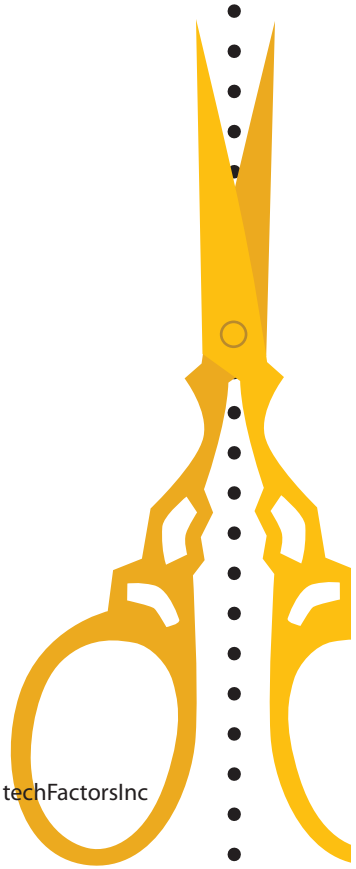
_____ 6. Airline reservation companies use minicomputers.

_____ 7. Mobile phones and video cameras contain special purpose computers.

_____ 8. Von Neumann architecture is characterized by the storage of the computer's program in its own memory and running different types of instructions.

_____ 9. Special purpose computers lack versatility.

_____ 10. Mainframes can process trillions of instructions per second.



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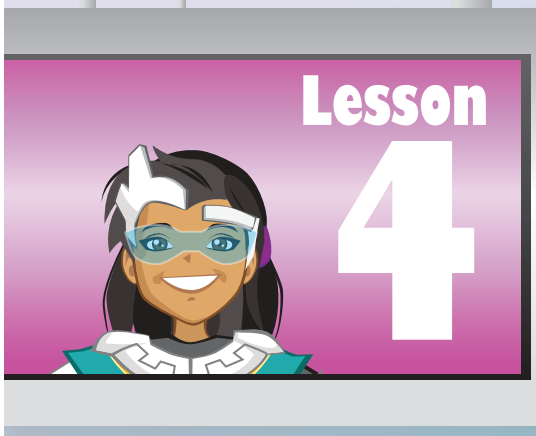

Power in Computers

- Explain input/output operations
- Explain processing and computation operations
- Explain logic operations
- Identify the computer's strengths

We cannot deny the fact that computers have many advantages especially because they have certain capabilities that make our work easier. They can perform functions that humans can't normally do. They process operations faster and more accurately. Let's take a closer look at these operations.

Input / Output Operations

The raw data that the computer needs to process has to be entered into the computer through input devices such as the keyboard, mouse, scanner, etc. And after data has been processed into meaningful information, they have to be sent out into an output device such as the monitor and printer or saved into a secondary storage such as the hard disk or CD.

The two processes mentioned above, input and output, can also be called together as I/O. **I/O operations** are carried out by I/O devices. I/O may also refer to the signals that are sent to and from these devices. Inputs are signals received by the computer, outputs are the signals sent from it. When you press the keyboard or click the mouse, these movements are converted into signals which the computer can understand. On the other hand, output devices such as monitors and printers, convert output information into formats that we humans can read.

The data read from the disk or to be written to it stay temporarily in the main memory where they can be processed by the CPU. The CPU and the main memory are considered as the working area of the computer. Any movement of data to or from them is considered I/O. So when the data is read from the disk drive, or saved into it, I/O operations are also performed.

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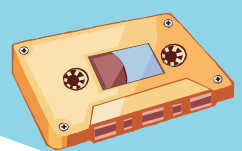
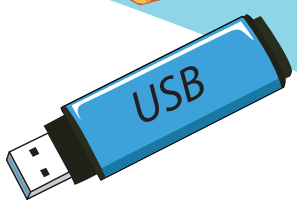
Data Access

There are two basic input and output operations when accessing data: READ and WRITE. In Word, for example, you READ when you open data and you WRITE when you save it. READ/WRITE operations depend on whether data access is sequential or random.

Sequential access means that data is retrieved in a specific order, that is, one after another in sequence. A cassette tape is sequential because you can only play songs in the sequence that they are recorded. If you want to play song number 4, you have to fast forward and skip songs 1 to 3.





In **random access**, data is sent or received without following a sequential order. Data may be read as bytes. Examples of random access storage are the hard disk and the flash drive.

When data is read from or written to a disk, a device called the head is moved over the area of the disk to be accessed. After a new file has been created, other operations can be used for manipulating it.

Processing and Computation Operations

The computer's main job is data processing. It accepts data input, processes it into useful information, and sends it as an output or stores it for future use. Data processing follows a cycle composed of several major steps: origination, input preparation, processing, and output preparation.

Origination refers to the organizing and recording of data into some format. This may be any document such as an employee record, sales order, birth certificate, etc. **Input preparation** involves the conversion of the original document into a format that the computer can understand. This has three substeps: editing, coding, and verifying. **Processing** is the actual transformation of data into information. This may involve many specific processes like sorting, arithmetic operations, etc. **Output preparation** entails providing the user with information. Output may be saved or stored for future retrieval, produced in several copies (printed out), or sent (communicated).

To sum up, data processing involves procedures, data, equipment, and personnel. There is an interaction between the hardware and software components of the computer system. Human action is also needed in data processing. That is why another component called **peopleware**, which is composed of the developers and users, is considered as part of the entire computer system.

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The computer is also used for computation. Computation is done when a certain problem has to be solved with the use of an algorithm (a set of rules specifying how to solve a problem) that will work on the given input.

There are still many other processing and computation operations that the computer can perform. These may be categorized according to the fields related to computer science. **Information science**, for example, is the study of data and information. Operations include interpretation, analysis, storage, and retrieval of information. **Information security** is the analysis and implementation of system security. This is needed in order to protect information from hackers. **Information systems** is the application of computing to support the operations of an organization. Logic is a formal system of reasoning. **Logic** is needed in organizing the instructions fed into the computer. These are just some fields in computer science.

Logic Operations

The logic operations in the computer use **Boolean algebra**. Boolean algebra was named after George Boole, an English mathematician at University College Cork, who defined it in the mid-19th century. The three basic logical operations are AND, OR, and NOT. Boolean algebra is used in the electronic design of computing devices and also in the flow or sequence of instructions fed into the computer. Here is a simple example of how Boolean algebra works:

Boolean algebra has only two elements, 1 and 0. Do they look familiar? Remember binary numbers? Remember that the (digital) computer works in terms of bits. So here is an example of how bits are used. Now, 0 is taken as "false" and 1 as "true." When these values are formed with any one of AND, OR, and NOT, we form a boolean expression.

For example:

0 AND 0
1 AND 0

The relationship of these 2 binary values (0, 1) in terms of the logical operators AND, OR, and NOT, can be summarized in the following tables:

X	Not X
1	0
0	1

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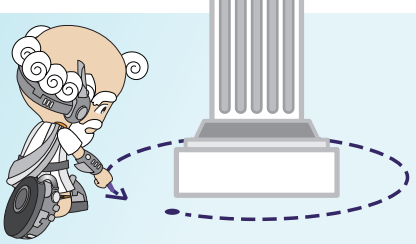
X	Y	X and Y
1	1	1
1	0	0
0	1	0
0	0	0

X	Y	X or Y
1	1	1
1	0	1
0	1	1
0	0	0

The Computer's Strengths

The computer is said to exhibit the characteristics of: 1) **speed**, which refers to the speed of the central processing unit (CPU) measured in clock ticks or clock cycles; 2) **accuracy**, or the correctness of computations as long as the formula applied has no error in it, the input is correct, and there are no external interruptions; 3) **consistency,** which refers to the uniform and standard performance of the computer to all possible input combinations; 4) **reliability**, which means that the computer is able to perform its required functions under stated conditions for a specified period of time; (5) **communications**, that is, the computer can perform information transfer between users or processes, according to agreed conventions or protocol; and 6) **memory capability**, which means the computer is able to retain data either temporarily or permanently.

ROUND UP



A computer's capabilities depend largely on the software installed in it. The data inputted into it only become practical to the user when they are processed and translated into output. This requires exact algebraic computations on the part of the computer. This math logic makes the computer an accurate and consistent communications tool for information technology.

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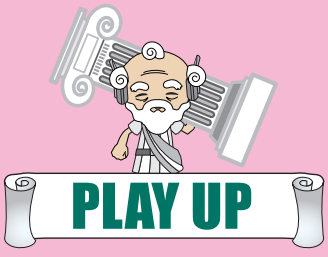

A. Encircle the output devices from the list below. Box the input devices.

MAIN MEMORY	SCANNER	MONITOR	FLASH DRIVE
KEYBOARD	MODEM	PRINTER	SPEAKERS
CPU	HARD DISK DRIVE	MOUSE	WEB CAMERA

B. Write T on the blank if the statement is True and F if it is False.

_____ 1. I/O devices are considered as the working area of the computer.

_____ 2. Computers can only retain data temporarily.

_____ 3. Boolean algebra has only two elements: 1 and 0.

_____ 4. Algorithm refers to the set of rules used to solve a problem.

_____ 5. Peopleware is not considered a part of the computer system.

_____ 6. Data processing involves data only.

_____ 7. Information science refers to the study of data and information.

_____ 8. Data that are saved on a tape require random access.

_____ 9. The speed of the computer refers to the speed of its memory.

_____ 10. The logic operations in the computer use Boolean algebra.

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C. Word Search

Identify the terms that match the given descriptions. Find and mark the Word Search box.

1. measured in terms of clock ticks or clock cycles _____
2. needed in organizing instructions fed into the computer _____
3. actual transformation of data into information _____
4. the organizing and recording of data into some format _____
5. part of the computer system that refers to developers and users _____
6. the type of algebra used in the logic operations of the computer _____
7. means data is accessed one after another in sequence _____
8. signal received by the computer _____
9. refers to the computer's uniform and standard performance to all possible input combinations _____
10. signal sent from the computer _____

B	O	O	L	E	A	N	Q	R	M	S	Y	L	J	L
E	P	N	E	R	C	C	B	S	T	S	C	W	C	N
E	R	L	Q	A	C	H	C	S	P	E	E	D	O	W
R	O	A	U	T	U	P	T	U	O	C	E	I	N	H
A	C	I	E	E	R	R	L	R	R	C	T	I	S	N
W	E	T	N	L	A	B	E	C	B	A	S	M	I	O
E	S	N	T	P	T	M	A	O	N	M	C	V	S	G
L	S	E	I	O	U	G	O	I	O	O	S	Y	T	I
P	I	U	A	E	D	T	G	E	E	D	N	D	E	N
O	N	Q	L	P	E	I	W	R	X	N	O	M	N	P
E	G	E	K	A	R	O	I	Z	F	A	C	L	C	V
P	T	S	N	O	C	I	G	O	L	R	J	O	Y	T

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Section 3

The Virtual World

A computer can be a gateway to a world of information that is possibly greater than any library that ever existed. Anyone may enter this world and contribute to its vastness with the proper tools and know-how.

This section furnishes the student with information on how to make things like websites and browsers work over the Internet. It shows them how this virtual world has a written language of its own which makes possible the creation of websites.

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Unfolding the Net

- Narrate the history of the Internet
- Identify the different Internet technologies and applications of the Internet
- Identify online resources and tools
- Explain and predict the future of the Internet

History of the Internet

The **Internet** started as a military research from the Department of Defense of the United States of America in 1957 through the Advanced Research Projects Agency (ARPA). The Internet was originally aimed to establish America's lead in science and technology applicable to the military. But due to its many potential uses, it became a publicly available information superhighway.

Paul Baran was one of the scientists who made the Internet possible through his packet switching principle. **Packet switching** is the breaking down of data into packets that are labeled to indicate the origin and destination of information and the forwarding of these packets from one computer to another until the information arrives at its final destination.

Year	No. of Computers Connected	Highlights
1957	None	USSR launched first satellite. USA started ARPANET.
1962	None	Packet switching was developed.
1972	4	The first e-mail program created by Ray Tomlinson of BBN.
1973	23	Transmission Control Protocol/ Internet Protocol (TCP/IP)
1976	111+	Ethernet technology was developed which led to Local Area Network (LAN).

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Year	No. of Computers Connected	Highlights
1983	562	TCP/IP became the core Internet protocol and replaced NCP entirely.
1985	1961	The National Science Foundation (NSF) began deploying its new T1 lines.
1988	56,000	After the completion of the T1 (1.544Mbps) NSFNET backbone, Internet traffic increased quickly.
1992	1,136,000	NSFNET backbone upgraded to T3 (44.736Mbps)
1994	3,864,000	Pizza Hut® offers pizza ordering on its Web page.
1996	over 15,000,000, and growing rapidly	Internet Service Providers (ISP) became the major carrier of Internet traffic.

Internet Technologies and Applications

The Internet has evolved from simple dial-up technology to high-speed data networks. Applications have become more advanced from simple Web page to complex video conferencing applications. Nowadays, computers, radio, television, mobile phones, cars, and even wearable computers can be connected to the Internet using embedded networking.

The continuous evolution of the Internet was caused by the need of people to transmit high traffic and high-bandwidth applications over the network. In addition, the explosive advancement of software technology powered the Internet's applications.

What do you think would you want to contribute to the evolution of the Internet?

Do you know?

The number of Internet users in the world surpassed 3 billion by the end of 2014. In the Philippines, there are an estimated 39 million users.

The following are the different technologies being used on the Internet:

Local Area Network (LAN). This interconnects computers in one location.

Wide Area Network (WAN). This interconnects different LANs.

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Wireless Fidelity (WiFi)/WiMax. This allows wireless Internet access using Internet Protocol (IP).

General Packet Radio Service (GPRS). This allows mobile users to access the Internet using cellular phones.

4G LTE (Fourth Generation Long Term Evolution). The standard for high speed data wireless communication for mobile phones. Therefore it is the one that operates at the leading edge of speed and reliability.

Voice over Internet Protocol (VoIP). This allows telephone calls over the Internet using Internet Protocol (IP).

Multimedia Streaming. This allows audio/video streaming over the Internet.

Do you know?

Embedded networking in the human body is one of the proposed applications of the Internet. If humans are networked, we can easily monitor population growth, manage human resources, and prevent crimes. One technology called **radio-frequency identification (RFID)** can be embedded into the human body to give each person a unique identification. However, there are many people opposed to this proposal because of privacy and other issues.

Broadband. As applied to the Internet, this refers to high-speed transmission of data between your computer and the Internet.

Cluster/Grid Computing. This allows intensive computations to be distributed to thousands of computers and lets them process computations simultaneously.

Many different Internet applications include: 1) online news, shopping, gaming, and trading; 2) e-mail and chat; 3) search engines; 4) online digital libraries; 5) home schooling; 6), databases; 7) e-government; and, 8) personal and healthcare services.

Online Resources and Tools

The main purpose of the Internet is to serve billions of online users. Most of the Internet applications aim to bring people closer to each other. Here are some of the most popular online resources available, some of which can be used for free:

E-mail. This allows registered users to send and receive electronic messages to other online users. Online e-mails differ in "Inbox" capacity. Most free e-mail providers offer capacities of 4MB, 100MB, and 1GB. Free e-mail services require you to register to an account before you can use them.

Search Engine. This is an online tool that can be used to find almost all kinds of information. The most commonly used search engine is Google® due to its simple, fast, and reliable free search engine service.

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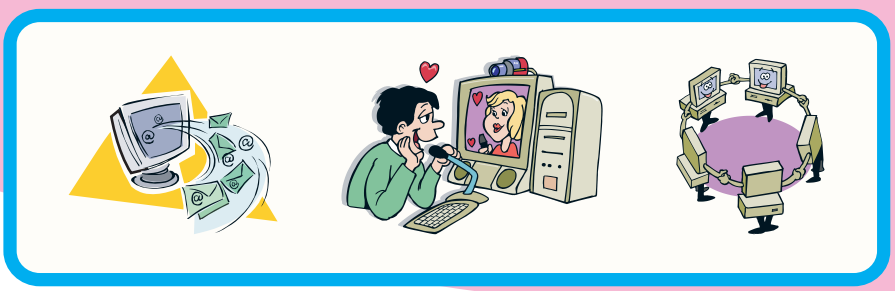
Chat. This allows you to have a conversation with another online user in real-time. Using a microphone and a video camera, an advanced chat system will allow you to have a real-time voice and video conversation. An example of this service is Yahoo!® Messenger which is also free.

Blog. This is a quick way of publishing your information on the Internet. Nowadays, even cell phone users can easily update their blog sites by sending the messages directly from their phone to the Internet passing through the GPRS networks.



P2P (Peer-to-Peer) Networks. This allows users to share files such as documents, software, MP3 music, videos, pictures, and many others. An example of this is uTorrent which can be used to download files for free.

Social Networks. Members of online communities connect to family members and friends easily. Most social networks can be used to search for and track old friends and relatives on the Internet. An example of this social networking tool is Facebook.

Internet Trends and Predictions

We have learned that the Internet evolved from a simple interconnection of two computers to an interconnection of millions of computers providing new technologies and applications for cluster computing systems, embedded networking, personal networking and home networking. Here are some of the trends and predictions on the Internet:

- With the world going mobile and wireless access becoming commonplace, usage of mobile devices like the smartphone and tablet will overtake that of the desktop PC in connecting to the Internet for social networking, ecommerce, entertainment, and other online services.
- The migration of information and entertainment to the Internet will continue to grow, with newspapers, magazines, TV, and movies becoming more and more available in digital form and online. The emergence of Internet TV, which gets TV on the Internet, and Internet Protocol TV (IPTV), which gets Internet on your

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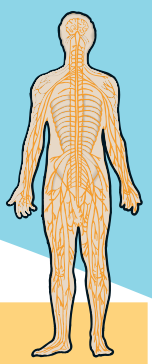
TV, is evidence that viewers are increasingly making the Internet a source of information and entertainment.

- As broadband Internet becomes more widely available, collaboration and real-time interaction over the Internet will become bigger and more frequent. There will be no limit to the number of people who can participate in one collaborative project. VoIP, which allows free calls anywhere in the world, will change the entire business model of telecommunications.

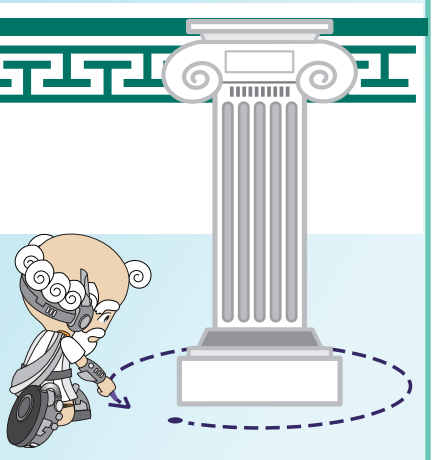


- Computing devices will proliferate as embedded RFID and Bluetooth technology will allow home appliances, phones, cars, and even clothes to be connected to a home personal network and to the Internet.
- Virtual classes will allow home-schooling systems and thus reduce traffic in major cities of the world.

Do you know?

The human nervous system is an example of a perfect Internet. As an organic network, the advanced architecture of the human nervous system is now being studied to model the next generation Internet infrastructure.

ROUND UP



The first Internet was something that wasn't intended for public use because of its military nature. The Internet made use of the worldwide telephone network so that its computers can connect to each other. Today, it uses high-speed data networks using cables or various wireless technologies. The widespread use of the Internet has made possible the availability of online resources and tools that has made using it easier and more effective. As Internet technology progresses and becomes more ubiquitous, more people will have the means to access the World Wide Web. This is expected to change the way people socialize and work.

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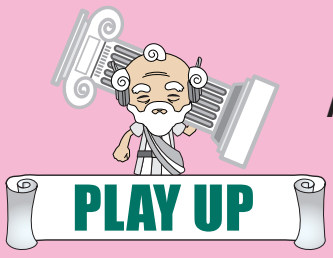
NAME: _____

GRADE/SECTION: _____

DATE: _____

SCORE



A. Match column A with column B. Write your answer on the space before each number.

A	B
_____ 1. allows telephone calls over the Internet using Internet protocol	a. chat
_____ 2. online tool used to find any kind of information	b. multimedia streaming
_____ 3. allows online conversations in real-time	c. WiFi
_____ 4. allows users to share files via the Internet	d. LAN
_____ 5. allows wireless Internet access	e. e-mail
_____ 6. interconnects computers in one location	f. Broadband
_____ 7. online communities that allow you to connect to family members and friends	g. search engine
_____ 8. allows high-speed transmission	h. GPRS
_____ 9. allows video/audio streaming over the Internet	i. WAN
_____ 10. allows mobile users to access the Internet	j. blog
_____ 11. interconnects different LANs	k. VoIP
_____ 12. breaking down of data into packets	l. packet switching
_____ 13. allows registered users to send and receive electronic messages	m. social networks
_____ 14. a quick way of publishing information on the Internet	n. cluster/grid computing
_____ 15. allows intensive computations to be distributed	o. P2P

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B. Give specific examples for each of the following Internet applications.

1. Social Networks

_____

_____

_____

2. E-mail

_____

_____

_____

3. Search Engine

_____

_____

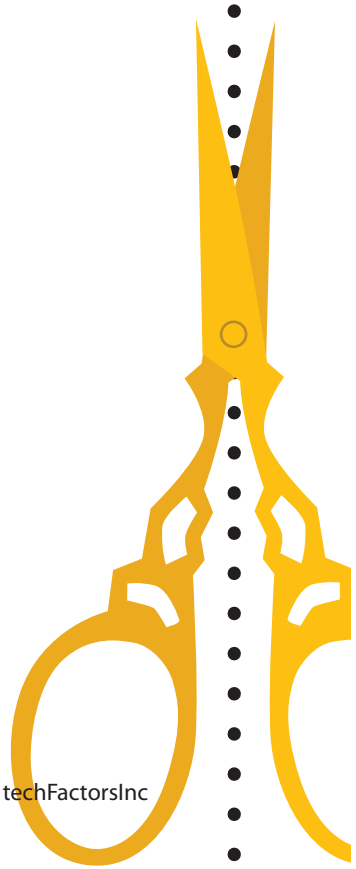
_____

4. Chat

_____

_____

_____



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How the Net Connects

- Identify the basic components of a network
- Define networking concepts
- Design a basic local area network (LAN)
- Demonstrate how basic connection to the Internet using dial-up is done

Basic Hardware and Software Connectivity

Computers can only communicate with each other using appropriate software and hardware components that enable proper network interface and cabling. For a packet originating from a computer to reach its recipient, it passes through different network devices such as a network interface card (NIC), router, hub, switch, etc.

The speed of data transmission depends on the bandwidth of the medium connecting two computers on a network. **Bandwidth** is the measure of the speed of data transmission which can be in Kbps, Mbps, Gbps, or Tbps. In order to measure the speed or bandwidth utilization of a network, network measurement techniques can be used by collecting data using the **Simple Network Management Protocol (SNMP)**. SNMP is a protocol used to monitor the status and activity of certain network devices and is ideal for network management.

The different components of Internet connectivity include the following:

Host computer. This computer speaks with other computers in the network. It must have an NIC which allows another host to connect to a network using a specific type of cable or wireless medium. A host must contain the operating system (OS) and software applications such as an Internet browser needed to connect or access to a network.

Do you know?

You can get the IP address and MAC address of your PC by typing "ipconfig" in the DOS command prompt. You can also use **ping** to check if a machine is online or **tracert** to see how far a certain website is from your location.

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Network interface card (NIC). This is used to connect a computer to a network. Each NIC has a unique name called "MAC Address." It can be 10Mbps, 100Mbps or 1Gbps in speed.

Hub or switch. This is used to connect many computers in one local area network (LAN). It simply allows packets to pass through and find their way to their destination.

Router. This is a packet switching device that is used to connect many computers in different LANs or networks. Without a router, packets from different networks will not be able to reach their destination.

Internet service providers (ISP). This provides temporary or permanent connections to their subscribers to access the Internet. The connection can be through Dial-up, Digital or Direct Subscriber Line (DSL), satellite access, Bluetooth, GPRS, WiFi, or cable TV.

Do you know?

A **proxy server** can be used to filter the kind of information to be made available to users. If your LAN has a proxy, your browser does not directly connect to the Internet. The proxy server can be used to filter prohibited content and other sites that may have bad effects to users.

Network services. These are services and applications being provided by different dedicated servers such as Web proxy, DNS, mail, FTP, streaming, or file server.

Network sockets.These are also called "ports." A Web server, for example, can be configured to listen to port "80" to accept incoming HTTP requests from Internet browsers. All Internet services have different sockets or ports being used. The creation of programs that can allow computers to communicate is called **socket programming**. It uses the client-server model, which is also being used on the Internet.

Networking Concepts

With the proper interconnection of hardware and installation of software applications, computers can talk to each other using protocols. A **protocol** is a special set of rules that computers in a network must use in order to talk to and understand each other.

Do you know?

You no longer need to set an IP address when you connect via dial-up. **Dynamic Host Configuration Protocol (DHCP)** allows your machine to automatically configure its IP based on your ISP.

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A basic example of this protocol is the **Transmission Control Protocol /Internet Protocol (TCP/IP)**. In TCP/IP, IP is responsible for moving packets of data from node to node. A **packet** is the basic unit of Internet data being transmitted through a packet switching process. TCP is responsible for verifying the correct delivery of data from client to server.

How are computers identified? Do they have names? In computer networking, we do not call computers by just any name as we do to humans. In a TCP/IP network, each computer is named by a unique number called an IP address which can be IPv4 or IPv6.

Utilities for troubleshooting TCP/IP

Ping	ARP	IPConfig	NBTStat
Netstat	Route	Hostname	Tracert

Utilities for testing TCP/IP connectivity

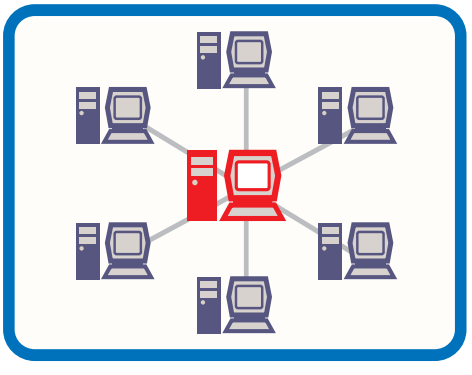
FTP	TFTP	Telnet	RCP
RSH	REXEC	Finger	

The current IP addressing being used for the Internet is IPv4. IPv4 uses 32-bit IP addresses, and with 32 bits, the maximum number of IP addresses is 2^{32}—or 4,294,967,296. This provides a little more than four billion IPv4 addresses (in theory). For example, your computer can have an IP address of "192.168.0.1" and the other computer in your network is "192.168.0.2." This numerical naming of computers is difficult to memorize.

Using a **Domain Name Service (DNS)**, computers connected to the Internet can be called through a human-like naming system. For example, through DNS service, the IP address "192.168.0.1" is equivalent to "host.pinoynet.com".

Designing a Local Area Network (LAN)

With the development of wireless access and fiber-optics, we can now access the Internet through our local area network (LAN) which can be found in school computer laboratories, universities, Internet cafes, offices, etc. For example, we can use a wired network to set up a LAN. We will call our network "pinoynet.com." The network address assigned to us is "192.168.1.0". Our network consists of 1 Web server that will function as our local website server, 5 workstations which can be used by network users, and 1 hub or switch which will be used to interconnect the workstations in a LAN.



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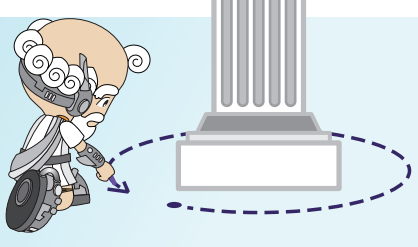
Basic Internet Connection Using Dial-Up

The Internet started as a dial-up network. Connecting to the Internet using dial-up requires a device called a **modem** that will encode and decode data. "Modem" is short for modulator/demodulator. It modulates digital data from your PC so that it can pass through the analog telephone line, and demodulates the analog data into digital data which can be interpreted by your computer. Your modem will actually dial to your ISP and allow connection only with a prepaid or post-paid account and a valid username and password. Due to the nature of telephone lines, a dial-up Internet connection is quite slow since it can only transmit and receive up to 56Kbps speed of traffic. DSL or broadband allows much faster Internet access. The cost of Internet access is directly proportional to the speed of access, thus dial-up is the cheapest way to access the Internet.

ROUND UP



In order for computers to communicate with one another, basic elements and components have to be in place, such as a proper network interface and standard protocols. The Internet evolved from a wired to a wireless network and the development of tools ranging from the telephone to decoders followed suit. Today, different systems are used which generally differ in connection speed.

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NAME: _____

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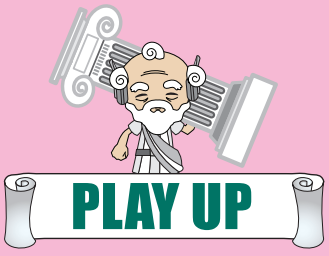

A. Encircle the letter of the phrase that is NOT TRUE of the given term:

1. bandwidth

a. can be in Kbps, Mbps, Gbps, or Tbps
b. affects the speed of data transmission
c. the basic unit of Internet data

2. protocol

a. a special set of rules that computers in a network use to talk to each other
b. an example is DNS
c. an example is TCP/IP

3. host computer

a. a computer that speaks with other computers in the network
b. needs a router to allow another host to connect to a network
c. must contain the operating system and software applications needed to access a network

4. Internet service provider

a. provides only temporary connections to subscribers to access the Internet
b. allows access to the Internet with a pre-paid or postpaid account and a valid username and password
c. connection can be through dial-up, DSL, satellite access, Bluetooth, GPRS, WiFi or cable TV

5. network interface card

a. has a unique name called "MAC Address"
b. used to connect a computer to a network
c. a packet switching device

6. router

a. needed for packets from different networks to reach their destination
b. must have an NIC which allows another host to connect to a network
c. connects many computers in different LANS or networks

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7. modem

a. short for modulator/demodulator
b. dials to a TCP/IP
c. encodes and decodes data

8. SNMP

a. a protocol used to monitor the status and activity of certain network devices
b. ideal for network management
c. responsible for moving packets of data from node to node

9. dial-up

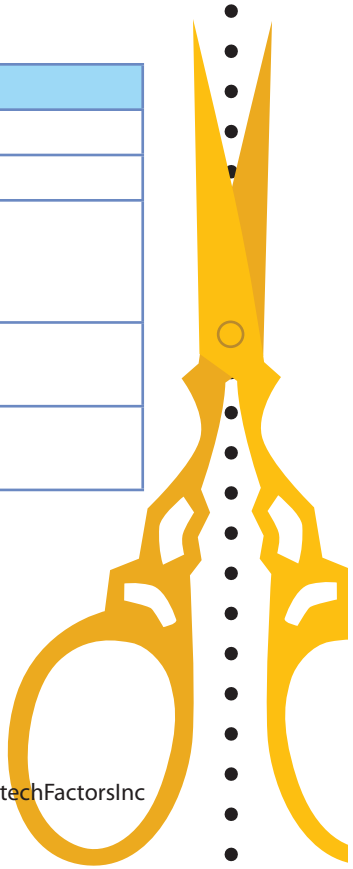
a. cheapest way to access the Internet
b. transmits and receives up to 56Kbps speed of traffic
c. provides fast Internet access

10. hub

a. also called a router
b. used to connect many computers in one local area network
c. allows packets to pass through and find their way to their destination

B. The following table gives you the features of Dial-up Internet access. Find out and compare DSL Internet access with Dial-up based on the given factors. Fill in the column under DSL.

Factors	Dial-up	DSL
Connection speed	56 kbps	
Use of phone line	Occupies a phone line	
Ease of Use	Need to dial an access number to connect to the Internet	
Availability	Available to everyone with a phone line	
IP Address	Unique IP address for each connection	



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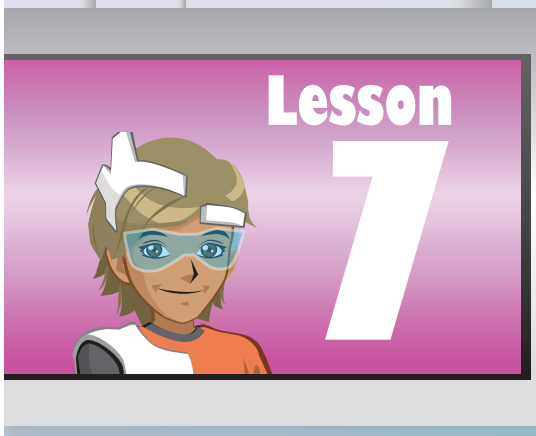

Language of the Web

- Explain the HTML scripting language
- Apply the basic principles in HTML programming
- Use standards in HTML tags
- Create a simple Web page

Scripting Languages

In the world of Web developers, a **scripting language** is a programming language or format that tells the computer how to display a Web page. A scripting language can run within a Web browser. Most common of all scripting languages is the **HyperText Markup Language (HTML)**. In advanced Web design, a scripting language is a specialized language used to create scripts. When inserted into a Web page, the scripts control various elements of the page, such as the user interface, styles, and HTML markup. Other types of scripting languages available today are Javascript, VBScript, PHP, Perl/CGI, XHTML, XML, ActionScript, AJAX, and jQuery.

HTML is the lingua franca for publishing hypertext on the World Wide Web (WWW). It can be created and processed by a wide range of tools, from simple plain text editors—you type it in from scratch—to sophisticated **WYSIWYG (What You See Is What You Get)** authoring tools. HTML uses tags to structure text into headings, paragraphs, lists, hypertext links, etc. Anything that is enclosed between "<" and ">" symbols is called a **tag**. HTML also has **attributes** which define the property of an element. In order to be a good Web developer, you must know the different HTML tags.

Basic HTML Programming

We will now learn the basics of HTML programming. First, we should decide how we will write HTML codes. There are two ways: HTML by hand, which uses Notepad or text editor to write HTML codes manually; and with an HTML editor, which uses a tool that writes and edits tags automatically (for example, Dreamweaver.) There's not much difference if you use either one, but it is faster and easier to create Web pages using WYSIWG editors. The following steps will teach you how to start programming with HTML and familiarize you with some HTML tags.

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1. Start with a title.

Every HTML document needs a title. Here is what you need to type:

```
<title>My first HTML document</title>
```

Change the text "My first HTML document" to suit your own needs. The title text is preceded by the start tag <title> and ends with the matching end tag </title>. The title should be placed at the beginning of your document. To try this out, type the above into a text editor and save the file as "test.html," then view the file in a Web browser. If the file extension is ".html" or ".htm" then the browser will recognize it as HTML. Most browsers show the title in the window caption bar.

2. Add headings and paragraphs.

If you have used Microsoft Word, you will be familiar with the built-in styles for headings of differing importance. In HTML, there are six levels of headings. H1 is the most important, H2 is slightly less important, and so on down to H6, the least important.

Here is how to add an important heading: `<h1>An important heading</h1>`

And here is a slightly less important heading: `<h2>A slightly less important heading</h2>`

Each paragraph you write should start with a tag. The is optional, unlike the end tags for elements like headings. For example: `<p>This is the first paragraph.</p>`

3. Add a bit of emphasis.

You can emphasize one or more words with the tag, for instance:

```
This is a really an <em>interesting</em> topic!
```

4. Add interest to your pages using images.

Images can be used to make your Web pages distinctive and to get your message across. The simple way to add an image is by using the <img> tag. Let's assume you have an image file called "peter.jpg" in the same folder/directory as your HTML file. It is 200 pixels wide by 150 pixels high.

```
<img src="peter.jpg" width="200" height="150">
```

The src attribute names the image file. The width and height aren't strictly necessary but help to speed the display of your Web page. But something is still missing! People who can't see the image need a description they can read in its absence. You can add a short description as follows:

```
<img src="peter.jpg" width="200" height="150" alt="My friend Peter">
```

The alt attribute is used to give the short description, in this case "My friend Peter."

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You can create images in a number of ways—with a digital camera, by scanning an image, or creating one with a painting or drawing program. Most browsers understand GIF and JPEG image formats, and newer browsers also understand the PNG image format. To avoid long delays while the image is downloaded over the network, you should avoid using large image files. Generally speaking, JPEG is best for photographs and other smoothly varying images, while GIF and PNG are good for graphics art involving flat areas of color, lines and text.

5. Add links to other pages.

What makes the Web so effective is the ability to define links from one page to another, and to follow links at the click of a button. A single click can take you right across the world! Links are defined with the <a> tag. Let's define a link to the page defined in the file "peter.html":

```
This is a link to <a href="peter.html">Peter's page</a>.
```

The text between the <a> and the is used as the caption for the link. It is common for the caption to be in blue underlined text. To link to a page in another website, you need to give the full Web address (commonly called a URL). For instance, to link to www.w3.org you need to write:

```
This is a link to <a href="http://www.w3.org/">W3C</a>.
```

You can turn an image into a hypertext link. For example, the following allows you to click on the company logo to get to the home page: `<a href="www.w3.org"><img src="logo.gif" alt="home page"></a>`

6. Use various kinds of lists.

HTML supports three kinds of lists. The first kind is a bulleted list, often called an **unordered list**. It uses the <ul> and <li> tags, for instance:

```
<ul>
        <li>the first list item</li>
        <li>the second list item</li>
        <li>the third list item</li>
</ul>
```

Note that you always need to end the list with the end tag, but that the is optional and can be left out. The second kind of list is a numbered list, often called an **ordered list**. It uses the <ol> and <li> tags. For instance:

```
<ol>
        <li>the first list item</li>
        <li>the second list item</li>
        <li>the third list item</li>
</ol>
```

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Like bulleted lists, you always need to end the list with the end tag, but the tag is optional and can be left out.

The third and final kind of list is the **definition list**. This allows you to list terms and their definitions. This kind of list starts with a <dl> tag and ends with </dl> Each term starts with a <dt> tag and each definition starts with a <dd>. For instance:

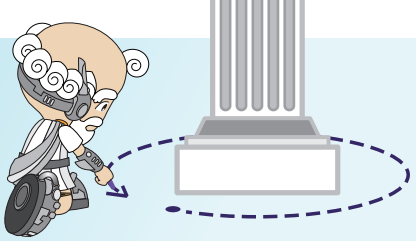
```
<dl>
        <dt>the first term</dt>
        <dd>its definition</dd>
        <dt>the second term</dt>
        <dd>its definition</dd>
</dl>
```

The end tags </dt> and </dd> are optional and can be left off. Note that lists can be nested, one within another. You can also make use of paragraphs and headings, etcetera, for longer list items.

Creating Your Own Web Page

Before creating your own Web page, you should be aware of copyright issues. Make sure that whatever you put in your Web page such as images and text are not copyrighted by others. Here are the steps in creating your own Web page: 1) Gather information; 2) Determine the intended audience; 3) Create a storyboard; 4) Plan your navigational tools; 5) Create an aesthetically appealing Web page; 6) Establish credibility; and, 7) Upload your website to a Web hosting provider.

ROUND UP



Websites are possible because of scripting languages, like HyperText Markup Language (HTML), that tell computers how to display them. Computer users can make use of HTML by writing scripts on their own or by using HTML editors that automatically edit scripts to produce the necessary displays.

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NAME: _____

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DATE: _____

SCORE

A. Match column A with column B. Write your answer on the space before each number.

_____ 1. most common scripting language

_____ 2. uses a tool that writes/edits HTML automatically

_____ 3. uses Notepad or text editor to write HTML codes manually

_____ 4. used to structure text into headings

_____ 5. bulleted list

_____ 6. JPEG, GIF, PNG

_____ 7. a programming language that tells a computer how to display Web pages

_____ 8. numbered list

_____ 9. tag used to add an image to a Web page

_____ 10. allows the listing of terms with their definitions

a. unordered list

b. tags

c. <img>

d. HTML by Hand

e. scripting language

f. HTML editor

g. ordered list

h. HyperText Markup Language

i. image formats

j. definition list

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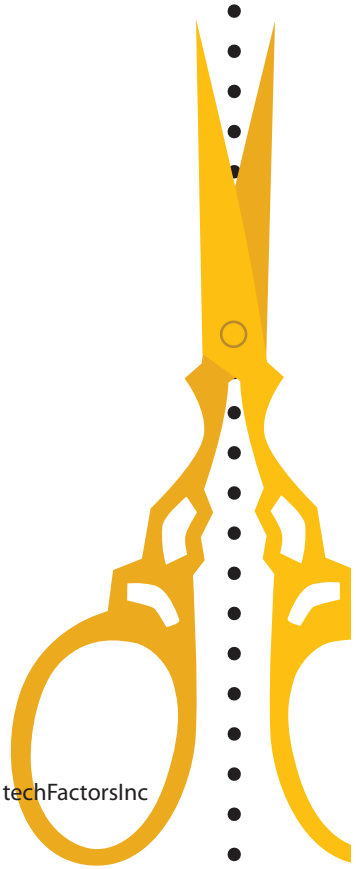
B. Write down the HTML tag that is used to add the parts of an HTML document.

1. paragraph - <_____>
2. emphasis - <_____>
3. link to another page - <_____>
4. unordered list - <_____> and <_____>
5. title - <_____>
6. image - <_____>
7. ordered list - <_____> and <_____>
8. important heading - <_____>
9. slightly less important heading - <_____>
10. definition list - <_____>



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Section 4

Practical Computing

The computer can be a practical tool that takes the place of many common home and office gadgets. For example, it is a media player, typewriter, post office, organizer, and network device all at the same time. All these capabilities are covered in this section which addresses the basic needs of the student for a solid hands-on grasp of the everyday practical applications of computers.

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Hooking Up via E-Mail

- Demonstrate how e-mail works
- Demonstrate the use of Webmail
- Use Outlook Express
- Identify E-mail Etiquette and Netiquette

How Does E-mail Work?

Electronic mail, commonly called **e-mail**, is the most common application on the Internet. E-mail is any message directed from one individual to another and sent from one computer to another. E-mail allows persons to send and receive electronic messages economically and fast.

All e-mail users have unique e-mail addresses. An e-mail address is a registered account from an e-mail provider. It contains a unique username and domain name of the e-mail provider separated by the "@" symbol.

username@domainname.com

One disadvantage of e-mail is that it is only available in areas with Internet access. In rural areas with no telephone system, e-mail is not yet available and postal mail is the only option.

Before e-mail was invented, people only used the **snail mail** or postal mail system which requires a postman to manually deliver messages to your doorstep. In e-mail, the postman is replaced by a computer that serves as the **mail server**. Mail servers may contain hundreds of registered e-mail accounts. Since the e-mail address does not specify the geographic locations of the sender and receiver, we can access e-mails from anywhere in the world over the Internet. There are two ways to access e-mail—through Web-based interface (webmail) or client windows applications which connect directly to the mail server. Webmail uses an Internet browser to fetch and display e-mails from a mail server. E-mail services can be free or commercial. The most commonly available free e-mail services are Yahoo! Mail and Gmail.

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Using Webmail

Webmail is short for Web-based e-mail system. It was termed "Web-based" because it uses the HyperText Transfer Protocol (HTTP) to fetch messages from a mail server. An Internet browser is used to display, read, send, and manipulate e-mail messages. The most obvious advantage of webmail is that it is accessible by just using an Internet browser without any e-mail software.

Webmails can be compared using the following criteria:

Mail Storage Capacity. This determines the maximum capacity of the webmail account. For example, both Gmail has 15GB of free mail storage and Yahoo! has 1TB of free mail storage at present.

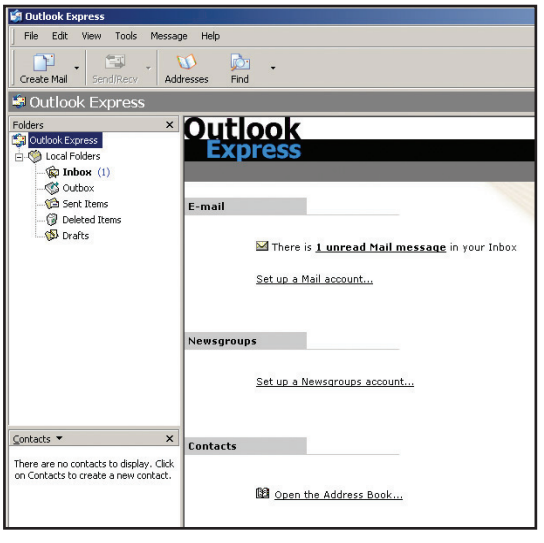
Special Features. These are enhanced tools or features that differentiate one webmail service from another. An example of this is Gmail's "folderless," message-tagging, and conversation-threading feature.

Accessibility. Some webmails can be accessed using Post Office Protocol version 3 (POP3) or Internet Message Access Protocol (IMAP) which can be displayed in client windows applications such as MS Outlook.

Security. How does your webmail provider keep your e-mails secure?

Cost. Some webmails are commercial. Yahoo!® Mail and Gmail are two of the most commonly used free e-mail services. However for a certain annual fee, the mail storage capacity can be increased.

Using Outlook Express



Outlook Express is a basic Internet mail program that is part of Internet Explorer and Windows. It directly connects to the mail server in order to retrieve, send, and delete messages. It supports POP3, IMAP, Simple Mail Transfer Protocol (SMTP) and HyperText Transfer Protocol (HTTP) e-mail servers. Since it communicates directly with the mail server, Outlook Express must be configured first in order to specify the correct hostname or IP address and port of the mail server. Outlook Express can also be used to fetch different mail boxes such as from a webmail with POP3 feature like Gmail. To determine the settings of your Web server, check their website or contact the network administrator.

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The things needed to configure Outlook Express are: the e-mail address, mail server type (HTTP/POP3/IMAP), incoming mail server (HTTP/POP3/IMAP), outgoing mail server (SMTP). To launch the Outlook Express, just click Start > Programs > Outlook Express from your Windows taskbar.

The most common Outlook Express problems you will encounter are:

1. wrong configuration of mail servers, ports, e-mail address, protocol, etc.
2. no network access, or mail server is down.
3. wrong username and password.
4 virus infection.

E-mail Etiquette and Netiquette

E-mail etiquette means "the prescribed ways of using e-mail in cyberspace." **Netiquette**, on the other hand, are the prescribed ways of using not only e-mail but all other Internet technologies, applications, and resources. Here are some of the most important:

Originating an E-mail

- When writing e-mail for the first time, specify where you got the e-mail address of the person you are e-mailing to.
- Always fill up the "Subject" box.
- Don't just include attachments. First ask the recipient if he needs them.

Do you know?

- People now use e-mail less often because of the emergence of Instant Messaging (IM) systems. Chikka.com is the first Philippine-based IM system which allows you to send messages from your computer to a mobile phone.
- **Spamming** means sending the same message that usually offers products or services, to hundreds or thousands of e-mail addresses in the hope of getting a few people interested. It displays extreme selfishness and total disregard for the 99%+ that are annoyed and inconvenienced by it.

E-mailheads and Signatures

- Use only e-mail letterheads on formal letters such as proposals, contracts, etc.
- Don't use letterheads for informal e-mails.
- Make a short, concise, and consistent signature.

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Capitalization

- Don't write e-mail in all lowercase or all uppercase. Using all uppercase implies you're shouting. On the other hand, using all lowercase may be taken to mean you don't have enough respect for your recipient to use proper capitalization.

First Names and Titles

- If your correspondent uses your first name, then by all means use his also. Otherwise, use proper addressing and titles.

The Message

- Keep business messages short and to the point.
- When replying, remove the lines that are not relevant and write only beside the topic you are replying to.
- Don't use smileys (:-) :-/) in business e-mails.

Unsolicited E-mail, Junk, and Spamming

- When sending unsolicited e-mail, put only a one-line message followed by details on how you can be contacted for more information.
- Use "Bcc" if you want to protect the privacy of your other recipients. "Cc" makes all the names of your recipients visible to all.
- End a message with your full name, e-mail address, and signature.
- Check your e-mails at least twice a day if you have the time and resources.

Responsible Use of E-mail

The following will help you use the Internet in a manner that is responsible, safe, and productive:

1. Install virus protection software. Scan e-mail attachments before opening them.
2. Do not share your password with others.
3. Never share personal information online such as your name, address, telephone, or credit card number.
4. **Spider software** are used to search e-mail addresses on the Internet. (Tip: don't just put e-mail addresses in websites; use "at" instead of "@")

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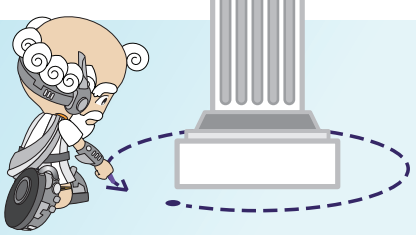
5. Use correct and consistent e-mail signatures.
6. Don't forward chain e-mails.
7. Don't use a fake e-mail address to send e-mail to another person.

Do you know?

Emoticons are symbols used in e-mail and other electronic communication.

:-) :-(:-D :-X :-S
;-) :-P :-O >:-(

ROUND UP



E-mails work just like real mail. The difference is that they are not physical and the addresses they have only exist in the virtual world of the Internet. The messages coming from a computer are simply stored and accessed using their addresses from big servers around the world.

There are several tools for e-mailing available. Some use Internet browsers and others are bundled into operating systems. There are also rules to be followed when writing with e-mail. This set of rules is called netiquette.

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NAME: _____

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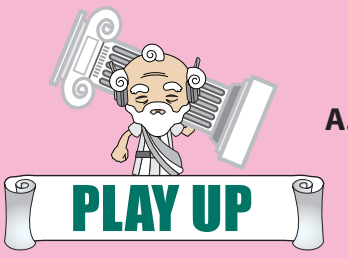
DATE: _____

SCORE



A. Match column A with column B. Write your answer on the space before each number.

A	B
_____ 1. software used to search e-mail addresses on the Internet	a. e-mail etiquette
_____ 2. Web-based e-mail system	b. netiquette
_____ 3. symbols used in e-mail and other electronic communication	c. spamming
_____ 4. prescribed ways of using e-mail in cyberspace	d. Bcc
_____ 5. prescribed ways of using all other Internet technologies	e. snail mail
_____ 6. used in sending e-mails to protect the privacy of other recipients	f. e-mail address
_____ 7. registered account from an e-mail provider	g. Outlook Express
_____ 8. refers to the maximum capacity of the webmail account	h. mail server
_____ 9. protocol used by webmail to fetch messages from a mail server	i. spider
_____10. stand-alone Internet mail program	j. webmail
_____11. sending the same message that usually offers products or services, to hundreds or thousands of e-mail addresses	k. e-mail
_____12. another term for postal mail system	l. HTTP
_____13. where all registered e-mail accounts go to	m. Internet browser
_____14. any message directed form one individual to another and sent from one computer to another	n. mail storage capacity
_____15. what is used to display, read, send, and manipulate e-mail messages	o. emoticons

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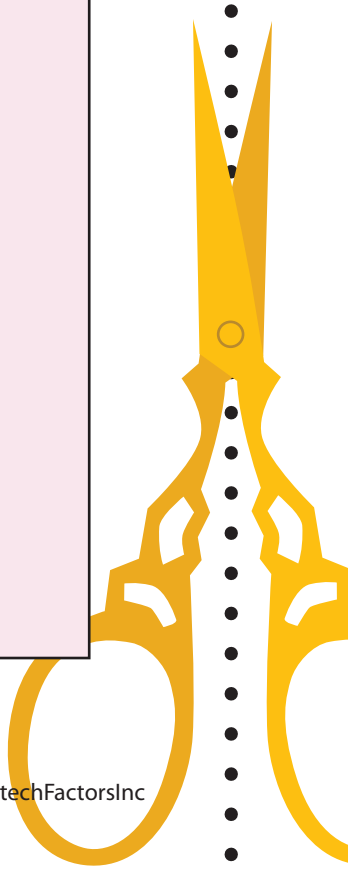
B. Problem Solving

Let's say you have registered to a webmail service with 20MB of mail storage capacity. If an e-mail occupies 10kB, how long will it take to fill up your maximum storage capacity if you are receiving 5 e-mails a day and sending 3 e-mails a day? Assume that you are not deleting any message and each sent message is saved. Express your answer in days.



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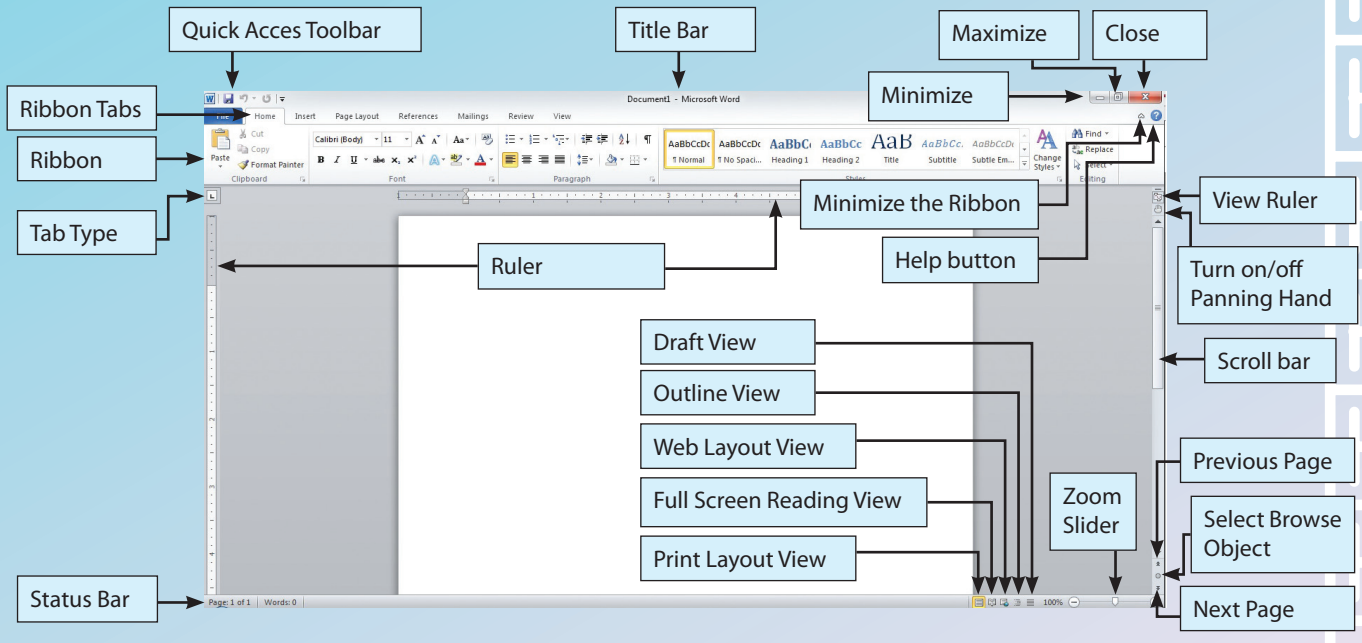
Brushing Up on Word Processing

- Demonstrate skills in word processing
- Create, save, and print documents
- Identify the uses of MS Word

MS Word Screen

Microsoft Word (MS Word) is one of the most widely used word processing software. It runs on top of the Windows operating system and is bundled with the Microsoft Office Suite, a commercial software application. MS Word has a user-friendly interface that is used with a mouse and keyboard. There are also tools emerging with voice-recognition that allow users to speak the words or letters that they want to input into MS Word.



MS Word Features

Cut and Paste. This technique allows ease of copying, pasting, and arranging document components. Ctrl+C and Ctrl+V are two commonly used shortcuts. To copy, select what you want to copy, press Ctrl+C, then go to where you want to paste it and press Ctrl+V. Note that this feature can also be used in other Windows applications.

Using Tables. To insert a table in the document, just click the Insert tab, then the Table button. You can specify the number of rows and columns as well as other properties using the menu options that appear.

Inserting Graphics. When inserting graphics into the document, choose a file format like JPEG as this is relatively smaller in size compared to other formats like BMP. Inserting graphics of large file size to an MS Word document can be disadvantageous because it not only increases the size of the document but it also slows down the display of the document.

Using Text Boxes. Text box is a box where you can type text inside. This can be used to separate text or put a box to a sentence or paragraph in order to emphasize that part of the document. To insert a text box, click on the text box icon on the Drawing toolbar, then type the text inside the text box.

Using WordArt. WordArt is a predefined template on formatting or adding effects on fonts in the form of graphical images. You can use this for making titles of documents, for example.

Using Spell and Grammar Check. The spell and grammar checker features are artificial intelligence features that have been incorporated in MS Word.

Common MS Word Problems

Here are some common problems you may encounter while using MS Word and their possible solutions:

Virus. Scan the entire file system for viruses on a regular basis. Infected files should be treated or deleted.

Cannot save file. Check read/write permissions on the folder or disk. Check also if the disk is full.

Do you know?

To type "ñ" and "Ñ," key in "Alt+164" and "Alt+165" respectively.

"x_1" can be created using key sequence "x"+"Ctrl"+"="+"1."

.BMP images are usually large. It is not advisable to insert them in documents.

To quickly close MS Word, press "Alt+F4."

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Cannot open file. Make sure that the file or disk is not corrupted. Make sure also that the real file was saved and not the shortcut of the file.

Problems in inserting graphics. Check the layout and colors. Each image has properties in order to mix text and graphics. You can also change the color of text and graphics to grayscale or a specific color.

Recovering deleted files. Deleted files go to the Recycle Bin where you can recover them. But files deleted from the Recycle Bin itself will no longer be recovered.

Saving and Printing MS Word Documents

When saving an MS Word document, you specify the destination of the saved file, then give a filename with the extension *.doc* or *.docx*. For security reasons, you can create a password to open or modify the document.

You can save your files into different versions to avoid overwriting documents that you may need to go back to later on. Computers nowadays have large enough disk spaces for making identical copies of files with different versions. You can also save a Word document to a different format such as a Web page (.html).

You can print an MS Word document using a:

Local Printer. This is the printer connected to the computer where you typed the document.

Network Printer. This printer is not connected to your computer but located somewhere in your local area network (LAN).

PDF Printer (Acrobat Distiller). This prints the document in PDF format. It should first be installed.

Do you know?

The speed by which you type or encode a document is measured in **words per minute (wpm)**. The slowest typist's acceptable speed is 25wpm which is equivalent to a 10-year-old child's doing a word processing job. What is your typing speed in wpm?

Open-source software applications for office tools are becoming popular. Examples of these productivity tools are OpenOffice, StarOffice, and KOffice. The equivalent of MS Word in OpenOffice is Writer.

If you want to preserve the format of the attached document or you don't want others to edit your work, you can convert the MS Word document into PDF format before sharing it. You will need to install an Adobe® Acrobat Distiller or any available PDF converter. There are also Web-based tools that let you upload your MS Word document to be converted for you.

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Before you print your document you can use **Page Preview** to check if the document is okay for printing.

Uses of MS Word

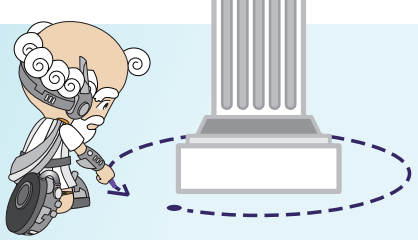
MS Word is one of the most popular office applications widely used for the production of resumes, research papers, technical documents, letters, forms, tables, brochures, proposals, surveys, and marketing research. MS Word documents can be shared through the Internet by attaching to e-mails, linking using HTML from a Web page, or uploading to an FTP or Web server. If you have an FTP server, you can upload your MS Word document to it and let your recipient download it from the URL of the FTP document.

Ethical Use of Word Processors

1. Do not tap hard on the keyboard when typing on your computer.
2. Do not just copy copyrighted items from the Internet, especially images and texts.

ROUND UP

The word processing program, MS Word, is the most popular with computer users when it comes to typing things like resumes and research papers. MS Word has features which allow users to manipulate letters, text, and pictures.



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DATE: _____

SCORE

A. Match column A with column B. Write your answer on the space before each number.

A	B
_____ 1. allows one to move up, down, or across a document	a. tabs
_____ 2. this appears at the bottom of the MS Word window and provides information such as the current page, and the total number of pages	b. title bar
_____ 3. blinking vertical line	c. Print Preview
_____ 4. found below the Ribbon	d. ruler
_____ 5. located at the very top of the MS Word screen	e. Print Layout view
_____ 6. most often used MS Word view	f. scroll bar
_____ 7. File, Home, Insert, Page Layout, References, Mailings, Review, View	g. text area
_____ 8. lets you check if the document is okay for printing	h. Ribbon
_____ 9. displays sets of command buttons that execute certain commands	i. status bar
_____ 10. a large area below the ruler where text is typed	j. cursor

B. Write T on the blank if the statement is True and F if it is False.

_____ 1. To change the font size of a word, the Home tab is clicked.

_____ 2. To exit MS Word, the File tab is clicked.

_____ 3. To insert a table in a document, the Insert menu is used.

_____ 4. To move to the next cell in a table, the Tab key is pressed.

_____ 5. The Delete and Backspace keys may be used to delete text in MS Word.

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_____ 6. Indentation allows the indentation of a paragraph from the left margin only.

_____ 7. Double-spacing is the default line spacing used in MS Word.

_____ 8. There are two types of alignment used in MS Word—left and right.

_____ 9. Spelling errors in MS Word are marked with a green wavy line.

_____ 10. Ctrl+C and Ctrl+P are used to copy and paste selected text in a document.

C. If you are to develop a word processing software in the future, what are the features that you would want to incorporate in it? Describe the features then make a layout or draft of your design.

Features:

_____

_____

_____

_____

Design:

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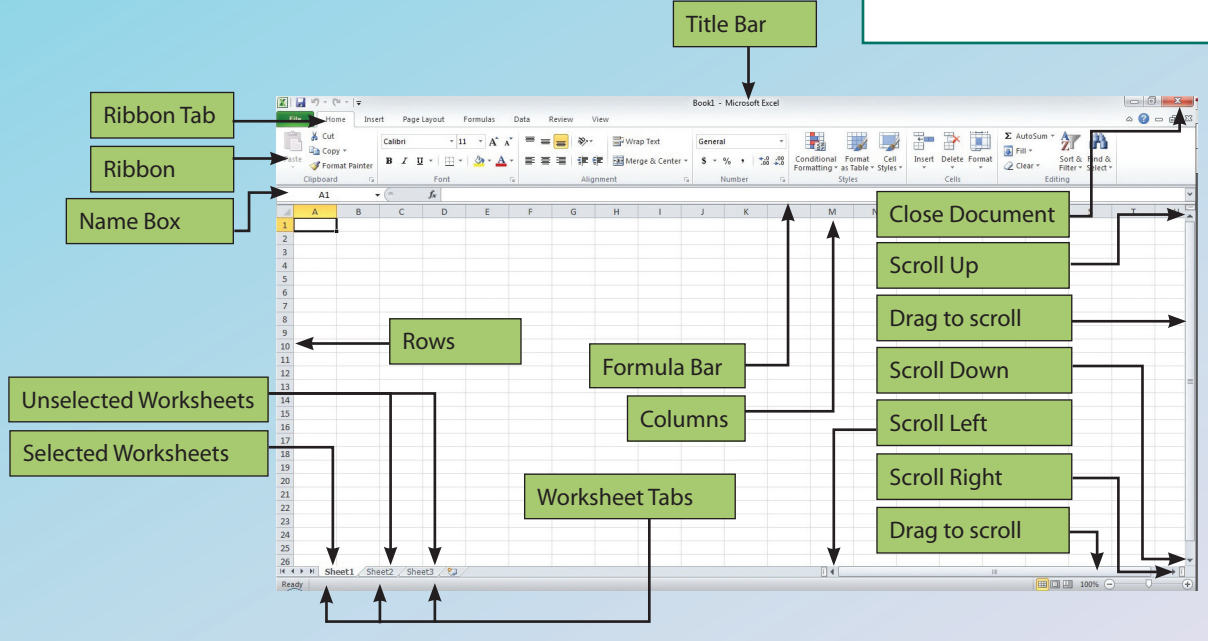
Brushing Up on Worksheets

- Demonstrate skills in using spreadsheets
- Create, save, and print MS Excel worksheets
- Identify the uses of MS Excel

MS Excel Screen

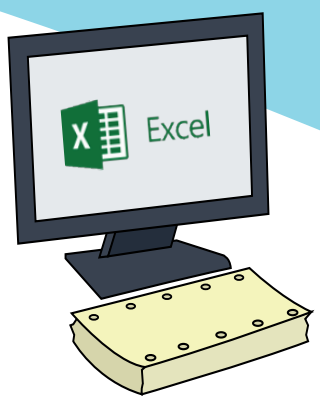
Microsoft Excel (MS Excel) is another application software that comes with the Microsoft Office suite. The name was derived from the word "cell" which is the basic part of a spreadsheet. A **cell** can hold data which can be letters or numbers. A cell is referenced by its row number and column letter. In a worksheet, there are thousands of cells which form a large tabular spreadsheet. Each cell is surrounded by grid lines. These borders do not appear when printed unless the border properties are changed.



MS Excel Features

Aside from the basics of creating tables and cells in the worksheet, Excel also lets you insert pictures and graphics, make a text box, and put hyperlinks to certain cell entries. It also has the **freeze/unfreeze** function, which allows you to retain a row or column when you view the whole worksheet in a workbook. You can also open "tab" delimited special files and graph data from the database.

Keyboard Shortcuts



Ctrl+Home. This brings you to the starting page of a spreadsheet.

Ctrl+End. This brings you to the end of a spreadsheet.

F2. This edits the active cell's content without overwriting it.

Arrow Key. This can be used to navigate cells instead of using a mouse.

Enter. This overwrites the cell's previous entry after typing your data on that cell.

Opening and Copying Worksheets

An MS Excel file is a workbook composed of three worksheets by default. Each worksheet can be accessed by clicking on its tab. To open an existing Excel workbook, click File > Open.

Copying Worksheets

To copy a worksheet to the same workbook:

1. Right-click on the tab of the worksheet to be copied.
2. Click *Move or Copy…*
3. Click to check *Create a copy*.

This process will create a new worksheet with the name and contents similar to where it was copied from.

Do you know?

Formulas can also be copied from cell to cell in one worksheet or even to other worksheets. A formula can be constructed such that it gets data from other worksheets for use in computations. Deleting worksheets presently linked to a formula will cause errors in the computations.

To copy a worksheet to a different workbook:

1. Follow steps 1 to 3 above.
2. Select the destination workbook (existing or new) from the panel that says *To book:*.
3. Click the sheet name that you want the moved or copied sheets placed in front of. Click *(move to end)* to place the sheets in the open workbook displayed into the *To book:* box. Then, click OK.

This will create a new worksheet with name and contents similar to where it was copied from.

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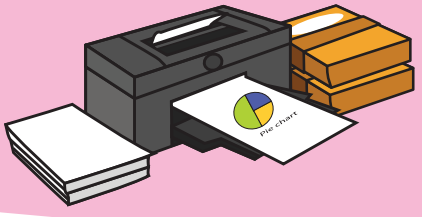
Saving and Printing MS Excel Workbooks

Here are some things to consider when saving an MS Excel file:

1. Specify the destination of the saved file, whether hard disk, USB flash drive, or network drive.
2. Give a filename with the extension *.xls* or *.xlsx*. Don't use special characters but instead use underscore and descriptive filenames.
3. For security reasons, you can create a password to open or modify the workbook.



You can save to a different format, for example, *.html/htm* as Web page. When saved as a Web page, a workbook's worksheets are separated into different HTML files. But when opened with a browser, it will have almost the same format as the one on the Excel screen.

You can print an MS Excel file using a local printer or a network printer. The local printer is directly connected to your computer, while the network printer is located somewhere in your local area network (LAN). Before you print your document, you can use Page Preview to check if the document is okay for printing.

Uses of MS Excel

MS Excel can be used for making forms and tabular documents that require computations (formulas are used), for accounting purposes (e.g., employee payroll computation), for importing/exporting database data to Excel (e.g., graphing data), for macros to make programs embedded in an Excel document, for storage of data and making a simple database.

MS Excel files can be shared on the Internet by: 1) attaching to e-mails (but make sure not to open files with macros as they may contain viruses); 2) uploading to an FTP or Web server for download; 3) linking the

Do you know?

An Excel worksheet is composed of many pages combined in one screen. So, if you want to print it, you have to specify a specific page number or else it will print all pages in the worksheet. You can use *Print Active Sheets* to select the specific pages that you want to print. The Print Preview area on the right of the Print tab's Backstage view lets you check if the selected page is correct.

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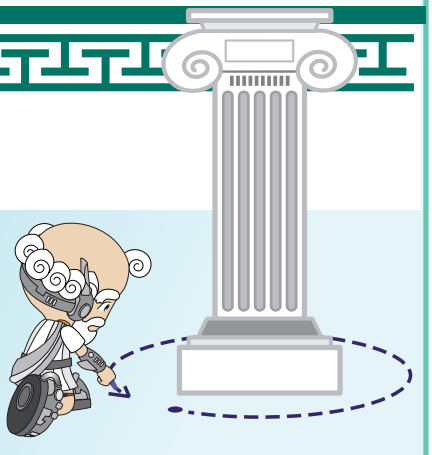
.xlsx document from an HTML Web page; and 4) inserting into an HTML document.

Excel's other cool features include comments, text alignment, formulas, copying worksheets from one workbook to another, computing formulas for using different worksheets, computing statistics based on data in an Excel worksheet, and even creating games.

ROUND UP

MS Excel is another popular program of the Microsoft Office suite. Its name is based on the word "cell" which is a basic part of spreadsheets. It is used in the production of forms and tables that accept numbers to be computed using special math formulas.



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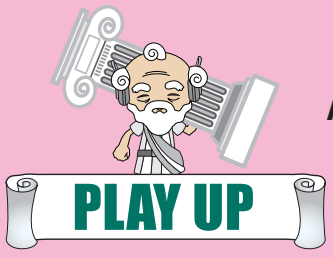

A. Match column A with column B. Write your answer on the space before each number.

A	B
_____ 1. composed of worksheets	a. values
_____ 2. contains columns and rows	b. title bar
_____ 3. A to IV	c. labels
_____ 4. set of prewritten formulas	d. worksheet
_____ 5. displays the name of the workbook being used	e. columns
_____ 6. A1	f. cell
_____ 7. numeric text on which mathematical calculations are performed	g. workbook
_____ 8. alphabetic, alphanumeric, or numeric text which does not perform mathematical calculations	h. rows
_____ 9. displays the address of the active cell	i. name box
_____ 10. 1 to 65536	j. functions

B. Write T on the blank if the statement is True and F if it is False.

_____ 1. In MS Excel, the number of decimal places of numeric values can be specified.

_____ 2. The merge and center feature is used to center a piece of text over several columns.

_____ 3. The AutoSum icon automatically adds a row of numbers.

_____ 4. In using a function, you supply both the operators and values to be calculated.

_____ 5. SUM is an MS Excel built-in function.

_____ 6. You can calculate the average of a set of values using the AVE function.

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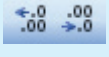
_____ 7. You can edit data in a cell by pressing F3.

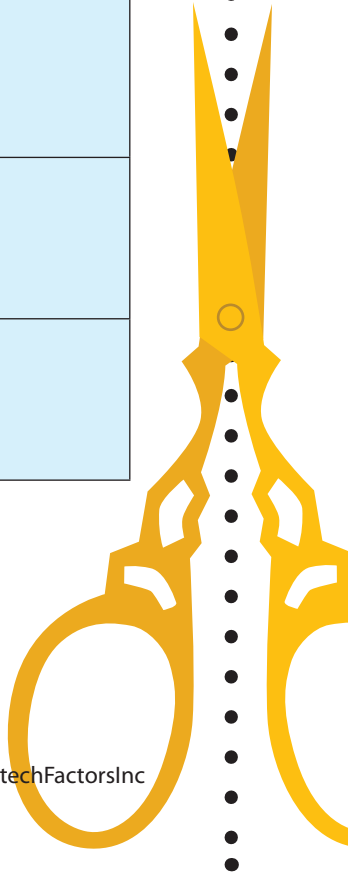
_____ 8. MS Excel calculations are performed from right to left.

_____ 9. Microsoft Excel's Charts group lets you create three kinds of MS Excel charts.

_____10. You can add background color to a cell or group of cells using Format Cells from the menu.

C. Find out the names of the following MS Excel icons and explain their function.

MS Excel Icon	Icon Name	Function
		
		
		
		
		



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Touching Base with Databases

- Identify the components of a database management system
- Create a database
- Demonstrate how to enter data into the database
- Demonstrate how to query data from the database

Components of a Database Management System

How does a database work? **Database software** (also called database management system or DBMS) are applications that allow you to store text, audio, video, and pictures into a database for future query and use. The DBMS can be installed in your local machine or "localhost." It can be found in a remote machine on the Internet. In the point of view of an ordinary user, a **database** is a storage area where information can be stored and accessed easily.

There are many types of databases. Available types of DBMS range from open-source (free) to commercial software. Examples of DBMS are SQL Server 2000, MS Access, Oracle, My SQL, PostGre SQL, Pervasive SQL 2000, Sybase, IMS, Informix, Ingress, Paradox, MSDE, and Foxpro.

All databases contain the following characteristics:

Database Table Name. All databases are composed of tables, where data are actually stored. In a database, no two tables can have the same name.

Columns and Rows. Similar to an MS Excel table, a database is composed of columns (vertical) and rows (horizontal). In MS Excel, you reference specific data through the intersection of a row and a column called a "cell." In a database, we reference a data by a name called "field." In searching a database, we don't actually use the columns and rows. Each data is referenced by a unique field and the table that contains it.

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Query Syntax. If MS Excel will be used as a database, it is very difficult to search for a specific data. In a database, it is easy to look for the data because it has some built-in functions for querying the data called **query syntax**.

Drivers and API. Drivers are software applications that help databases run in a specific operating system or software environment. An **application programming interface (API)**, on the other hand, is used by programmers to make programs that will "talk" to the databases.

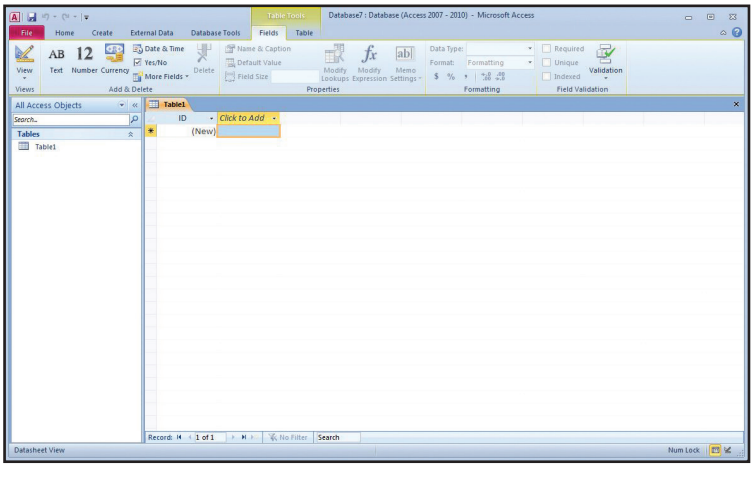
Creating a Database

In this lesson, we will use MS Access as our DBMS. **Microsoft Access** is a program that creates and manages databases. Its built-in features help you in constructing and viewing information. Microsoft Access breaks down a database in this way:

Database File. This is the main database file that you save to your hard drive or floppy disk (e.g., SchoolDatabase.mdb).

Table. This is a collection of data about a specific topic. There can be several tables in a database (e.g., Table #1 – Teachers, Table #2 – Students).

Field. These are the different categories or columns within a Table. Tables usually contain multiple fields (e.g., Last Name, First Name).



Record. This is a row entry of a table and consists of several fields.

Data types. These are the properties of each field. A field only has 1 data type (e.g., text or number). The datatype of a field determines the type of value it can store.

To create a database in MS Access, you should first run the Microsoft Access application. Just click on the Start button then All Programs. Go to the Microsoft Office folder and click on Microsoft Access 2010. Define the structure of the database by listing all of the field names, together with their corresponding data types and descriptions. You can't enter data into a database unless its structure has been defined first.

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MS Access has a graphical user interface (GUI) which allows you to use your mouse and keyboard to create databases.

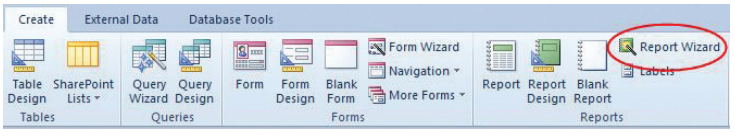
Entering Data into the Database

Databases can be used for many different applications such as for dynamic content websites, data center storage, accounting, and many others. Depending on your application, databases may contain different data. To make use of a database, information must first be entered.

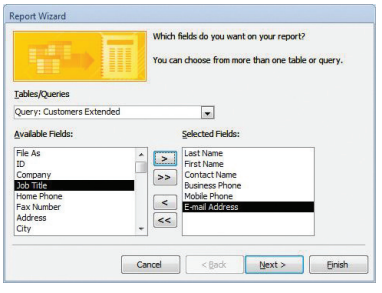
MS Access has two main views—Datasheet View  and Design View  . The Datasheet View lets you enter raw data into your database table. The Design View lets you enter fields, data types, and descriptions into your database table. Click on the Datasheet View to start entering data into each field.

To create a report using the Wizard:

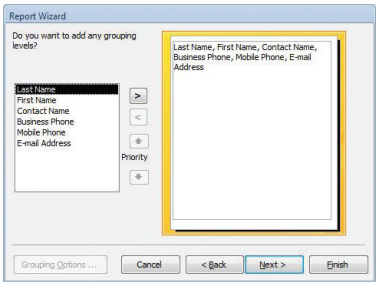
1. Click on the Create tab on the Ribbon, then select Report Wizard. The Report Wizard dialog box will appear.

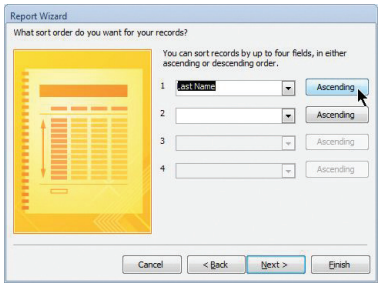


2. From the Tables/ Queries drop-down, choose the table or query that holds the data that you want to include in the report. Select individual fields by clicking the > button, or import all the fields with the >> button. When you are done, click Next.



3. The next screen allows you to assign grouping levels to your report to make it easier to read. Click Next when you are done.





4. The next page of the Wizard lets you choose the sorting order of the objects in your report. Click on Next when you are done.

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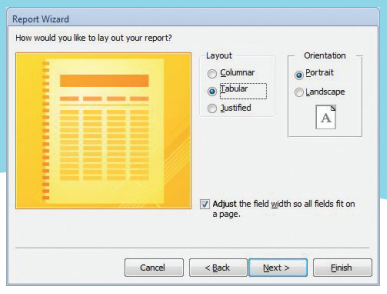
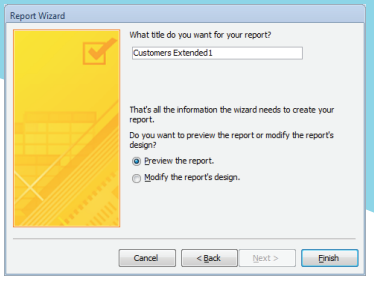
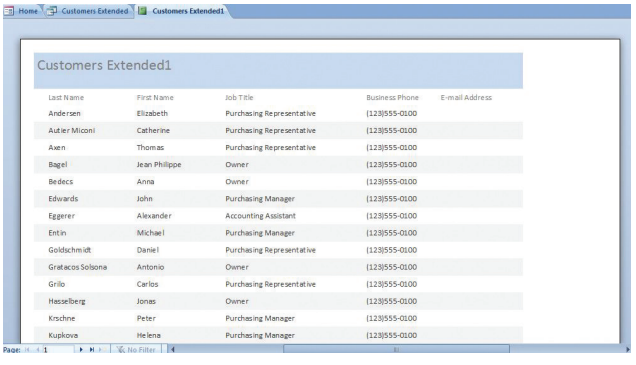


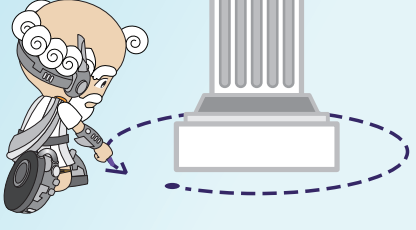
5. This page lets you set the different layout options for your report. Once you have made the appropriate changes, click Next.



6. Give your report a new name, then click on Finish when you are done. Note that MS Access will either show a preview of your report or allow you to make further changes to the layout based on the choice you select.



ROUND UP



Managing files that involve text, audio, video, and pictures for future use is made easier with database software. An example of this program is MS Access, which can create databases where related data may be stored and easily accessed.

Databases are used for different applications like websites and accounting programs. You can access information from a database or create a report for viewing or printing.

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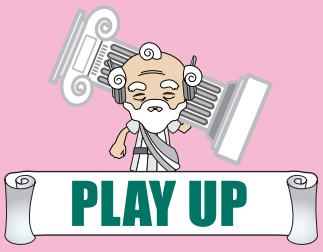

A. Match column A with column B. Write your answer on the space before each number.

A		B
_____ 1.	a storage area where information can be stored and accessed	a. Application Programming Interface
_____ 2.	software applications that help databases run in specific operating systems	b. DBMS
_____ 3.	built-in functions for querying data	c. database
_____ 4.	used by programmers in creating programs that will talk to databases	d. localhost
_____ 5.	where DBMS can be installed	e. drivers
_____ 6.	an application that allows you to store text, audio, video, and pictures into a database	f. record
_____ 7.	properties of a field	g. table
_____ 8.	row entry in a table	h. database file
_____ 9.	collection of data about a specific topic	i. query syntax
_____ 10.	the main database file saved in a hard drive	j. data types

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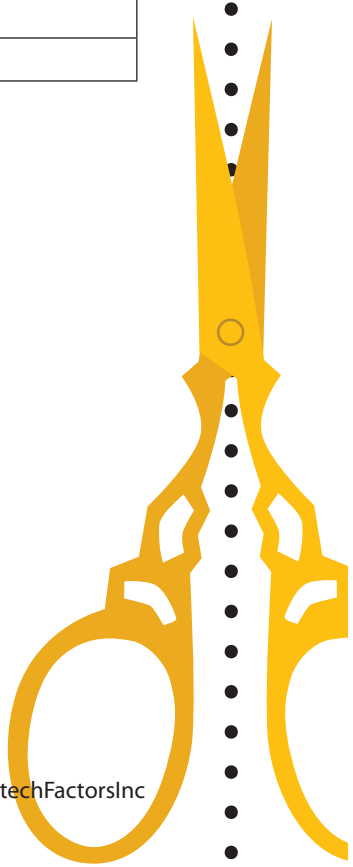
B. Design a simple database for a grocery store. Each table should contain information about one subject and the fields should be facts that you would need for that particular subject. Label each table and write the field names in the first row of each table. Then add the appropriate data on the succeeding rows.

Table 1: _____

Table 2: _____

Table 3: _____



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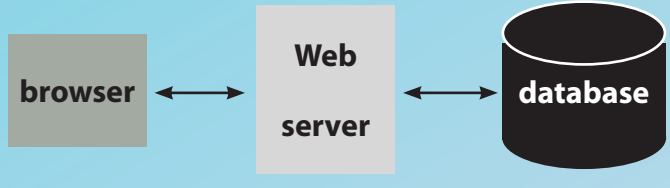
Lesson 12

More Database Details

- Explain the different ways of extracting data from the database
- Explain why databases should have efficient design

Database Interfacing

Databases will not be very usable if there are no systems that can interface with them. **Database interfacing** is a process of making programs or scripts that will query the databases in order to display or process the data. An example of a dynamic website or database-driven website is shown in the diagram. When a user surfs a website, the content is actually from a database. Advanced tools such as PHP/MySQL, ASP.NET, JSP, XML, ColdFusion, Perl, and CGI are needed to make a dynamic website.



The advancements in programming have made possible the explosive growth of database-driven applications. There are now many types of databases that run on different types of operating systems or software environments. In order for programming languages to talk with databases, programmers have developed different application programming interfaces (API) that specify how a certain program can talk to another program like a database.

Databases and their APIs have made possible the creation of dynamic websites or database-driven websites (i.e., news portals, forums, blogs, etc). Databases can be displayed by different markup languages such as XML, HTML, WML, DHTML etc. Using Java, PHP, C, Perl, and other programming languages, databases have become integrated in almost all types of interfaces ranging from websites to mobile phones.

Databases connected to a network can be accessed using the TCP/IP connection. These databases usually require you to specify the IP address, username, password, and connection type. Databases also use ports where they listen for connections from

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outside clients. To query the database, for example, your program can include a query like this:

"SELECT name, address, contact from database_table1".

You can also use the "INSERT" command on a database such as:

"INSERT into database_table1 values ('$name','$address','$contact')".

How Do Programs Communicate with Databases?

Connect to Database. Specify the hostname/IP address of the database, and the username and password on the database.

Prepare. Specify the command (SELECT, INSERT, UPDATE).

Execute. Execute the command with current parameters. This may return a result.

Display results. This can be a website, Windows application, or simple text file.

Responsible and Safe Use of Databases

- regular backup and maintenance of database server
- setting of user access permissions and grants
- keeping passwords secure

Common Hardware and Software Problems

- network problems (database is not accessible)
- authentication problems (username/password or IP address is wrong)
- data problems (data may not conform to types allowed)
- query syntax problems (wrong syntax)
- grants and permissions (no permission to use database)
- large database slows down performance
- simultaneous connections slow down the database

Wrong Perception of Databases

Don't compare Excel tables with databases. Databases are made by creating different stand-alone tables. Beginners may think it's simple to create and populate databases. But once you need to extract data from the databases, it's very difficult especially when the tables are not properly structured. And in terms of performance,

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speed and optimization, simple database structures may not work and meet the requirements of a complex system which may require databases to share data to different subsystems. To solve this problem, databases must be designed properly. E-R diagrams and normalization procedures must be done.

Guidelines in Creating Databases

Analyzing the Problem. The design of any system starts with gathering user requirements especially on who will use the database and what applications will interface with it. Most databases should be designed for usability. And most databases are now residing in a networked environment. Database designs must be flexible enough in order to save time and effort in future changes.

E-R Diagrams. Entity-Relationship (E-R) diagrams are illustrations of database fields and their relationship to each other in the different tables.

Normalization. This is the process of optimizing the number of tables in the database. This process creates tables that don't have duplicated data. In simple databases, there are fields or data that may be the same as in other tables. In normalized tables, we use "primary keys" and "foreign keys" to separate the different unique tables.

Database Design and Normalization

Within the Relational Database Model, a set of rules has been established to help you design tables that are meant to be connected through relationships. This set of rules is known as normalization. It can be applied to any relational database including Access, dBase, Oracle, etc. The benefits of normalizing your database include: 1) avoiding repetitive entries; 2) reducing required storage space; 3) preventing the need to restructure existing tables to accommodate new data; and 4) increased speed and flexibility of queries, sorts, and summaries.

There are five normal forms in all, each progressively building on its predecessor. In order to reach peak efficiency, it is recommended that relational databases be normalized through at least the third normal form. In order to normalize a database, each table should have a primary key field that uniquely identifies each record in that table. A **primary key** can consist of a single field (an ID Number field for instance) or a combination of two or more fields (called a multiple field primary key) that together make a unique key.

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The First Normal Form

A table is considered to be in First Normal Form if data has been divided into the smallest data elements possible. Also, it should not have duplicate groups of similar data within a row, or multiple values within a single field. Consider the following table:

Table 1

Agent Name	Address	Customer 1	Credit Amount1	Customer 2	Credit Amount 2
Sally Cruz	23 Vista St. Pasig MM	Wizard Corp.	P 30,000.00	Pets Inc.	P10,000.00
Jason Lim	56 Narra St. Makati MM	GTB Co.	P 50,000.00		

Some of the fields in this table contain too much data so we will need to split these into several fields:

Table 2

Agent ID	Last Name	First Name	Street	City	Province
001	Cruz	Sally	23 Vista St.	Pasig	MM
002	Lim	Jason	56 Narra St.	Makati	MM

In Table 1, there are two Customer and Credit Amount columns, but not all agents would have two customers, and others may even have more. To solve this, we will need to make records for the Customers as well:

Table 3

Agent ID	Last Name	First Name	Customer Name	Credit Amount
001	Cruz	Sally	Wizard Corp.	P30,000.00
001	Cruz	Sally	Pets Inc.	P10,000.00
002	Lim	Jason	GTB Inc.	P50,000.00

Table 3 is now in First Normal Form, but the problem is that there are repeating values in the primary key, Agent ID, which should not be the case. We therefore need to create another way of identifying each record. By adding another primary key, Customer ID, we create a multiple field primary key.

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Table 4

Agent ID	Last Name	First Name	Customer ID	Customer Name	Credit Amount
001	Cruz	Sally	1011	Wizard Corp.	P30,000.00
001	Cruz	Sally	1012	Pets Inc.	P10,000.00
002	Lim	Jason	1013	GTB Inc.	P50,000.00

You now have two primary keys in Table 3—Agent ID and Customer ID. Having a Customer ID will also minimize confusion if more than one agent were to have the same customer.

The Second Normal Form

A table is in Second Normal Form if it complies with the requirements of the First Normal Form. In addition, non-key fields should have a direct relation with the primary keys. Table 4 does not conform to the Second Normal Form because while Agent ID directly relates to the fields Last Name and First Name, it has no direct relation to the Customer Name and Credit Amount. In the same way, Customer ID is directly related to Customer Name and Credit Amount but has no relation to the Agent First and Last Names. The creation of two tables will solve this problem:

Table 5

Agent ID	Last Name	First Name
001	Cruz	Sally
002	Lim	Jason

Table 6

Customer ID	Customer Name	Credit Amount
11011	Wizard Corp.	P30,000.00
11012	Pets Inc.	P10,000.00
11013	GTB Inc.	P50,000.00

In Table 5, the First and Last Name fields are dependent on the primary key, Agent ID. In Table 6, Customer Name and Credit Amount are directly related to Customer ID.

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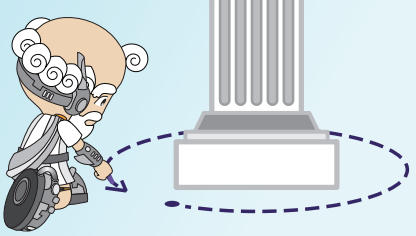
The Third Normal Form

A table is considered to be in Third Normal Form if it meets the requirements of the first and second normal forms. Also, it should have a single field as its primary key. Tables 5 and 6 above are also examples of the Third Normal Form.

ROUND UP



A database is useless if it doesn't have a good interface design to make the display of data easier. Advancements in programming have made possible the growth of database-dependent applications that use such interfaces. A database is not to be confused with a spreadsheet table because they are made by creating different stand-alone tables.

When making a database, it is best to identify the need first, then design tables that use rules called normalization before setting up the relationships of the objects involved.

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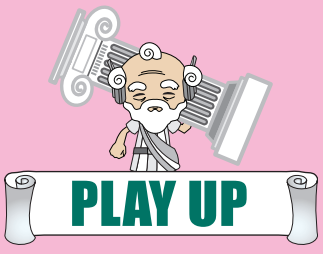

A. Write T on the blank if the statement is True and F if it is.

_____ 1. Excel tables are the same as database tables.

_____ 2. Normalization is the process of optimizing the number of tables in the database.

_____ 3. Normalization is done to avoid repetitive entries in tables.

_____ 4. Only foreign keys are used in the normalization process.

_____ 5. Database normalization makes the query process faster.

_____ 6. E-R diagrams illustrate the relationship of database tables.

_____ 7. A foreign key uniquely identifies each record in a table.

_____ 8. Connecting to a database requires a username and password.

_____ 9. Databases use ports to listen for connections from outside clients.

_____ 10. A result of a query from the database may be displayed through a text file.

_____ 11. A primary key can be a single field or a combination of two or more fields that together make a unique key.

_____ 12. A table conforms to the First Normal Form if it is divided into the smallest data elements possible.

_____ 13. A database is the same as a spreadsheet table.

_____ 14. Databases are still very usable even if there are no systems to interface with them.

_____ 15. Databases connected to a network can be accessed using the TCP/IP connection.

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B. Convert the following table to conform up to the Second Normal Form.

Service ID	Service Date	Patient ID	Patient Name	Patient Address	Service Code	Service Description	Price
82345	03/11/08	1001	Marian Sison	15 Sampaloc St. Manila	1001 1004	Urinalysis Chest Xray	300.00 400.00
82346	03/15/08	1002	Dindo Luna	4 Benito St., Pandacan	1012	CBC	250.00
82347	03/20/08	1003	Cris Chavez	21 Harvest St. Pasig	1020 1001	Fecalysis Urinalysis	350.00 300.00

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Brushing Up on Presentations

- Create, save and print presentations
- Demonstrate the many uses of MS PowerPoint

MS PowerPoint Screen

Microsoft PowerPoint (MS PowerPoint) is an important component in the suite of programs known collectively as Microsoft Office. PowerPoint provides a complete set of resources for creating presentations. Several presentation formats are available, including lectures, kiosks, photo albums, and much more. Multimedia can be included in the presentation so that key concepts can be explained using images, audio, video, and text. Presentations can be exported to the World Wide Web or can be exported to stand alone as QuickTime movies.

In the pre-PowerPoint era, lectures that did not use chalk or movie reels generally made use of transparencies or slides. **Transparencies** could be created from slide notes with larger fonts (or by enlarging typewriter notes using a photocopier). While the turnaround time was sufficient for many projects, the process was quite tedious, and the reproduction quality of original data could be less than desirable.

PowerPoint's beginnings stem from the frustrations that come with creating slides and transparencies. In April 1987 the Forethought Company from Sunnyvale, California published PowerPoint 1.0. PowerPoint was originally named "Presenter," and although the original goal was a Windows program, the developer changed his mind and created a Macintosh program instead. The original PowerPoint was exclusively for the Macintosh market, and it took sixteen months to create. Offering black and white colors only, PowerPoint offered a variety of line and drawing tools with handout and note pages, and it could be run from a single disk (no hard disk was required!).

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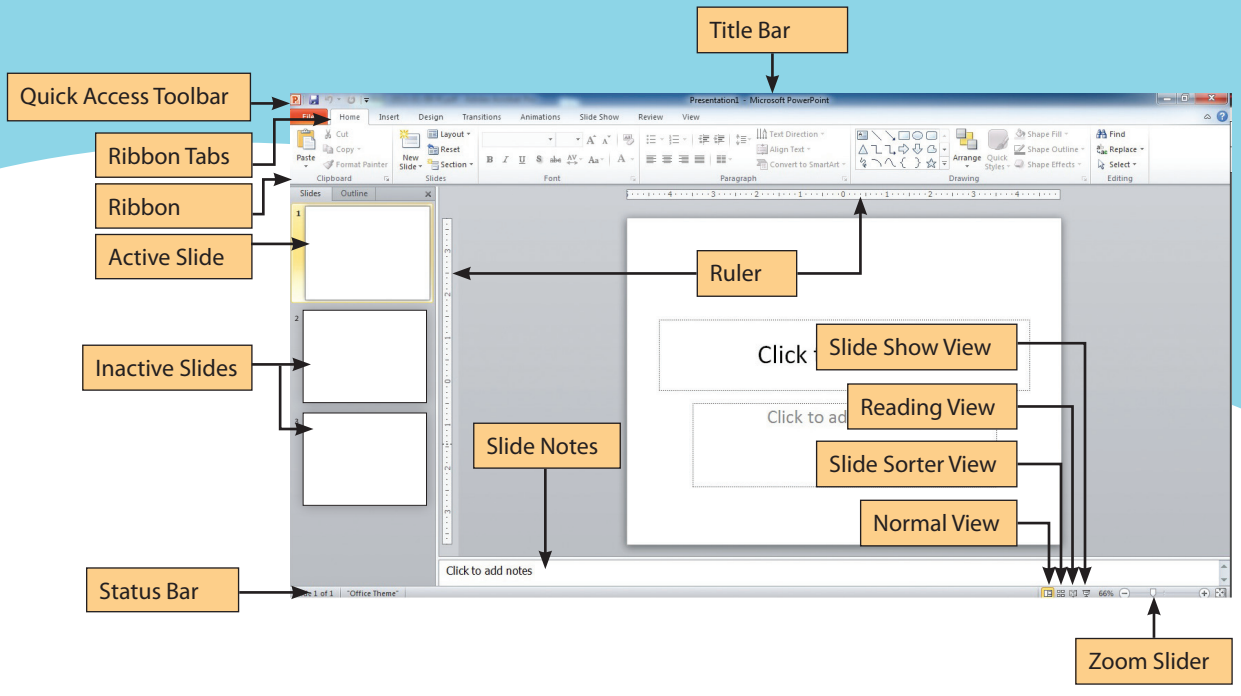

MS PowerPoint Features

MS PowerPoint makes it possible for us to create office presentations and multimedia slideshows. Sending to the Internet is done through:

- e-mail attachments with the extensions *.pptx* and *.pps*
- FTP/Web server uploads
- HTML links

With PowerPoint, we can do the folowing:

1. insert pictures and graphics
2. put hyperlinks to certain objects
3. make a text box
4. copy a slide or duplicate a slide
5. create a template
6. create hyperlinks in slides by linking to a document (.docx), a local slide, or a website

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Keyboard Shortcuts

F5. This brings you to the starting slide of the presentation.

F7. This checks spelling of the texts in the presentation slides.

F1. This displays Help for MS PowerPoint.

Creating/Opening a File

An MS PowerPoint presentation is composed of **slides**. Each slide can contain many graphics, texts, sound, or video in order to convey something to the audience.

- To open a new blank MS PowerPoint presentation, Click File > New > Blank presentation.
- To open a new MS PowerPoint presentation from template, Click File > New. On the Backstage view that appears, click *Sample templates*.
- To copy a slide:
  1. Go to Normal or Slide Sorter view. In Normal view, click on the Slides tab on the left side of the screen to display the Slides pane.
  2. Click on the slide you want to copy, then press Ctrl+C.
  3. Then go to where you want it pasted, then press Ctrl+V.

Common MS PowerPoint Problems

Here are some common problems you may encounter while using MS PowerPoint, along with possible solutions:

On Printing Documents

Make sure to check the printer settings. You may print documents as black and white or colored depending on the document or printer. Some printers can be configured to disable colors. It is also advisable to print PowerPoint slides as handouts because printing original slides can consume a lot of ink.

On Inserting Graphics

Check the layout of the graphics in your slide. The Layout option in the Slides group of the Home tab may be used to modify layout automatically. It is also important to check the graphics file size and to reduce large files if necessary.

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Saving and Printing PowerPoint Files

Here are some things to consider when saving an MS PowerPoint presentation:

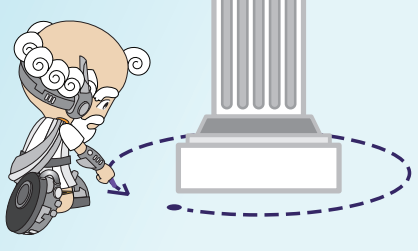
1. Specify the destination of the saved file, whether hard disk, USB flash drive, or network drive.
2. Give a name to your file. The filename extensions of MS PowerPoint files are *.ppt*, *.pptx*, *.pps,* or *.ppsx*. Use descriptive filenames.
3. For security reasons you can create a password to open or modify the document.

Do you know?

PowerPoint consists of high-color graphics and images which may waste too much ink when printed as they are. This problem is solved by printing the "Handouts" only. In this method, you can print 2-6 slides in a page.

ROUND UP

When there is a need to create presentations like lectures using the computer, the first application that comes to mind is Microsoft PowerPoint because it has multimedia capabilities to give the audience a complete audiovisual experience through slideshows.



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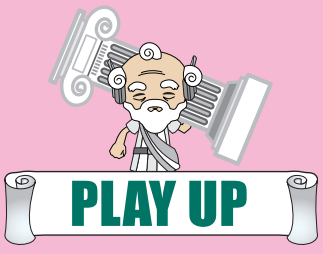
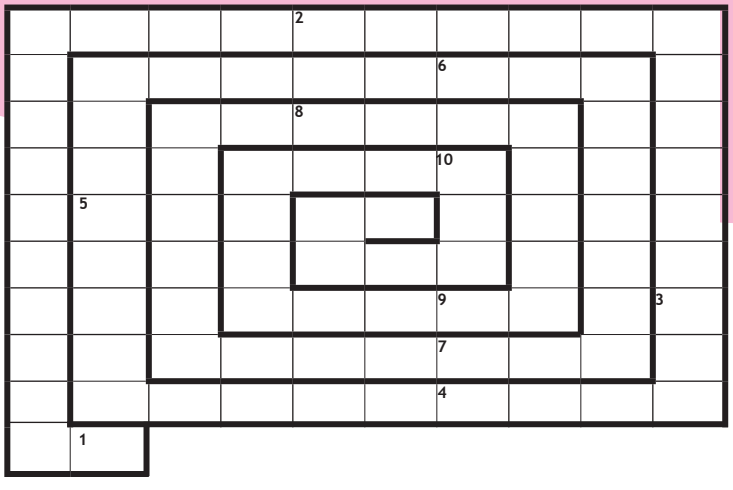


A. Spiral Word Puzzle

Identify the word being described in each number. Write the letters of the words in clockwise direction in the spiral puzzle starting at number 1. If you need more help, you may refer to the list of words given below.



1 used as slides in the pre-PowerPoint era
2 view that displays thumbnails of all your slides
3 vertical and horizontal guides
4 view that displays the slides as they will look in the final presentation
5 you can print slides in this format to save on ink
6 a special effect used to introduce a slide during a slide show
7 holds the objects in slides
8 a window that appears on the right side of the screen for options like Clip Art and Research to enable certain tasks
9 this links a text, an object or some other element to another document, webpage, or application
10 a tab that displays the text contained in the presentation

Words to be used in the puzzle:

ruler slide sorter	placeholder outline	slide show transition	hyperlink task pane	transparencies handouts

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B. Write T on the blank if the statement is True and F if it is False.

_____ 1. F5 runs the slide show.

_____ 2. MS PowerPoint gives you the option of printing your slides as handouts.

_____ 3. Design templates provide attractive backgrounds for your PowerPoint slides.

_____ 4. The Title slide contains two placeholders for the title and the subtitle of your presentation.

_____ 5. The text boxes in a slide cannot be resized and moved to another location.

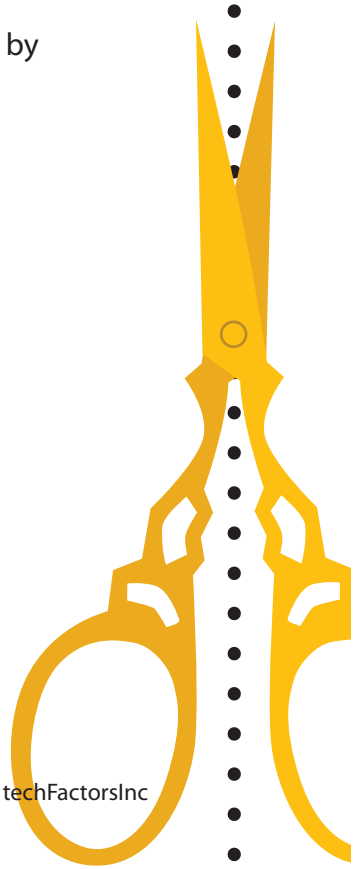
_____ 6. The command used to change the background color of your slides can be found in the Design tab.

_____ 7. Like MS Word, MS PowerPoint can also check the spelling in your presentation.

_____ 8. In MS PowerPoint, you have the option of adding visual and sound effects to your presentation by using the Insert tab.

_____ 9. You can only preview animation settings for your current slide by running the entire slide show.

_____ 10. The END key is used to stop the slide show.



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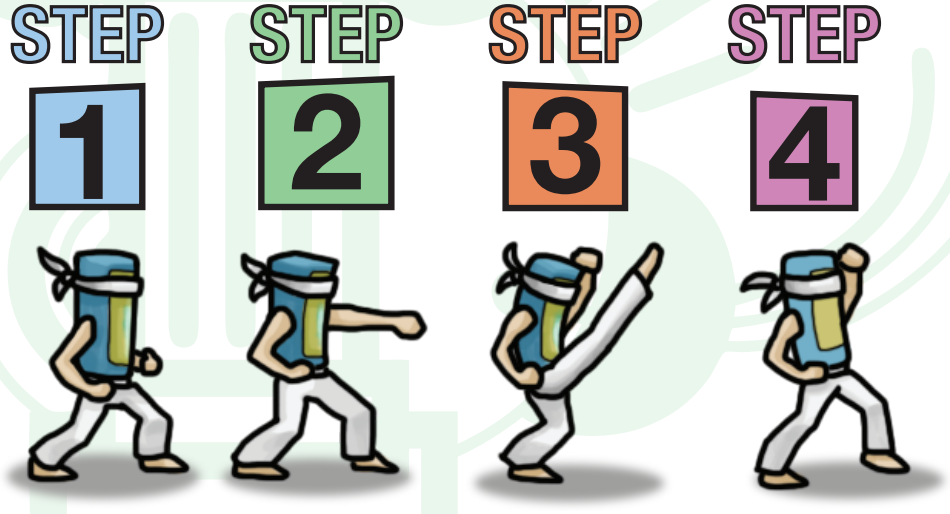
Section 5

Programming in Principle

Computers, you may say, are endowed with great intelligence. And their effectiveness and efficiency in performing a wide range of tasks make them practically indispensable. But even the most powerful of computers can become a nuisance—even useless—if something went wrong with any part of its programming.

In this section, you will learn certain basics in programming, including the different programming paradigms and the program development cycle. You will also understand the importance of providing a computer with relevant, sequential step-by-step instructions for it to be able to successfully execute the commands you give it.



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Problem Solving in Programming

Picture a monkey in a room. At the center of the ceiling, a bunch of bananas hang from a wire. In a corner of the room, there is a wooden box and a stick. The monkey is hungry, but the bananas are out of its reach. What can the monkey do?

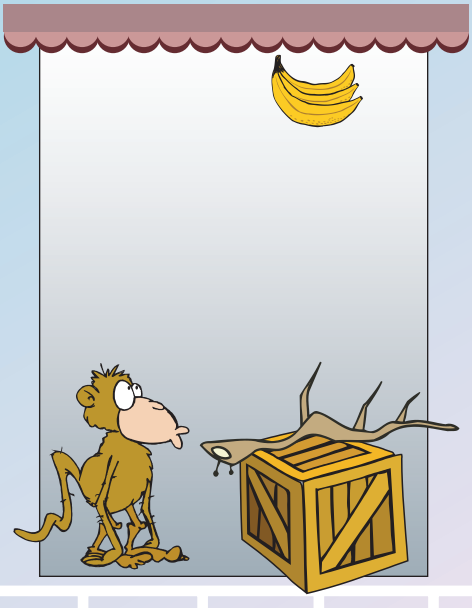
There are three possible ways for the monkey to get the bananas:

1. The monkey can stand on the box.
2. The monkey can use the stick.
3. The monkey can use the stick while standing on the box.

Just like the monkey, we also face everyday situations that call for problems to be provided with solutions. In many cases, we can solve the problems on our own. Still, there are problems that are hard to solve just by ourselves. This is why we need to use tools and follow steps to arrive at solutions. One of the tools invented to help us solve problems is the computer.

Like us, computers need to follow certain steps to be able to solve problems or finish a task. A computer needs to be told what to do for it to be useful. It needs a series of instructions, which are called **computer programs**. These programs specify steps of operations for a computer to follow in order to perform tasks. Many computer programs were written to solve problems. Some are simple, such as computing for someone's age based on his birthdate. Others, such as those used to predict the weather, are very complex.

- ✓ Define computer programs
- ✓ Illustrate the practical uses of computer programs
- ✓ Enumerate the various programming paradigms



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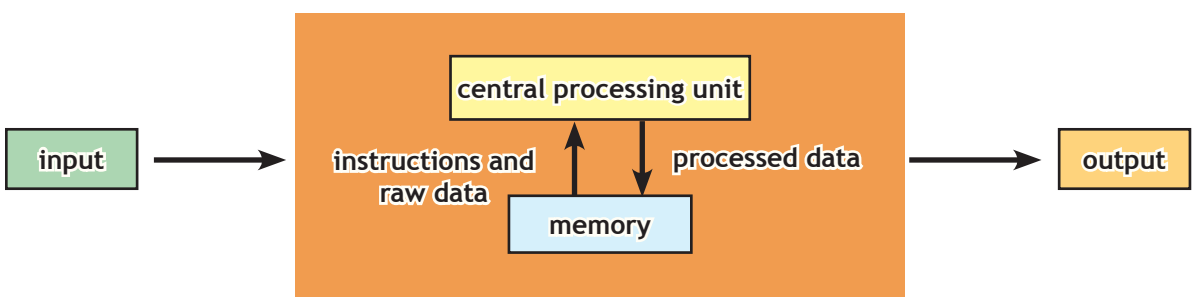
Programs as Solutions to Problems

The instructions that are followed by the computer are called **algorithms.** These are written according to the rules of programming. These instructions are what a computer follows to solve a problem or finish a task. A program exists so that the central processing unit (CPU) of a computer can follow commands. The program tells the computer what to do for it to be able to appropriately use inputs, like what is typed on a keyboard. A program also determines how the computer will handle the output for a task it was given.

The four basic components of information processing are: the CPU, memory, input, and output. A computer uses these to handle data and instructions.

> A human being should be able to change a diaper, plan an invasion, butcher a hog, con a ship, design a building, write a sonnet, balance accounts, build a wall, set a bone, comfort the dying, take orders, give orders, cooperate, act alone, solve equations, analyze a new problem, pitch manure, program a computer, cook a tasty meal, fight efficiently, die gallantly. Specialization is for insects.
>
> – Robert Heinlein, *Time Enough For Love*



How information is processed

Programming Paradigms

Remember how the monkey had a number of choices for it to solve its problem? It can use either the box or the stick, or both at the same time. It can also throw the stick at the bananas to make them fall.

Like the monkey, computer programmers can use different algorithmic paths or steps to arrive at an ending or conclusion.

The manner and method of solving a problem and writing a computer program to arrive at a solution is called **programming paradigm**.

In the succeeding pages are examples of programming paradigms.

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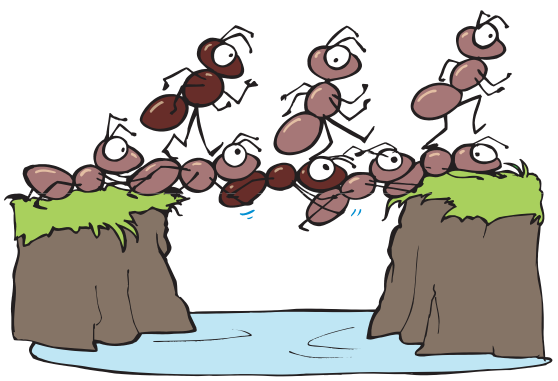
Imperative (Procedural) Programming

This makes use of a series of step-by-step operations on a set of variables. 'First do this, and then do that,' is the basic phrase that illustrates how imperative or procedural programming works.

This paradigm can be compared to the procedure on how to lock the keypad of a cellular phone. Each step in the process is necessary before the next step can be done. The last step in the procedure always results in a desired outcome. For example, to lock the keypad of a particular brand of cell phone, the user must press (1) the Menu button, and then (2) the asterisk button. When these actions are done, the outcome of the keypad being locked is achieved.

Programming languages such as BASIC, Pascal, FORTRAN, C, C++, and Python use the procedural programming paradigm."

Object-oriented Programming



Object-oriented programming is the paradigm that emphasizes the components of a program, called *objects*, rather than actions performed by the program. An object-oriented program explains how to manipulate such objects instead of the logic behind each. When objects are grouped together based on their operations, functions, and behaviors, they are called a *class*.

Objects, in turn, have unique attributes or properties. They can be grouped together based on their operations, functions, and behaviors. As an example, think of an ant colony as an object-oriented program. The ant colony is composed of the queen, the soldiers, and the worker ants. Each kind of ant has a unique function within the colony: the queen lays eggs, the soldiers protect the colony, and the worker ants gather food and tend to the queen. Each also has unique attributes. The queen is the only one who can lay eggs, the mating males have wings, the soldiers are the large ones, and the worker ants are the most numerous of them all. Together, the members of the ant colony function as one for the colony to expand the community, collect food, and tend to the young.

The ants are the objects in the program. These objects can be generalized into *classes*, which carry the attributes that define their function and the data that they can contain.

Object-oriented programming languages include Java, C++, Pharo, and Smalltalk.

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Functional Programming

This paradigm is"what-oriented." It emphasizes the problem to be solved rather than the steps needed to produce an outcome. Here, algorithms use mathematical functions as the means to arrive at a solution. To illustrate, a functional programmer would want to ask "how many steps are needed to walk up to the next floor," instead of "how he can get from one floor to the next."

A **functional programming** language allows a program to be created and corrected easily because it explains how a command is done rather than what effect it can have. This is why functional programming languages, like Lisp, Scheme, Haskell, OCaml and Clojure are popular in research and education.

Logic Programming

This computing paradigm is also known as *rule-based programming*. This paradigm solves a problem by following the logic of the rules set by the program.

For example, to identify a particular animal, you need to establish some rules to evaluate the aspect that needs to be identified. So the rules could ask for the number of legs the animal has; what pattern is on its fur; or, if it is horned, tailed, hoofed, or pawed. You can narrow down the choices by examining what you have according to the rules that you set.

Symbolic and Non-symbolic Programming

The paradigms themselves show the difference between symbolic and non-symbolic programming. **Symbolic programming**, as used by object-based programs, involves the manipulation of abstract symbols. An example would be how a doctor gives a diagnosis to a patient. Symbolic programming involves a level of understanding when solving a problem. On the other hand, **non-symbolic programming**, as used by a functional program, involves a lot of mathematical calculations. An example is a program that computes the average final grade of each student in a class.

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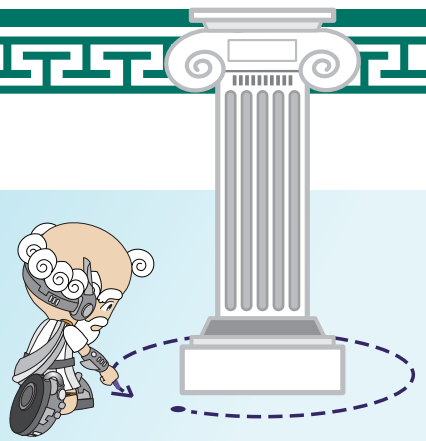

One machine that can help provide solutions to a problem is the computer. The set of instructions given to the computer on how to solve a particular problem is called a computer program. The manner and method by which computer programs solve a problem is called programming paradigm. Common paradigms are object-oriented programming, imperative or procedural programming, rule-based programming, and functional programming.

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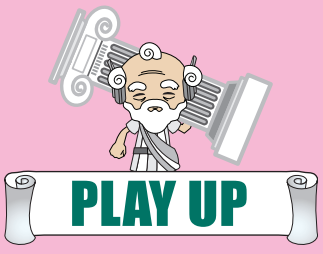

A. Match each word or phrase on the left with the correct meaning on the right. Write the letter of your answer on the space provided.

___1.	algorithm	a.	result
___2.	output	b.	a set of instructions followed by the computer
___3.	program	c.	programming used by functional programs
___4.	non-symbolic programming	d.	steps of operations for a computer
___5.	symbolic programming	e.	programming used by object-based programs
___6.	logic programming	f.	an example of Imperative programming
___7.	objects	g.	group of objects
___8.	BASIC	h.	a "what oriented" programming paradigm
___9.	functional programming	i.	components of a program
___10.	class	j.	also known as rule-based programming

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B. Provide what are asked for. Write your answers on the space provided.

1. The 4 programming paradigms

_____ _____

_____ _____

2. Four basic components of information processing

_____ _____

_____ _____

3. Illustration of how information is processed

C. Differentiate Symbolic and Non-Symbolic Programming. Unravel the key phrases below for each type and use them in a sentence.

Symbolic Programming: sabnpulatin al mstractopo fymbos

Non-Symbolic Programming: tolatheulatiac scammlcaon

_____

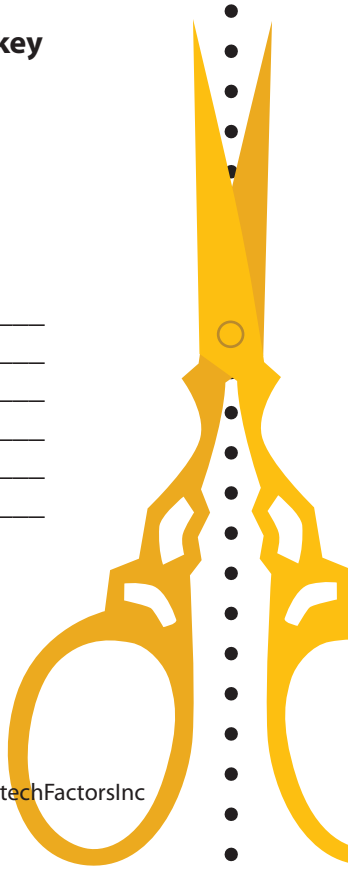
_____

_____

_____

_____

_____



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So What Exactly Is the Problem?

When was the last time you did not feel very well and had to go to the doctor? What did the doctor do when you told him you felt sick or were not feeling well?

Before a doctor can help you, he first has to check what is wrong with you. "Feeling sick" and "not feeling well" are vague complaints—not enough for a complete diagnosis. For the doctor to make the right conclusion about what ails you, he has to conduct a series of preliminary tests. He will check your heartbeat, your temperature, the way you breathe, and even the color of your tonsils. After that, he will write a prescription and give it to the nurse who will give you your medicines and carry out the doctor's instructions.

- ✓ Explain the problem definition step
- ✓ Define algorithm, source code, and machine code

In computer programming, steps are needed for a problem to be solved. These are like the steps taken by the doctor to discover the nature of an illness. Knowing what needs to be solved is the first and most important step of the program development cycle. Identifying the problem wrongly will only bring wrong solutions.

Input and Output

It is essential to know the details of a problem. Such input will provide an idea of what you might need for you to come up with a solution. For the doctor, the input would be the results of the tests administered to a patient—the temperature, the heart rate, the sound made when the patient breathes, the color of his tonsils, etc. For computers, **input** means the data that users enter into computers and which need to be processed.

Input is processed by a computer.

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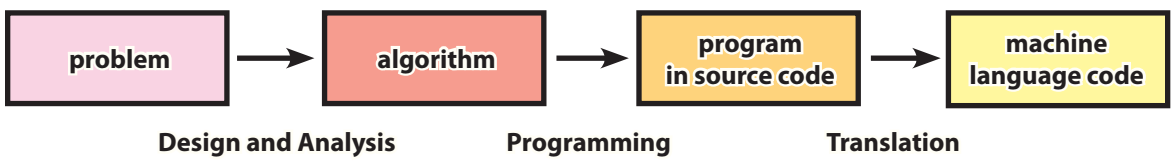
Getting an idea of what the problem is will also give you an idea of what the solution should be. In the case of the doctor, the solution is the prescription of specific medicines for the illness. The solution is the output, or what he actually wants to get from the problem-solving process. In computers, the **output** is the information produced by the computer program after processing data.

Program Development

Now, just as the doctor's diagnosis and treatment are needed to cure an ailment, a computer program is needed to solve a specific problem. Below is a simple diagram that illustrates how a program is developed until it is ready to be run in the computer.



The problem is analyzed and a solution is created in the form of an algorithm.

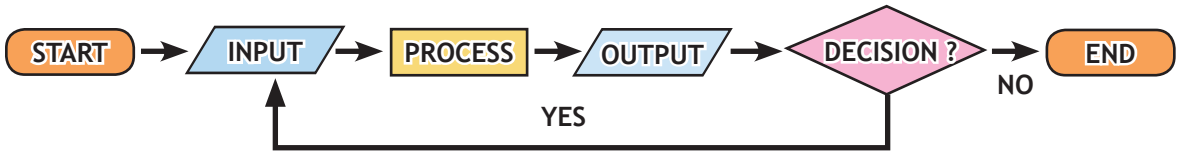
Algorithm, Source Code, and Machine Language Code

To develop a program, you first need to analyze the problem and design an algorithm. An algorithm lists the steps needed to solve a problem. It serves as an outline of the program. It is readable, even by non-programmers, and is used as a guide when constructing a program. After the algorithm is written, you then write the program, which is translated afterward to machine language code. Only then will it be ready to run on the computer.

Do you know?

Programming languages, which include C, Pascal, and Java, are usually called *high-level languages*. The C language is sometimes called a *middle-level language* because of its low-level coding formats. Assembly languages are considered *low-level languages* because they are just a bit more readable compared to machine code.

When you implement an algorithm using the rules and conventions of a programming language, you also produce the program **source code**. The source code is like the prescription that the doctor writes for the nurse to give to the patient.



A flowchart represents an algorithm.

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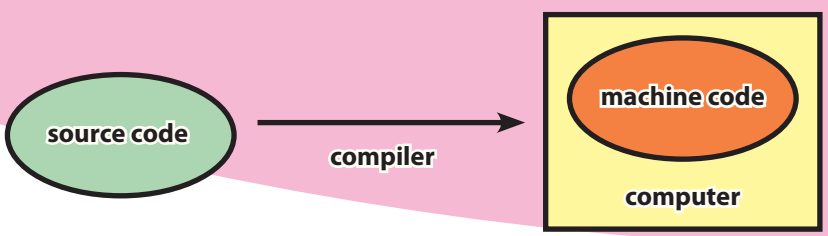
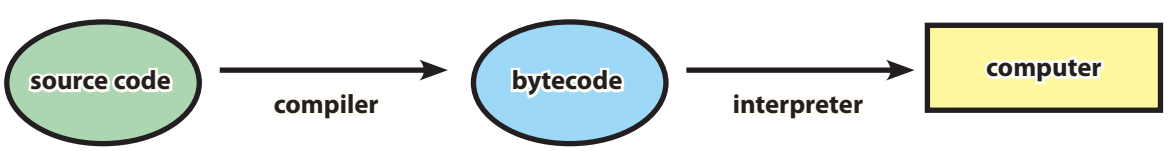
The source code contains logically arranged instructions for the computer, but it is not yet *executable*. This means it is yet to be carried out as an instruction in the computer. It is just plain text written according to the grammar and syntax rules of a programming language. It is not yet in a form that a computer can understand and follow.

In order for the source code to be executed by the computer, it must be translated into a format that the computer can understand. This format is the **machine language code**. In our example, this is how the nurse understands and plans to carry out the doctor's instructions.



The computer can directly execute machine language code, the instructions of which may be written in sequences of zeros and ones. The machine code is readily executable by the computer.

Compilation is the translation of the entire source code into machine code using a compiler. Syntax errors are usually detected during compilation. A **compiler program** is used to translate source code written in a high-level language into machine code. There are, however, compilers that compile the source code not into machine code, but into a less cryptic format. An example is the Java compiler that translates the Java source code into a **bytecode** or *class file*. An interpreter later runs this bytecode.



A source code is translated into a bytecode, which the computer can understand.

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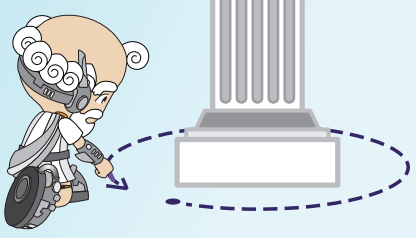

Identifying the problem is the most important part of the program development cycle. Once the problem is identified, the solution or output can be worked out.

After analyzing the problem, the steps needed to solve it are written in the form of an algorithm. If the algorithm is implemented using a programming language, the source code is produced. The source code is then translated into machine code, which the computer can understand and execute.

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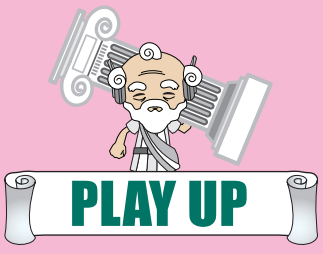

A. Provide possible inputs and outputs for each of the following problems.

	Problem	Input	Output
1	Compute student grades in a particular class.		
2	Compute the average income of 200 employees.		
3	Compute the change that needs to be given to customers who purchase specific items from a store.		
4	Send e-mail notification to all customers with unpaid bills.		
5	Print the name of each student and the title of the projects he/she submitted.		

B. Fill in the blanks. Write your answers on the blanks provided.

1. A(n)_____ is the data given by the users to a computer which needs to be processed.
2. The processed data is called _____.
3. A(n) _____ lists the steps needed to solve a problem.
4. When you implement an algorithm using rules and conventions of a programming language, you also produce the program _____.
5. In order for the source code to execute, it must be translated into _____.
6. The_____ is the translation of the entire source code into machine code.

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7. A(n) _____ is used to translate high-level language code into machine code.
8. Coding errors called _____ are usually detected.
9. The computer can directly execute machine language code, which may be written in sequences of _____.
10. C, Pascal, and Java are usually called _____.

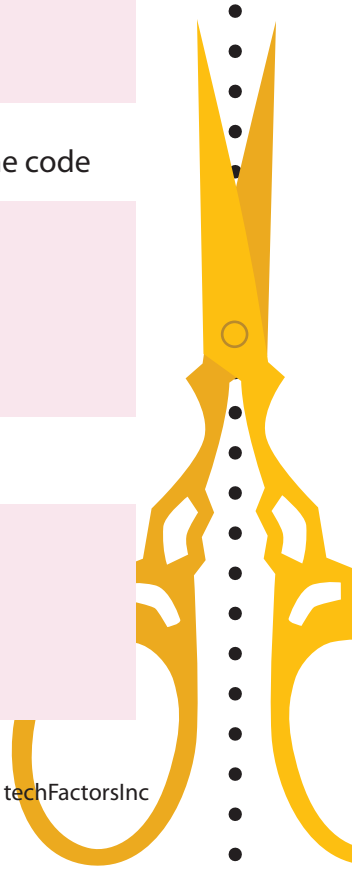
C. Draw the following.

1. A diagram that shows how a computer translates source code into bytecode

2. A representation of an algorithm

3. An illustration on how the computer translates source code into machine code

4. A diagram that shows how a program is developed



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Finding a Solution

- Explain the program development cycle
- Enumerate the steps of the program development cycle

After the physician diagnoses an ailment, what does he do? Often, he asks the patient to undergo a healthful regimen of diet and exercise, gives him a list of medicines to take, and advises him about what he can and cannot do during the course of the treatment.

So it follows that once the doctor has identified the problem that needs to be solved, he can then initiate the process of finding a solution. In this case, the problem is the ailment of the patient, and the solution is the regimen of diet, medication, and other prescribed actions.

When using a computer, a problem can be solved using a solution in the form of a computer program. The process of writing this program is called the **program development cycle**.

Steps in the Program Development Cycle

Just as the doctor follows definite steps when diagnosing and treating an ailment, the program development cycle also follows a series of steps:

1. Problem Definition

The problem to be solved must be clearly defined. Assumptions regarding input to the program and the desired output must also be made.

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2. Problem Analysis

In analyzing the problem, you must determine the most effective and efficient approach to solving it. Data pertaining to the problem must be gathered and analyzed. You need to break down the problem into tasks. You also need to incorporate existing solutions, if there are any.

3. Design of Data Structure

You need to determine the types of data structures that will be used in the program. **Data structure** refers to the way data is organized. It may also refer to the physical arrangement of data in the computer's memory. The choice of data structure depends on the application. You also need to consider the input data and the desired output.

4. Design of the Algorithm

This is the most crucial stage in problem solving with computers. The solution to the problem is described in **algorithmic notation**.

The specifics are divided into:

- General processing procedures required to convert input data into output results
- Input/output
- Calculations
- Logic comparisons and iterations
- Data storage/retrieval operations

5. Coding

From the algorithm, you are now ready to write the source code using your chosen programming language.

6. Program Testing

In this step, you test the program to find and correct any errors. You need to test the program's responses to all possible data input.

There are two types of errors:

- **Syntax error** – This is an error in notation or grammar. Errors such as this are discovered during compilation.

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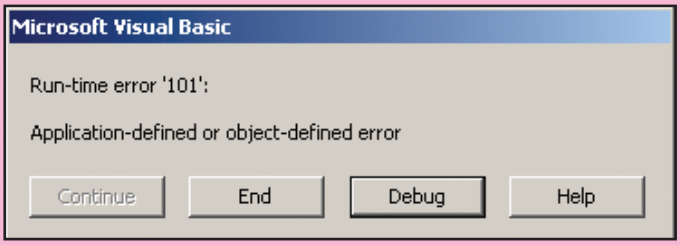
- **Logical or runtime error** – This is an error in logic. It is detected upon the running or execution of the program. The program might not give the desired output.



7. Program Documentation

When creating a program, you must also write the corresponding documentation. This will guide you through the different stages of program development. It will also be a useful reference for future improvements and modifications in the program. It is also very helpful for other people who will be using your program.

Documentation consists of external and internal documentation.

- **External documentation** – A reference manual and a user's manual may be developed alongside the program. These manuals provide instructions on how to install and use the program. They contain a description of the program operations, data structures, and the required input and output. They also help when modifying the program.
- **Internal documentation** – During the coding step, comments and remarks are written together with the program code to describe its different functions.

```
Private Sub Command1_Click()
  'The code below raises an error <- comment/remark
  Err.Raise (101)
End Sub
```

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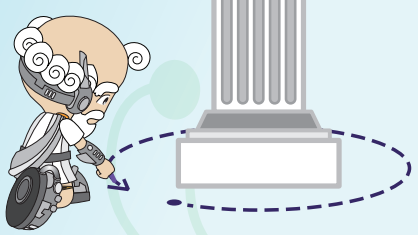
8. Program Maintenance

When the program is in use, errors may be discovered. Additional requirements may also be needed. In these cases, changes to the program will be necessary. Modifications are made for the following purposes:

- Correcting errors not detected during the testing phase
- Adapting to a new environment
- Enhancement or addition of new features

ROUND UP

The process of writing a computer program is called the program development cycle. It covers identification and analysis of the problem to be solved, formulation of the algorithm, data structures, coding, program testing, maintenance, and documentation.



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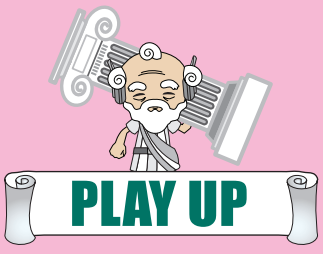

A. Answer the following on the space provided.

1. **What is the name of your favorite computer game?**

   _____

2. **What aspects of this game do you think are difficult to program?**

   a. _____

   b. _____

   c. _____

   d. _____

   e. _____

3. **Suppose your class is organizing a Christmas party. Write the steps necessary in planning and executing this event.**

   a. _____

   b. _____

   c. _____

   d. _____

   e. _____

   f. _____

   g. _____

B. Provide what is asked for. Write your answers on the space provided.

1. What is program development cycle? Complete the sentences.
   The program development cycle is the process of _____ for a problem in the form of a _____.

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2. What are the steps in the program development cycle?

_____ _____
_____ _____
_____ _____
_____ _____

3. During the design of the algorithm, specifics are divided into these parts:

_____ _____
_____ _____
_____

4. Differentiate syntax error and runtime error. Complete the sentences.
Syntax error is an error in_____ or _____ which is commonly discovered during _____. While logical or runtime error is an error in logic and it is detected upon _____ the program.

5. What are the purposes in making modifications in a program?

_____
_____
_____

C. Match the following steps in program development to their description. Write the letter of the answer on the blank.

___ 1. Problem definition	a. the step where modifications are done
___ 2. Problem analysis	b. writing the source code for the program
___ 3. Design of data structure	c. the problem to be solved is defined
___ 4. Design of the algorithm	d. the program is tested to find errors
___ 5. Coding	e. writing the documentation for the program
___ 6. Program testing	f. determining the most effective and efficient approach in solving a problem
___ 7. Program documentation	g. the most crucial stage in problem solving
___ 8. Program maintenance	h. determining the types of data structure that will be used in a program

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Lesson 17

Step-by-Step Solution

- Define algorithm
- Relate algorithms to everyday situations
- Describe the properties of a good algorithm

An important aspect of the program development cycle is the design of the algorithm, the list of step-by-step instructions in solving a given problem. An algorithm serves as the framework for the actual computer.

We encounter algorithms everyday, not just in computer programs. We can relate algorithms to recipes for cooking dishes, such as this one for *adobo*:

Ingredients

1/2 kg. pork, cubed	1/3 cup vinegar	3 tbsp. soy sauce
1/4 tsp. pepper	1/2 cup water	1 tbsp. sugar
1 tsp. salt	1 bay leaf	3 cloves garlic, crushed

Procedure

1. Combine ingredients in a pot.
2. Let stand for 30 minutes.
3. Cover the pot and bring to a boil over medium heat.
4. Remove pot cover once boiling stage is reached.
5. Reduce heat.
6. Simmer over low heat for about one hour or until meat is tender.
7. Transfer to a serving dish.
8. Serve.

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As you can see, the recipe lists the ingredients and tells how to cook the dish. We cannot proceed to cook the dish if any of the ingredients is not available. The procedure of the recipe is also given in steps, each building on the previous one. The procedure is logical, clear, specific, and concise.

What Is an Algorithm?

A computer algorithm also has the same properties as a recipe, and much more. If a recipe has ingredients, an algorithm uses *data* as raw material and processes data based on the sequence of *instructions*. The *input* is composed of data and instructions. The *output* is the outcome after the processing.

In the case of the *adobo* recipe, the inputs are the ingredients and the process of preparation. The output is the delicious *adobo* dish.

Writing algorithms involves planning. How an algorithm is written and implemented are important considerations when writing a computer program. Since an **algorithm** is the logical solution to a problem, the process is often called **program logic formulation**, in which the problem is solved in a systematic manner.

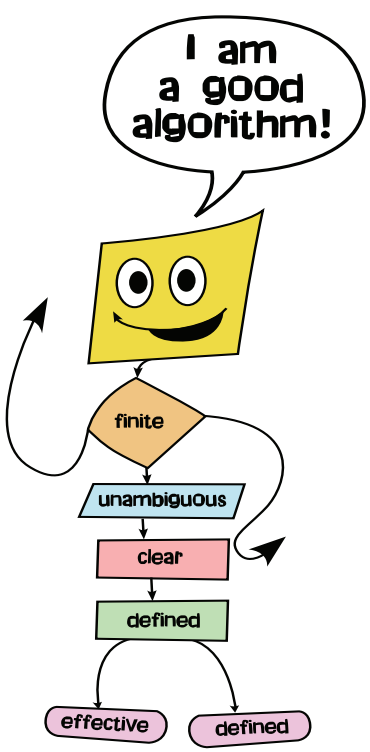
Do you know?

Augusta Ada Byron, countess of Lovelace and daughter of Lord Byron, is considered the first programmer. She wrote the first algorithm for the Analytical Engine of Charles Babbage in 1842. However, it was never implemented because Babbage did not finish his Analytical Engine.

Properties of an Algorithm

A good algorithm should have the following properties:

1. **It is finite.** It should be completed after a limited number of steps, and the number of steps taken depends on the input.
2. **It is unambiguous.** All the instructions and data declarations are clearly stated, and the result should be obtained from the input data. In our example, the dish that you should get from the *adobo* ingredients must be *adobo*, not *nilaga*.



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3. **Its sequence of steps is clear.** There is a step-by-step solution to the problem. The steps and their order of execution should be clear.
4. **All needed input and output processes are defined.** Input and output data should be of a compatible type.
5. **It is effective.** An algorithm is designed such that the problem will be properly solved.
6. **Its scope is defined.** An algorithm solves only that which is required. The range of inputs is known.

Kinds of Algorithms

How do you put an elephant in a freezer?

Easy! We only need to do the following:

Step 1: Open the freezer.

Step 2: Put the elephant inside the freezer.

Step 3: Close the freezer door.

Now, how do you put a giraffe inside the freezer that contains the elephant? Impossible? It's simple, really. Just do the following:

Step 1: Open the freezer.

Step 2: Remove the elephant.

Step 3: Put the giraffe inside the freezer.

Step 4: Close the freezer door.

The examples given above may be whimsical, but they show how a solution to a problem can be arrived at. In the second example, it is how to put a giraffe into a freezer that already has an elephant inside. The answer is to put the giraffe in after taking out the elephant first! The solution can be presented in logical steps.

The use of algorithms involves the systematic manner of solving the problem. Take note that the focus of expressing it is the logic (how you do it) of the solution and not the syntax (how it's written down). The algorithm breaks down a problem into a series of instructions that are executed in complete and concise steps.

Take note that algorithms are finite. In the second example above, the algorithm ends with Step 4, when the freezer door is closed. This illustrates how

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solving the problem will end up with an answer at some point. Finiteness means there are limits to the number of steps that can be taken. It is one characteristic of a proper algorithm.

Different problems need different solutions, and some problems are solved by carrying out two or more different solution paths. Like programming languages, algorithms can be classified into different paradigms or classes.

The following are some of the most commonly used algorithms in programming:

- **Recursive algorithm** – an algorithm that "calls" itself up repeatedly until a certain state is reached.
- **Greedy algorithm** – works by using a decision that is the best for the current situation. It never exchanges this decision for another. This is similar to when you are offered three boxes of chocolate, but you can only pick one. There's a big box, a medium-sized box, and a little box.

Which would you pick? Most likely you will pick the big one, the best choice at the moment. Unfortunately, if it does not taste good, you cannot exchange it for another.

- **Divide-and-conquer algorithm** – How do you break a bundle of sticks? Can you break all the sticks in the bundle all at once, or will it be easier to untie the bundle and break the sticks one by one? The divide-and-conquer algorithm works the same way. The big problem is divided into parts to be solved separately.

- **Graph search algorithm** – problems are represented as graphs. This algorithm gives rules for finding solutions to problems such as finding the shortest path between two points.

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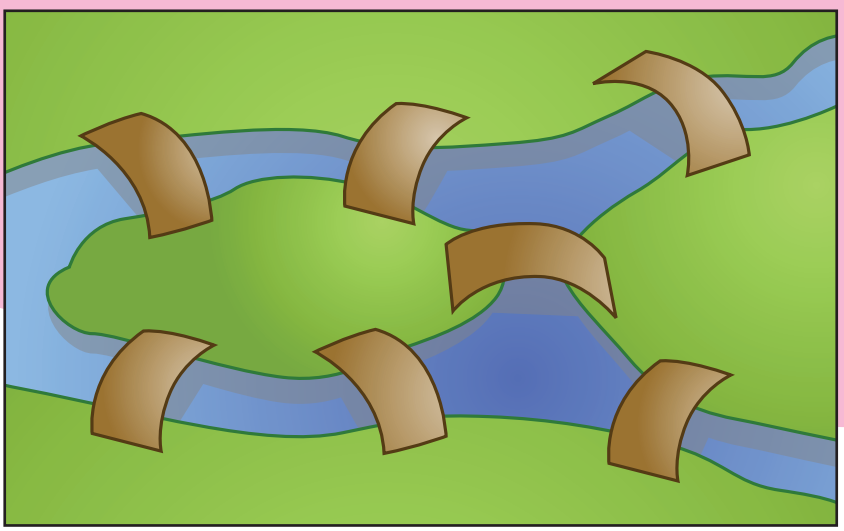
The Seven Bridges of Königsberg is one such problem that can be solved by a graph search algorithm. The city of Königsberg is composed of three islands connected by seven bridges, as illustrated below. The problem is to look for a possible path that will cross all the bridges once and go back to the starting point.



Writing and Expressing Algorithms

An algorithm can be expressed in two ways: as a flowchart or as a pseudocode. A flowchart is a visual representation of the solution, while a pseudocode is an algorithm that is written in a manner closer to a natural language. Pseudocodes use some of the conventions utilized by programming languages, while flowcharts use symbols to signify an action or state in the solution.

Do you know?

The person from whose name the term *algorithm* was derived lived in the 9th century A.D. He was Abu Abdullah Muhammad bin Musa al-Khwarizmi, a Persian mathematician and astronomer, now known as the "father of algebra." The name algebra itself was derived from his book, *al-Kitab al-mukhtasar fi hisab al-jabr wa'l-muqabala*, or "The Compendious Book on Calculation by Completion and Balancing."

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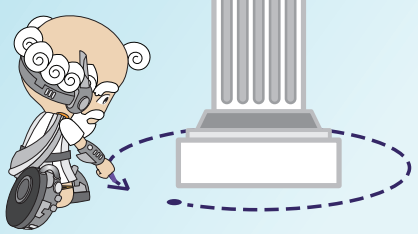
ROUND UP



An algorithm, which is a logical solution for solving a problem or completing a task, is the most important step in the program development cycle. It needs inputs of data and instructions to produce a desired output. There is a logical flow to the steps taken to make the output.

A good algorithm should have the following properties: finiteness, unambiguity, a clear sequence of steps, defined input and output, and effectiveness.

The most commonly used algorithms are recursive algorithm, greedy algorithm, divide-and-conquer algorithm, and graph search algorithm. Algorithms can also be expressed in two ways, either through flowcharts or through pseudocodes.

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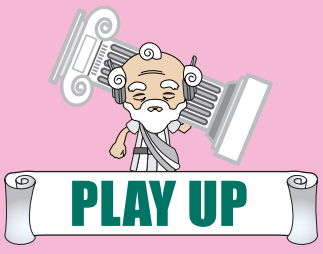

A. True or False. Write T if the statement is true, otherwise, write F.

_____ 1. Algorithms use instructions as raw materials to be processed using the data.

_____ 2. Planning is not necessary in writing an algorithm.

_____ 3. The process of writing an algorithm is called program logic formulation.

_____ 4. Augusta Ada Byron is considered as the first programmer.

_____ 5. Charles Babbage did finish his analytical engine in 1842.

_____ 6. A good algorithm should be finite.

_____ 7. In writing algorithms, it is not necessary to define the scope.

_____ 8. In program logic formulation, the problem is solved in a systematic manner.

_____ 9. An algorithm is ambiguous if all the instructions and data declarations are clearly stated.

_____ 10. The sequence of steps in a good algorithm should be clear.

B. Why do you think it is important to write an algorithm in solving a problem?

_____

_____

_____

_____

_____

_____

_____

_____

_____

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C. Identify the type of algorithm described.

Recursive algorithm	Graph search algorithm
Divide-and-conquer algorithm	Greedy algorithm

_____ 1. Useful for finding the shortest path between points

_____ 2. Waits for a certain state to be reached

_____ 3. Gives rules for finding solutions to problems

_____ 4. Problems are divided into smaller ones that are solved separately

_____ 5. Works by using a decision that is best for the situation

_____ 6. Problems are expressed as graphs

_____ 7. Never changes its decision for another

_____ 8. Calls itself up repeatedly

D. Identification. Provide the terms being asked.

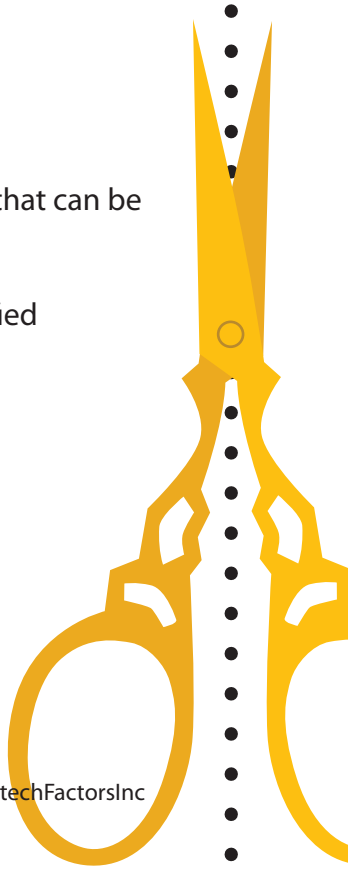
_____ 1. refers to the focus of an algorithm

_____ 2. refers to how the program was written down

_____ 3. means that there are limits to the number of steps that can be taken

_____ 4. like programming languages, algorithms are classified according to this

_____ 5. two ways to express an algorithm



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Lesson 18

Mapping the Solution

- Identify the basic flowchart symbols
- Express algorithms using flowcharts

Imagine yourself on a road trip. You are going to drive to a faraway place that you have never been to. The road going to that place is unfamiliar to you. What would you do before setting out on your journey?

Get a map, of course!

A **map** is a visual representation of a place. It is used for navigation. It tells you how to get from Point A to Point B by showing the routes that you can take to get there. It shows the roads and trails, the alternate routes, the obstacles that you might encounter along the way, as well as the dead ends and back streets that you should not take.

A map also features signs and symbols that give other information. These signs will show you directions to places, locations of facilities, and traffic rules and regulations that you should follow.

A flowchart is like a map. It is also used to help us reach a destination, but the end of its road is not a physical one. Instead, it is a solution to a problem.

Expressing Algorithms Using Flowcharts

A **flowchart** is a graphic representation of an algorithm. It uses symbols to represent the algorithm's logical steps, or flow of control, and the sequence of operations.

Flowcharts are also used as a schematic representation of any process. For example, you can use a flowchart to define the steps needed in assembling a toy house, or the instructions in filling out a form. One can readily see the flow of control in the algorithm because it is graphical.

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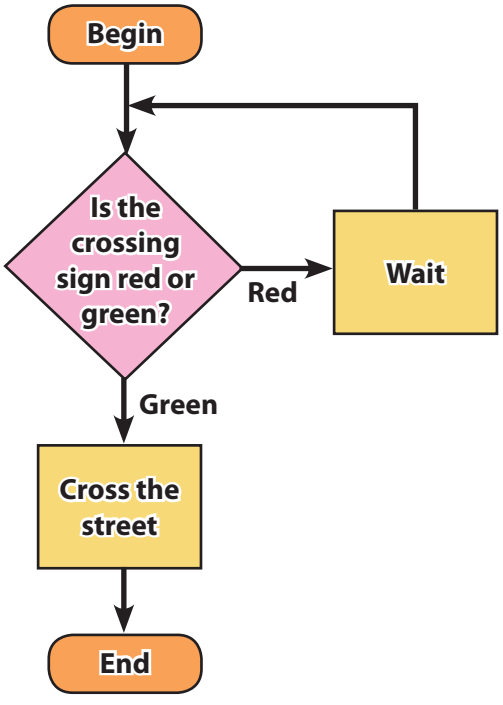
The basic elements of a flowchart are the start point, the end point, the input, the output, the possible paths, and the decisions. A flowchart can be made with simple drawings, or by using diagramming and drawing software such as Microsoft® Visio. Microsoft® Word also provides the basic flowcharting symbols.

Here is what a boy crossing a street does, as shown using a flowchart.



Basic Flowchart Symbols

Just as we use symbols on a map, we also use symbols in flowcharts. The following table lists some of the symbols and what they represent.

Symbol	Name	Meaning
	Terminal symbol	This is used to signify the beginning or the end of the program.
	Input/Output symbol	This represents an instruction that gets input from or sends output to an I/O device.
	Processing symbol	This denotes an operation or computation that must be performed.

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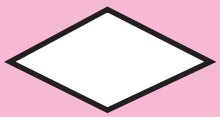
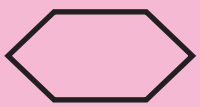
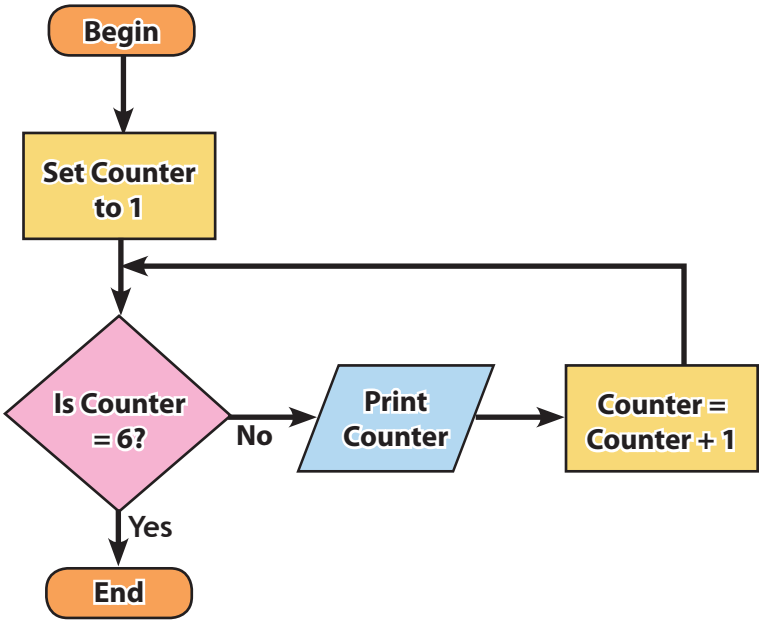
Symbol	Name	Meaning
	Decision symbol	This is used for branching statements. A condition is placed inside the symbol.
	Preparation symbol	This denotes preparatory actions such as data initialization.
	Predefined process symbol	This represents a process or procedure that has been defined somewhere else.
	On-page connector symbol	This connects one part of a flowchart to another.
	Arrows	They connect symbols and signify the flow or sequence of operations.

When formulating algorithms, programmers visualize the solution paths using flowcharts. For example, the algorithm for a program that prints the numbers from 1 to 5 would look like this in a flowchart:



As you can see, the flowchart identifies the starting point and the possible ending points of the process. In this case, it begins with the setting of the counter to 1 and ends when number 5 is printed.

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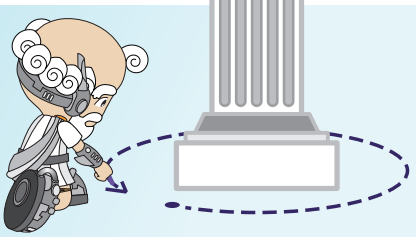
Between the start and end points is the sequence of actions that defines the process used. The sequence defines how the process will "flow" from one step to the next.

A **decision point** is needed to enable the process to go on in cases where two or more choices are present. A decision point is also called a *branching point* because it can present an alternative path for the process.

A flowchart should satisfy the properties of a good algorithm. In our example, we can see that it followed the criteria—the process is finite, the starting and the ending processes are well defined, and the inputs and the outputs are also clearly stated.

ROUND UP

A flowchart is a graphic representation of an algorithm. It uses symbols to represent the logical steps of the algorithm and their sequence, as well as to denote action and present information. It visually indicates the flow of control and the sequence of operations.



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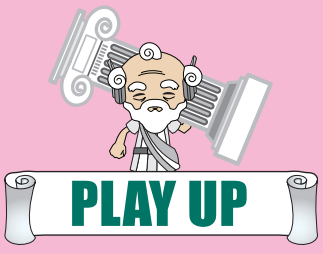

Construct a flowchart for each of the following:

1. Frying an egg:
   a. Heat the frying pan.
   b. Pour cooking oil in the pan.
   c. Get an egg.
   d. Crack the egg open.
   e. Pour the contents of the egg in the pan.
   f. Check if the egg is cooked.
   g. If the egg is not yet cooked, continue frying.
   h. If the egg is cooked, turn off the stove.
   i. Serve the egg.

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2. Getting the average of ten numbers:

   a. Set counter to 1.

   b. Set sum to 0.

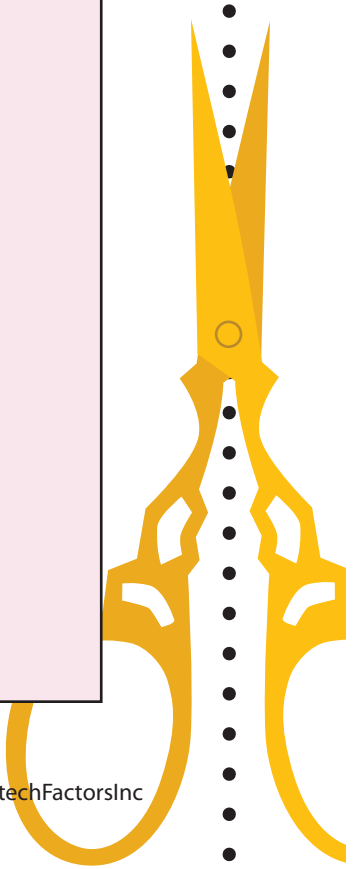
   c. Get number.

   d. Add number to the sum.

   e. If the counter is less than 10, add 1 to the counter. Then go to step c.

   f. If the counter is equal to 10, divide the sum by 10 and output the quotient as the average.

   g. End.



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Not Quite Programs Yet

- Express algorithms using pseudocode
- Appreciate the importance of control and program structures

Imagine that your parents are on a vacation and you are tasked to take care of the house. Shortly after leaving, your mom sends you a text message to your mobile cellular phone:

Cuk brkfast for Jr tmrw. H2O plants.
Buy mlk 4 baby. Cln haus.

At first, the message may seem like gibberish, but on second look, it is actually a form of **shorthand**, or a way of conveying information using shortened words and symbols.

Once you have read the message, your brain will process the message and "translate" it for you so that you will be able to understand it. It will then read to you as:

Cook breakfast for Junior tomorrow. Water plants.
Buy milk for baby. Clean house.

In writing a computer program, there are two ways of pinning down how the process will work and how the algorithm is to be written. One way is by laying out the process visually using flowcharts, as you have learned in the past lesson.

Many programmers also write algorithms using pseudocodes.

A **pseudocode** is a textual version of an algorithm. If you read it, you might see its resemblance to a real program. It is usually presented in a format close to how a spoken language, like English, is written, but without the syntax of any specific programming language. However, it may contain some borrowed constructs from popular programming languages such as Pascal, C, and Java, though usually in simplified forms.

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Writing Pseudocodes

There is no standard way of writing a pseudocode, but there are basic elements that a pseudocode should have, in accordance with the rules of programming. Still, programmers prefer to write in formats that mimic the way people communicate in real life. For example, the following pseudocode closely illustrates how the English language is naturally written or spoken:

```
Let the user enter his name

Display the value of a number

Increase the counter by ten
```

In contrast to the example above, the one below looks like the real code of a program:

```
Read (name)

Display (number)

Counter <- Counter + 10
```

However, even if there is no standard, it is recommended that the pseudocode be consistent with the words and notations used for a specific algorithm.

As mentioned, a pseudocode resembles or models a real program. Thus, the basic structure and elements of a program also exist in the pseudocode. Since it mirrors how the program works, the pseudocode usually becomes part of the program documentation.

Like a flowchart, a pseudocode should also have the properties of a good algorithm. It should be unambiguous, finite, effective, and logical. The sequence of steps should be clear and the scope clearly defined. It should only solve for what is required of the problem using a range of known inputs.

Control Structures

Although there are no standards for writing pseudocodes, and flowcharts can take many forms, there are necessary structures that the computer program follows: sequence, condition-selection, and repetition/iteration. These three structures or constructs represent the **logic**, or flow of control, in an algorithm. They are also characteristics that define structured programming. As such, they are called **control structures**.

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1. **Sequence** – Here, the order in which the instructions are executed is sequential, line-by-line, or from top to bottom. Otherwise, it would be from the first line of instruction, going down to the last one. However, there are constructs now, such as an object-oriented program, that do not follow a strict sequential order of execution.

   Example:

   Do step 1, then step 2, then step 3, then step 4.

2. **Condition-selection** – This structure allows branching to happen in a code. A decision has to be made whether or not to execute certain instructions. This decision is usually based on some condition that has to be satisfied. Examples of condition-selection statements are 'if-else,' 'if-then-else,' 'case,' and 'switch.'

   Example:

   If hot, do step 1. If cold, do step 2…etc.

3. **Repetition/Iteration (loops)** – This is used when an instruction or a set of instructions has to be executed several times. Examples of repeating constructs are: loop, while loop, repeat-until loop, and do-while loop.

   Example:

   After Step 4, go back to Step 2 and repeat.

A control structure (or combinations) uses data as it executes to arrive at a particular state and/or the final output. It is a defined way of handling the inputted data.

Data Structure

When writing a program, the two fundamental elements that the programmer has to consider are the algorithm and the data structures. The simple equation below tells us the different parts that a program is composed of:

program = algorithms + data and/or data structures

We have already talked about algorithms, which are composed of one or more control structures. Now let us discuss **data structures**, the organized collections of data items which are an equally important part of a computer program.

A small program may need simple data, like integers; but a bigger program may need more data that must be grouped together. An example is the record of an employee, which includes his name, number, designation, and position.

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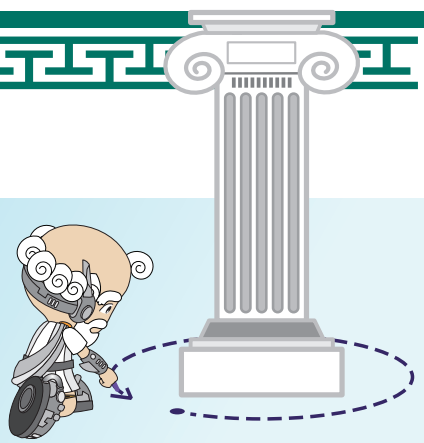
Your own ID card has your name, grade level, section, and ID number. A program that keeps track of all the students in a school has to use a data structure, like a *list* of student *records*, with each record containing the data of one student. This list may be an **array** or a **linked list**. Both are computer implementations of data structures.

ROUND UP



Another way of formulating and presenting algorithms is by using pseudocode, a textual version of an algorithm. A pseudocode is written close to the format of a natural language. Although there are no rules on how to write a pseudocode, it should borrow elements specified by the rules of programming.

A program also follows control structures that set the flow in an algorithm. Equally important to consider are the data structures to be used by it.

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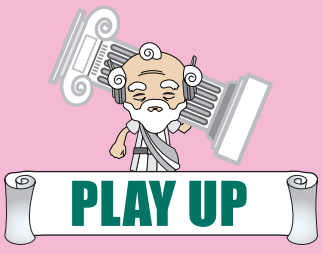

A. Write a pseudocode that prints the numbers 1 to 5.

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B. Match the following statements to the term it describes. Write the letter of the correct answer on the blank.

____ 1. way of conveying information using short words and symbols

____ 2. the order in which instructions are executed

____ 3. organized collections of data items

____ 4. a textual version of an algorithm

____ 5. this structure allows branching to happen in a code

____ 6. computer implementations of data structures

____ 7. flow of control

____ 8. used when an instruction or set of instructions has to be executed several times

____ 9. characteristics that define structured programming

____10. a way of repeating statements until a given condition is satisfied

a. array or linked list

b. condition-selection

c. pseudocode

d. data structure

e. shorthand

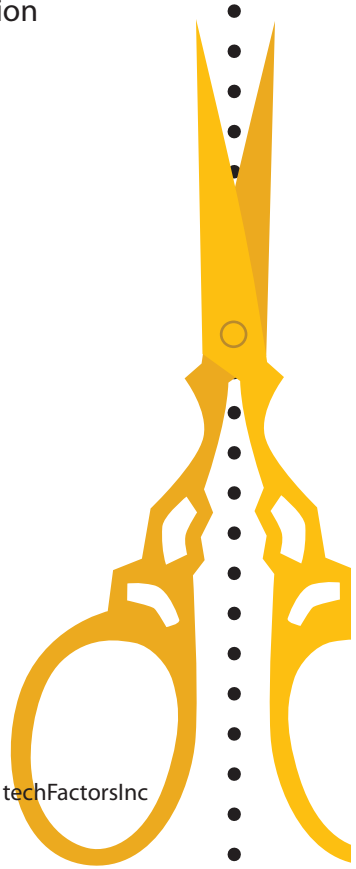
f. loop

g. control structures

h. sequence

i. logic

j. repetition/iteration



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Section 6

Scratch™: Programming in Practice

By now, you know that there are several different kinds of programming languages, some of which require literally weeks to learn. In this section, we will cover the basic concepts of Scratch, a free visual programming language that is primarily for children. It is designed to focus on computational thinking skills with a simple puzzle-solving approach to software development.

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Programming with Scratch

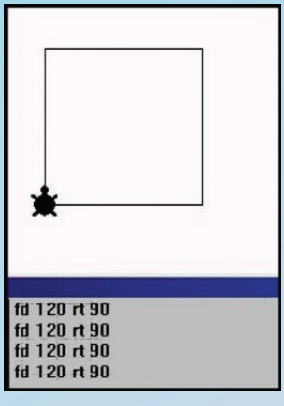
Brief History

When we trace the history of the Massachusetts Institute of Technology (MIT), a private research university in Cambridge, we see that part of it has been their mission to contribute to the education of children in computing.

In 1967, the LOGO programming language was born through geniuses Daniel G. Bobrow, Wally Feurzeig, Seymour Papert, and Cynthia Solomon. LOGO allows a child to control the movement (Move and Turn commands) of "turtle graphics," which are blocks of program commands. Their study revealed that a child can learn the principle of geometry by playing with the movable turtle graphics objects.

- ✓ Define Scratch
- ✓ Recognize the core design principles of Scratch Programming

With the contribution of LOGO programming in children's learning, MIT continued the development of LOGO by introducing StarLogo, which uses graphical blocks to represent commands. Once again, it had improved the programmer's productivity which gave the opportunity for children to start programming in their early years.



StarLogo TNG: The Next Generation is the current version of StarLogo modeling and simulation software

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The 30 years of involvement of MIT in computer programming in education led to another revolutionary ICT tool. The MIT Media Lab's Lifelong Kindergarten Group developed SCRATCH, which was funded by the US National Science Foundation (NSF).

Intended User

Have you imagined yourself being interested in programming? It has been viewed that programming is a very difficult, sometimes boring task that is only for those who are good in numbers. However, that perception only paints a partial picture of programming. The fact is that the ability to think and reason critically and creatively is now important for 21st century learning. In order to effectively acquire the skill, students should be trained as early as the age of 8.

Technology fluency should also be considered since the new generation of learners is already comfortable interacting with technology in everyday activities, but nevertheless, you can easily count only by hand the number of students that are capable of creating their own games or animations. Just imagine a child who can read but can't write.

Scratch

The name "SCRATCH" came from the techniques used by disc jockeys, otherwise known as DJs or deejays, to produce funky sound effects. To create scratch audio, a DJ spins a vinyl record back and forth and the sound created is mixed with the music. Similarly, you can mix graphics and audios when programming in Scratch. Sounds cool, right?

Scratch is also called the "YouTube of Interactive Media" because you can create your own stories, games, and animations and share them on the Scratch Website wherein members of the community can respond by commenting constructively. Feedback serves to boost confidence and encourages users to create even more projects.

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Three Core Design Principles for Scratch

More Tinkerable.

Scratch has the same look and feel as Lego bricks when children attempt to tinker and construct structures out of the bricks. Scratch uses graphical "programming blocks" to create a program.

More Meaningful.

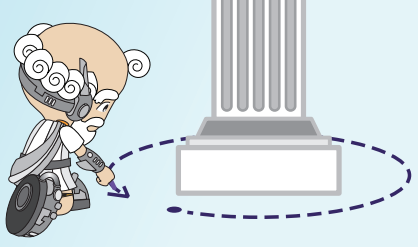
Real-life activities are the most successful tools in learning which is why Scratch supports different themes for stories, games, animations, and simulations which can be customized in projects.

More Social.

Collaboration/Sharing is embedded in the Scratch user interface which allows members to support one another, collaborate with each other, and critique each other's work.

ROUND UP

Scratch is a visual programming language developed to help children create their own stories, games, and animations and share them to the community. Scratch adheres to three core design principles: more tinkerable, more meaningful, and more social.



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NAME: _____

GRADE/SECTION: _____

DATE: _____

SCORE

A. Identify the word or phrase being asked in the following statements.

_____ 1. Used in LOGO programming that allows a child to control the movement of an image

_____ 2. The original programming language which uses graphical blocks to represent commands

_____ 3. A person who creates sound using a vinyl record that mixes with music

_____ 4. The group that developed Scratch Programming

_____ 5. It is also called the YouTube of Interactive Media

B. If you are going to create your own project using Scratch, what content vehicle will you choose? Choose only one and briefly explain your choice on the next page.

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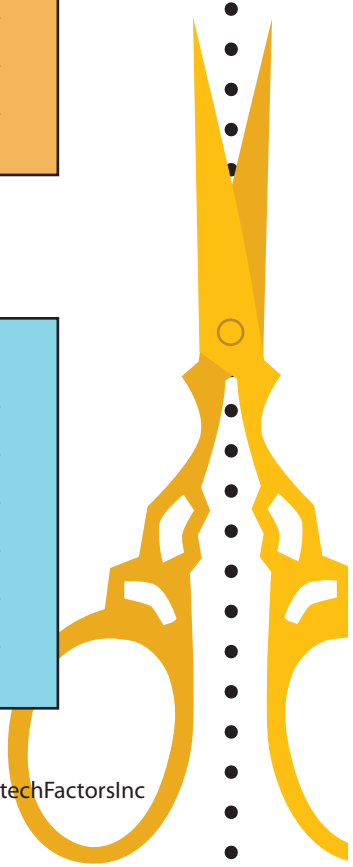
(You can visit this website for your guide: https://scratch.mit.edu)

Stories

Games

Animation



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Taking A Closer Look in Scratch

LOOK AND FEEL OF SCRATCH

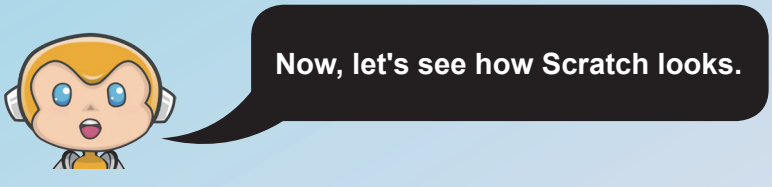
MIT has already released 2 versions of Scratch. The first version was released to the public on January 8, 2007 followed by 4 more in a series. Scratch 1.4 was succeeded by Scratch 2.0 after four years.

Scratch 2.0 was officially released on May 9, 2013. This version allowed direct editing from the web browser, be it in an online or offline editor.

In order for Scratch to run smoothly, you need to run it with the following system requirements:

- Windows, Mac, or Linux (32 bit) operating system
- Adobe Air version 2.6+ (already included when you download Scratch)
- Over 23 MB of free hard drive space

- ✓ Navigate the Scratch environment
- ✓ Identify the basic functions of the Scratch environment



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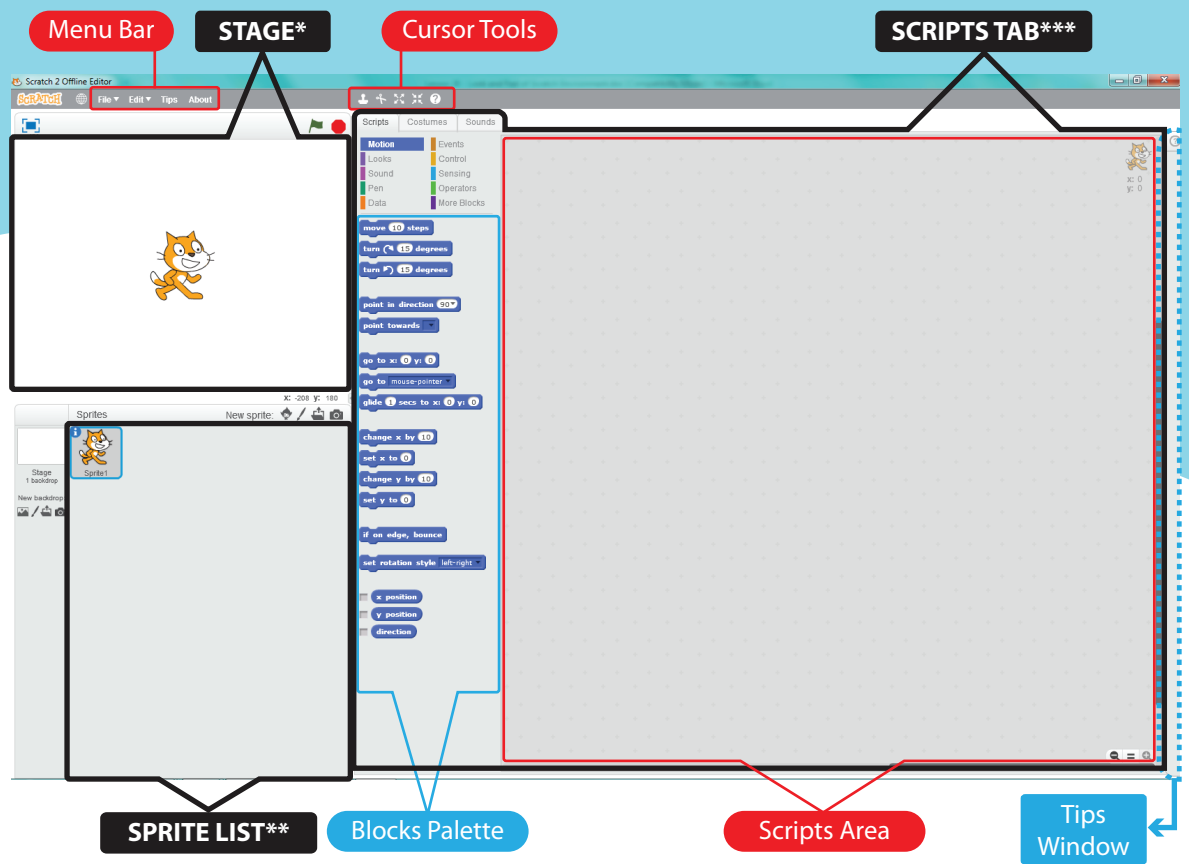


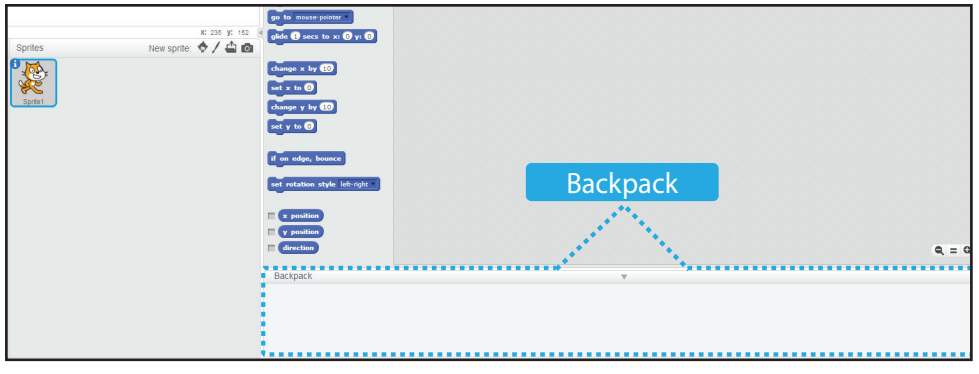
Figure 21-1: Scratch Offline Editor Interface

When launching the application, you should see a single window divided into 3 major panes:

* Top Left (STAGE)

** Bottom Left (SPRITE LIST)

*** Right (SCRIPTS TAB) which is composed of the Blocks Tab and Scripts Area. Tabs also contain the Costumes and Sounds. If you are using an online editor, you can see the Backpack at the bottom right which allows you to share your project and recycle existing sprites and scripts.



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Stage

The Stage is where the sprites are drawn, move, and interact. It is similar to a graphical paper wherein each box is considered as 1 step. There are 480 steps horizontally and 360 steps vertically. During the start of your project, the sprite is in step 0 or (0,0) coordinates. Now, try moving the mouse cursor on the Stage. You will notice that the numbers at the bottom are changing. This is what you call the (x,y) coordinates.

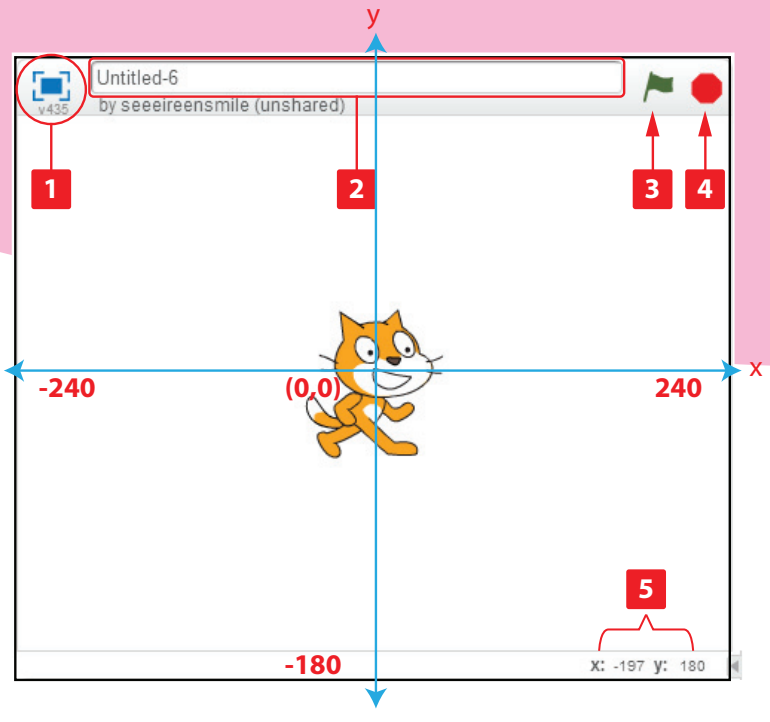

Figure 21-2: Stage is similar to a graphing paper

1. **Presentation Mode Icon** allows you to hide all scripts and other tools. The Stage is zoomed-in for better appreciation. Try to press the icon and observe what happens. If you want to go back to the original mode, click the Zoom Out button or press the ESC key.
2. **Project Name** is only available in the online editor. You can edit the box and this lets you see the name of the current project.
3. **Green Flag**, when clicked, will start your program.
4. **Stop**, when clicked, will end your program.
5. **Mouse (x,y) Display Area** is located at the bottom part of the Stage where you can see the coordinates of the mouse position.

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Sprite List

When you are starting a new project, Sprite List shows all the names and thumbnails for the sprites in your project. By default, a cat-costumed sprite is provided for new projects.

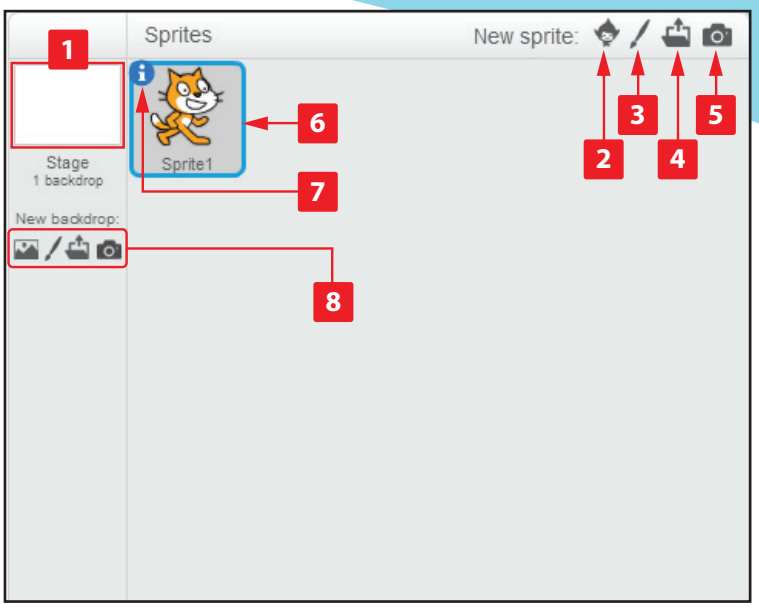

Figure 21-3: Sprite List

1 **Thumbnail for the Stage** allows you to see the background image for the Stage. By default, it's a plain white backdrop.

2 **Sprite Library** gives you the option to change the sprite according to the category and theme of your project.

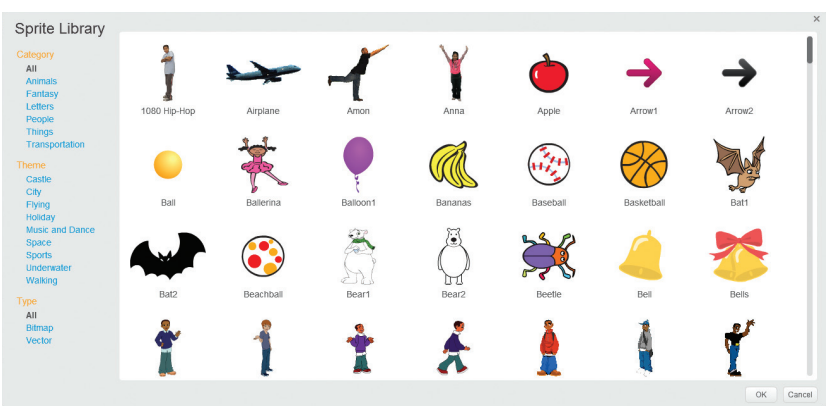

Figure 21-4: Sprite Library

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3 **Paint Editor** lets you draw your own costume. If you can draw using MS Paint or Paint.Net then you will have no difficulty in using the Scratch Paint Editor which utilizes vector and bitmap graphics. One important features of Scratch Paint Editor is the set costume to center which allows the user to view and set the center of the image.

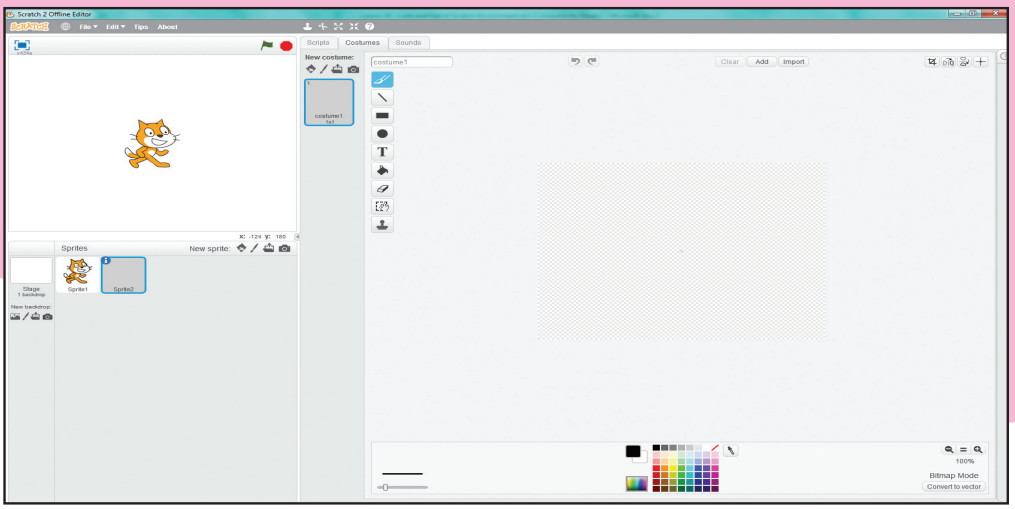


Figure 21-5: Paint Editor

4 **Upload Sprite** allows you to upload or import sprite from any local file.

5 **Sprite from Camera** allows you get a new sprite directly from the camera connected to your computer.

6 **Thumbnail for Sprite** is a display of an active sprite which is highlighted with a light blue border. Each sprite has three properties: scripts, costumes, and sounds. You can access the properties by a single click on the thumbnail or a double-click on Stage.

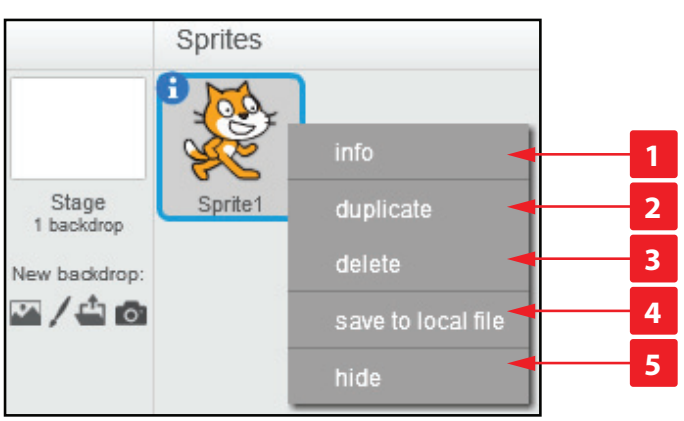
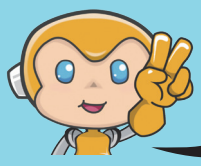


Figure 21-6: Sprite Properties



Add 2 new sprites from the Sprite Library and rearrange them by dragging the thumbnails.

When you right-click the thumbnail, different sprite options will be displayed:

1 – info shows the sprite information

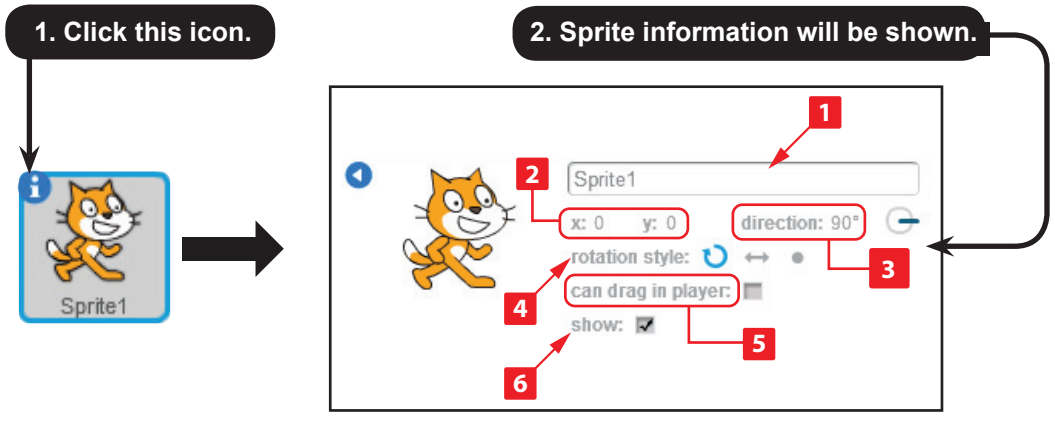
2 – duplicate allows you to copy the highlighted sprite with a different name

3 – delete allows you to delete a sprite from your project

4 – save to local file allows you to save or store a sprite to a .sprite file on your computer

5 – hide allows a sprite to be visible or not

7 **Sprite Information** shows the attributes of a selected sprite. You can also change the name of the sprite in this option.



1 – **edit box** is located at the top, allowing you to change the sprite's name.

2 – **x and y values** shows the current position of the sprite.

3 – **sprite direction** displays the direction of the sprite. You can drag the blue line in a clockwise or counter-clockwise direction.

4 – **rotation style** consists of three buttons: Rotate, Left-right flip, and No rotate. These buttons are used when you want to control the costume appearance as the direction changes.

5 – **can drag in player** is a checkbox that directs whether or not the sprite can be dragged in Presentation mode.

6 – **show** is another checkbox that allows you to show/hide the sprite at program design time.

8 **New backdrop** buttons allow you to choose, create, upload, or take a shot directly from your camera to set as a new background.

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Blocks Tab

1. current category is highlighted with color blue
2. 10 Basic Scratch Blocks Palette Categories
3. available blocks in the current category

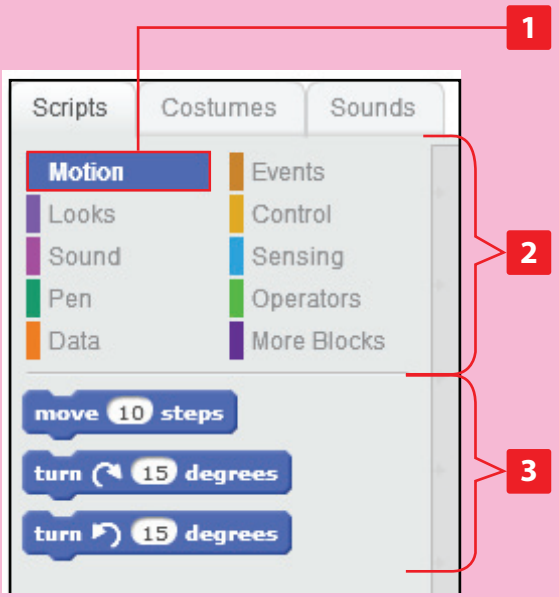

Figure 21-7: Blocks Tab

Scratch Blocks are used in creating a Scratch program. Scratch Programming has four building blocks:

- Command Blocks - (stack blocks) perform the main commands
- Function Blocks - are divided into two: reporter blocks which are used for a finite number of variables; and boolean blocks which are used to determine whether a condition is TRUE or FALSE
- Trigger Blocks - (hat blocks) start every script
- Control Blocks - are divided into two types: C blocks (wrap blocks) loop the blocks inside them; and Cap blocks which are used to stop scripts.

Click this block 

.

What did you observe?

When you click the move 10 steps, the cat moves 10 steps to the right.

Now, change the value to 50 by clicking the number and observe once again. Cool, right?

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Scripts Area

The Scripts Area is similar to a play or movie script where all the texts are written. In Scratch, you don't need to write everything. You just need to drag and drop the blocks from the Blocks Tab to the Scripts Area. As you can see in Figure 21-8, a white highlight indicates where the next block should be placed to form a valid connection.

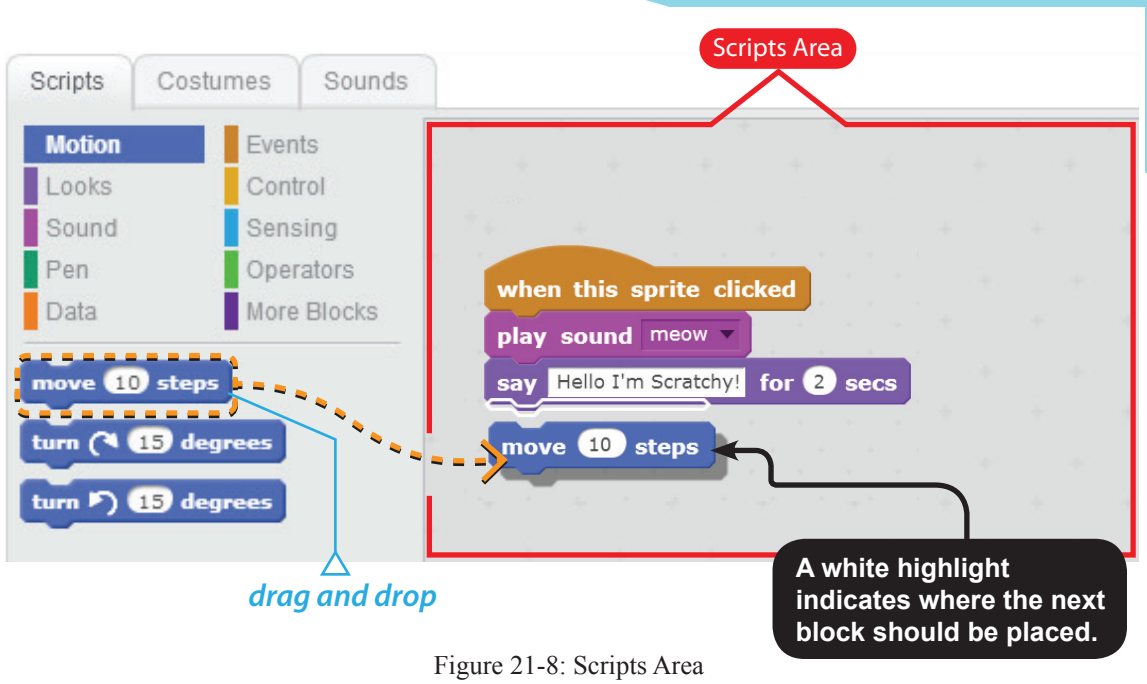

Figure 21-8: Scripts Area

Costumes Tab

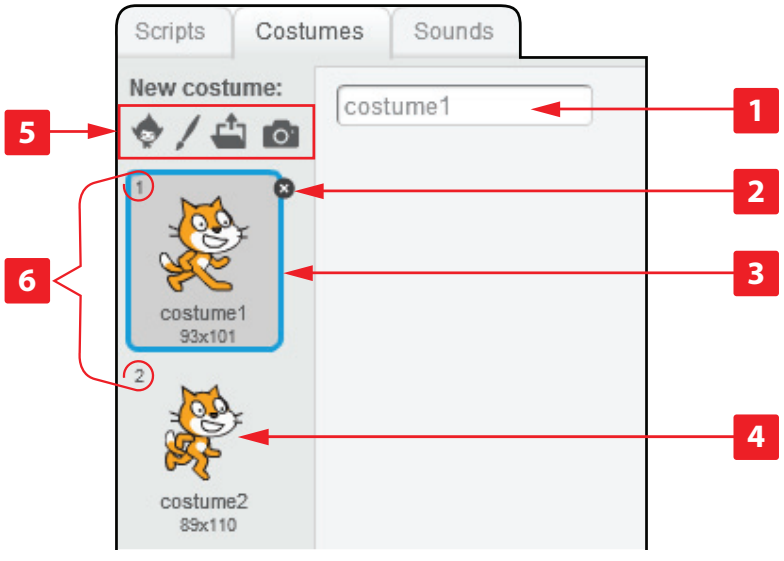

Figure 21-9: Costumes Tab

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Over time, you will find it boring if you keep wearing the same old dress (style, color, etc.). One of the best features of Scratch is its capability to change how the sprite looks. You can do this using the Costumes tab. It contains everything you want for your sprite's costumes just like your personal closet that lets you choose what clothes and color you want to wear.

1. Use this edit box if you want to change the name of the selected costume.
2. This button is used if you want to delete the costume.
3. The light blue costume represents the current costume.
4. New costume for your sprite. Just click the thumbnail if you want it to be the current costume.
5. You use these buttons if you want to add a new costume.
6. You can change the order of the costumes by clicking and dragging them.

Sounds Tab

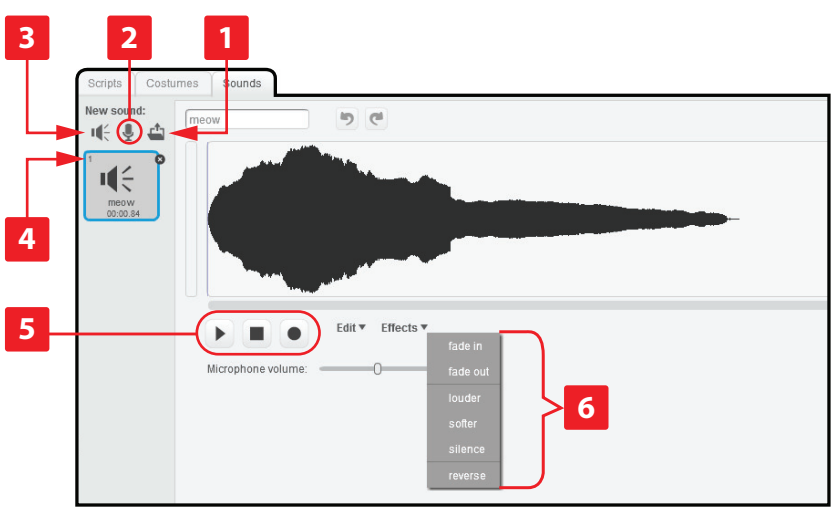

Figure 21-10: Sounds Tab

Isn't it cool that aside from changing the costume of the sprite, you can also play sounds? You can give different emotions to your sprite, like make it happy or sad.

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1. You use this button if you want to upload sound from your files. However, Scratch can only read MP3 and WAV sound files.
2. The microphone button is used if you want to record a new sound.
3. The speaker button is used if you want to choose a sound from the sound library provided by Scratch.
4. This thumbnail represents the current sound file. As you can see, the playback duration of the meow file is 00:00:84 seconds.
5. The three recording buttons represent the Play, Stop, and Record commands.
6. Scratch has six sound effects that you can use: fade in, fade out, louder, softer, silence, and reverse.

Backdrops Tab

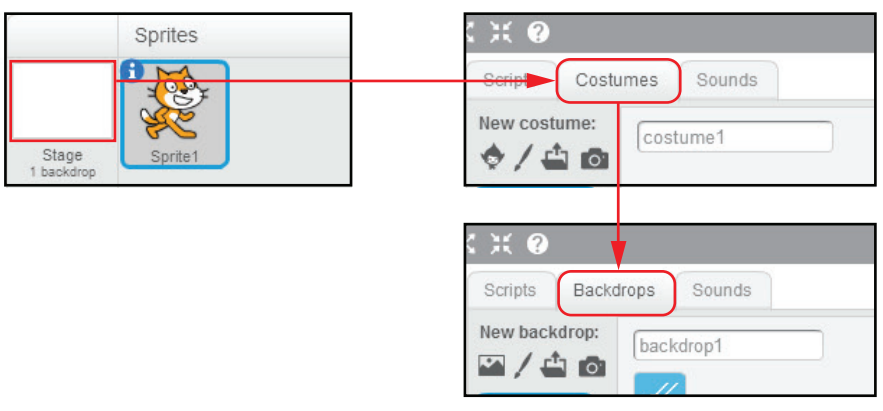

Figure 21-11: Change of Costumes to Backdrops Tab

Backdrops Tab is identical to **Costumes Tab**. When you select the **Stage1 backdrop**, the tab will change from Costumes to Backdrops. If you are creating a game or movie, the tendency is you want to change the backdrop for a different scene.

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Tool Bar

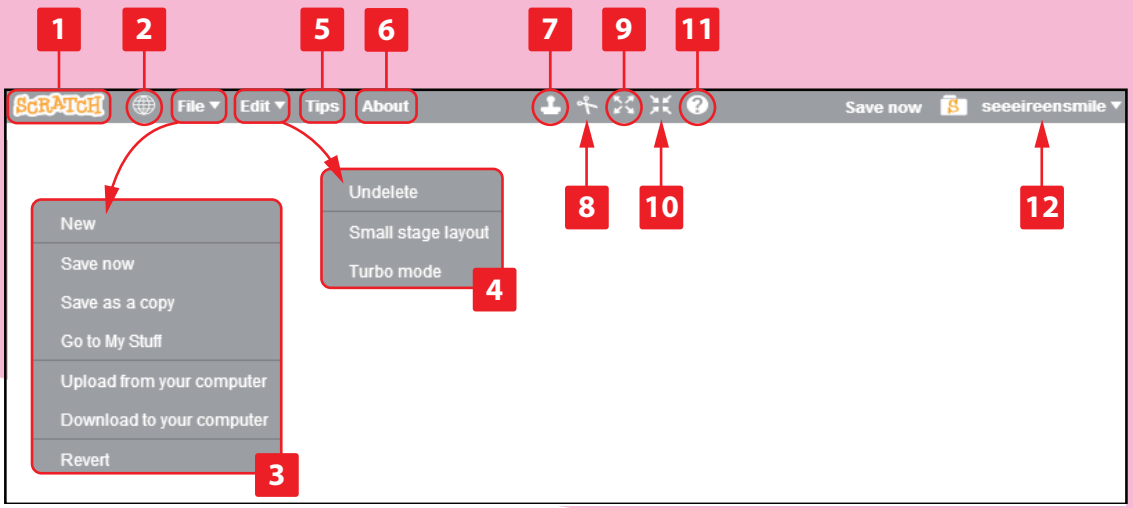

Figure 21-12: Scratch Toolbar

1. If you click the **Scratch logo**, you will be directed to their website's landing page (http://scratch.mit.edu/).

2. Scratch is capable of adapting to different languages. When you click the **Globe** icon, you will be provided with lots of languages across the globe.

3. From File menu, you can create **New** project/s, **Open** an existing project, **Save/ Save As** new existing project, **Share** your project/s to the online community, **Check for updates** (if there are any upgrades to Scratch), and **Quit** if you want to leave.

   Scratch projects have an .sb2 file extension to distinguish them from the version (.sb).

4. From the Edit menu, **Undelete** will bring back your last block, script, sprite, costumes, or sound deleted. Undelete is similar to the function of the Undo command. If you choose the **Small stage layout**, a check sign will be displayed which allows you to shrink the Stage. **Turbo mode** increases the speed of some blocks, specifically if they involve movement.

5. When you click the **Tips** menu, the Tips Window will be shown. Tips is similar to the **Help** menu.

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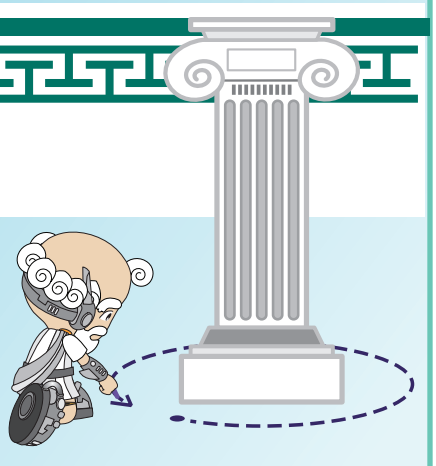
6. When you click **About**, you will be directed to the **About** page (http://scratch.mit.edu/about/).
7. The stamp icon allows you to **Duplicate** the script, costumes, and sounds. Once you click it, your mouse cursor will be changed to a stamp, then, you can click the script, costumes, and sounds you want to duplicate.
8. The scissors image allows you to **Delete** the script, costumes, and sounds. It works like the stamp icon that lets you click the items you want to be removed.
9. **Grow** allows you to increase the size of the costume on the Stage.
10. **Shrink** allows you to decrease the size of the costume on the Stage.
11. **Block help** is used to give you basic information about the Scratch environment.
12. **Username** appears only when you are working on an online editor. This indicates the name and profile of the user currently working on a project.

ROUND UP



The Scratch environment is divided into 3 major panes:

- Stage
- Sprite List
- Scripts Tab

Scratch Programming has its own built-in Paint Editor which is similar to what's used on MS Paint and Paint.Net. One of the important features of Paint Editor is setting the center of an image.

Scratch Programming has four building blocks: Command, Function, Trigger, and Control. Command blocks are also called stack blocks. Trigger blocks are also called hat blocks. The Control blocks are of two types: the C block and the Cap block.

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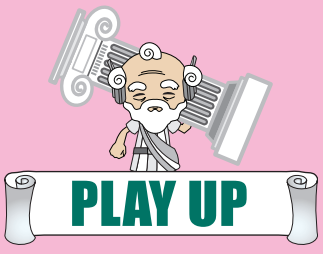
NAME: _____

GRADE/SECTION: _____

DATE: _____

SCORE



A. Identification. Identify the items asked for in the following statements.

_____1. One of the major panes of Scratch which is composed of the Block Tab and Scripts Area

_____2. Place where the sprites move, draw, and interact

_____3. Identical to Costumes

_____4. Gives the option to change the sprite according to the category and theme of the project

_____5. Option at the bottom of the Scripts Area that allows sharing of a project with the online community

B. Translate each block into a statement.

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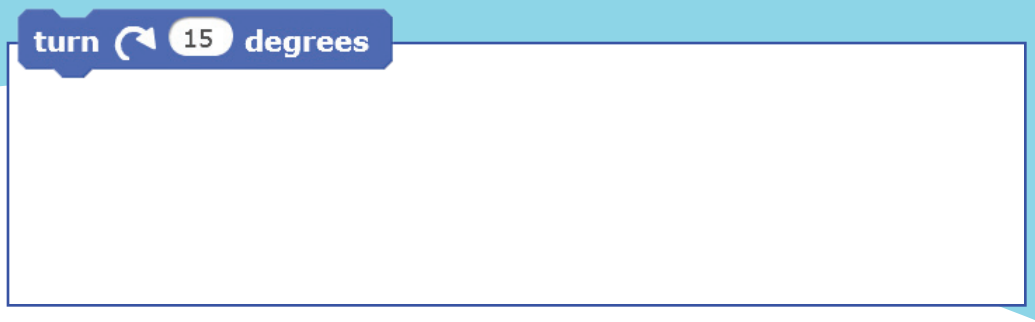

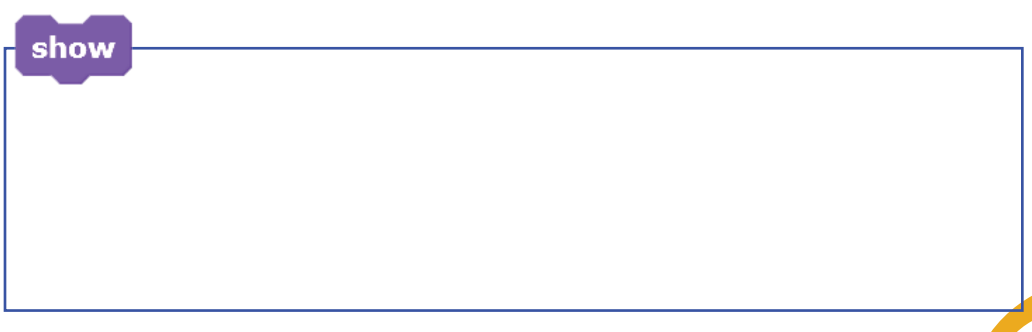

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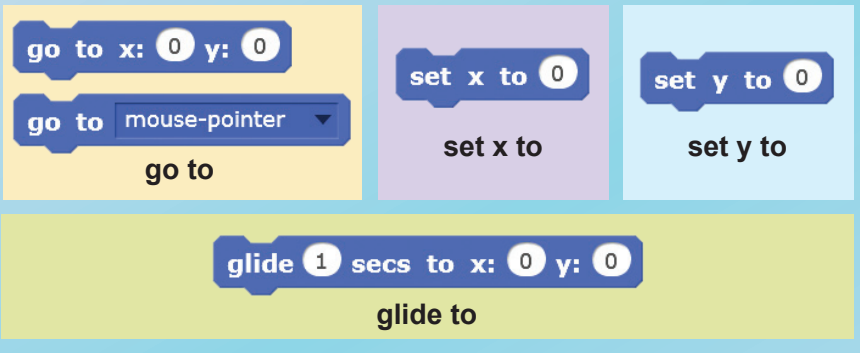
Using Motion Commands and Changing the Sprite's Looks

Absolute Motion



- Explore the Motion commands of Scratch
- Draw artistic and geometric patterns
- Create animations and image effects

Scratch has four absolute motion commands that let you direct where the sprite should move on the grid.

If you want Tekki to move from one point to another (at position 200,150) just like what is illustrated in Figure 22-1, you use the **go to x, y** block. The x-coordinate tells Tekki how far to move horizontally, whereas the y-coordinate tells how far to move vertically across the Stage.

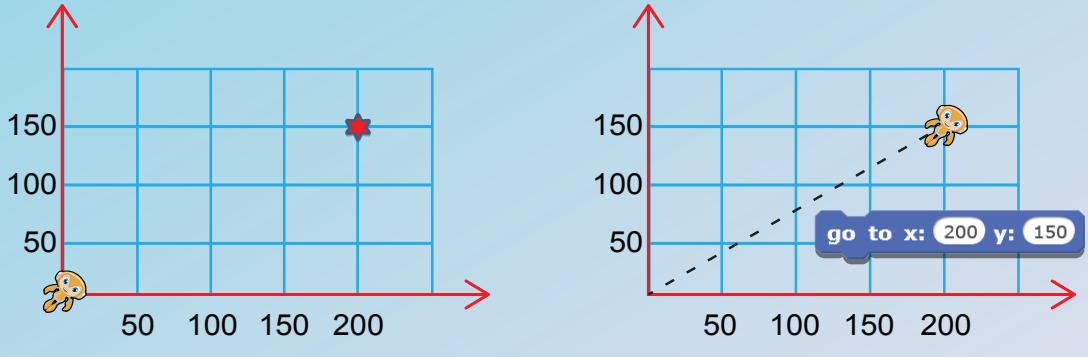


Figure 22-1: Sprite moving to any point on the Stage using **go to x, y** block

On the other hand, you use the **go to mouse-pointer** block if you want to go to the location of the mouse-pointer or another sprite.

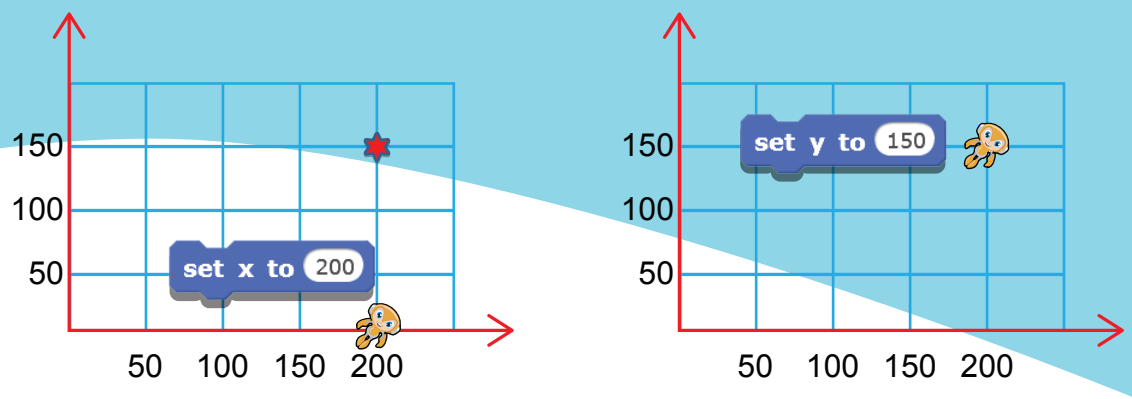


Figure 22-2: Sprite moving to any point on the Stage using **set x to** and **set y to** block

Figure 22-2 illustrates how **set x to** and **set y to** are used independently. If you want to show the current x and y position, you can use the reporter blocks. Just click the checkboxes next to the x position and y position blocks to see their values on the Stage.

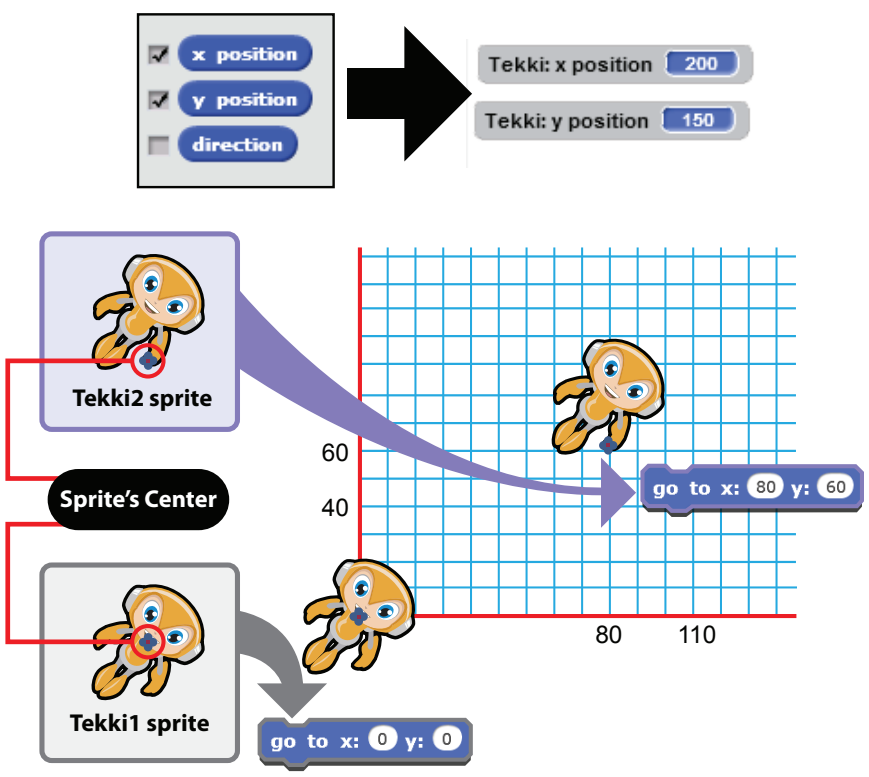


Figure 22-3: Motion commands in reference to sprite's center

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It is important to identify the sprite's center as it affects the movement. By default, Scratch assigns the center of a sprite. For example in Figure 22-3, the default center of Tekki1 sprite is right below his mouth, located at point (0,0). Once you modify the center of your sprite, it will now become the new basis for the sprite's location. Look at the Tekki2 sprite with a modified sprite's center located at the left hand. When you command the Tekki2 sprite to transport to point (80,60), the sprite's center, which is the Tekki2 sprite's left hand, is now at the point (80,60).

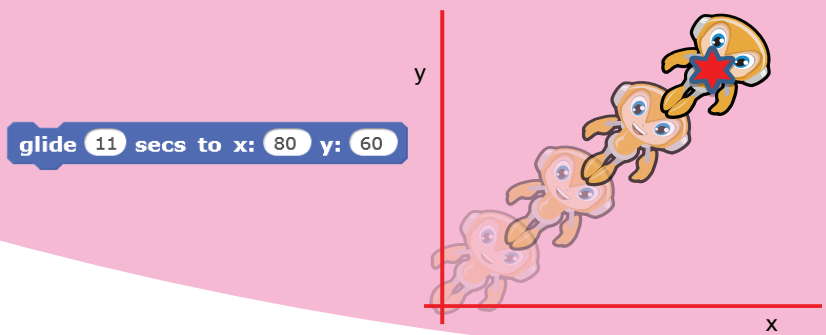

Figure 22-4: Motion command in glide to block

Figure 22-4 shows how the sprite moves smoothly to a certain **x, y** position on the Stage using the **glide to x, y** block. It is almost identical to the **go to** command, but it allows you to set how long Tekki will take to reach the target.

Relative Motion

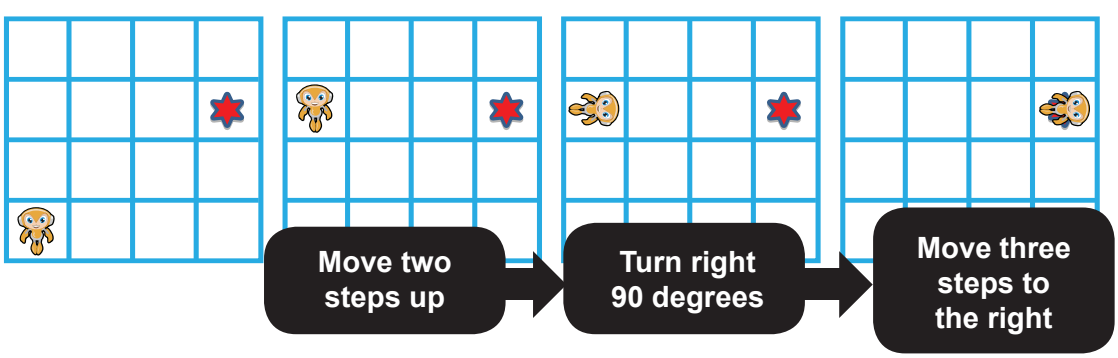

Figure 22-5: Moving sprite using the Relative Motion Commands

Move and **Turn** are relative motion commands. Figure 22-5 shows how the commands are used to move Tekki to his destination. The first command instructs Tekki to move two steps up, turn to the right 90 degrees, and move three steps to the right until Tekki reaches the destination.

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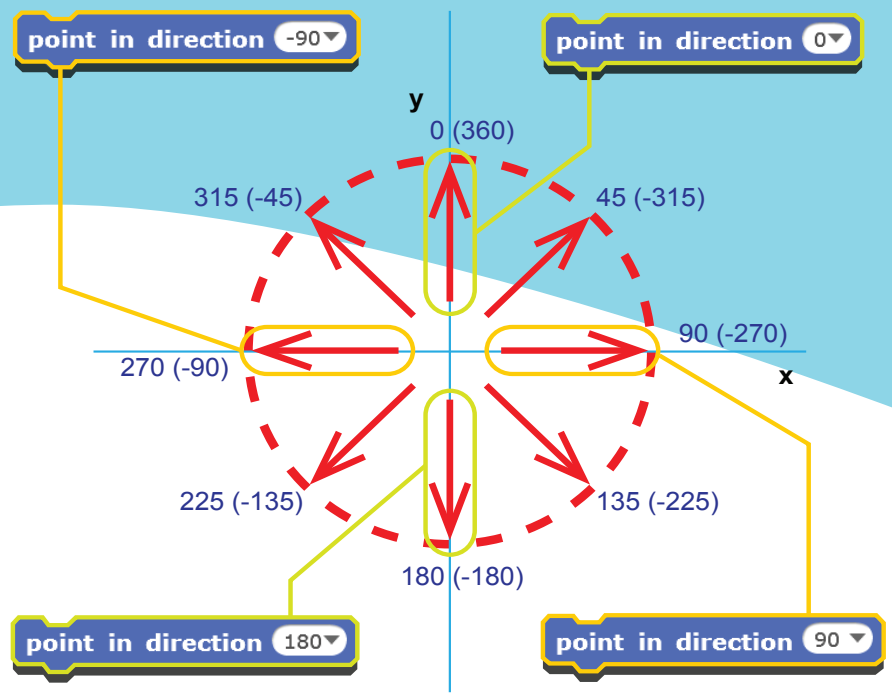

Figure 22-6 Scratch different directions

It is important for you to understand how Scratch uses directions to move a sprite using the **point in direction** command. In Scratch, UP direction is equivalent to 0, RIGHT is 90, LEFT is -90, and DOWN is 180. Notice that 225 (-135) points the sprite to the same direction, which is Southwest. This only means that you can use any of the two values.

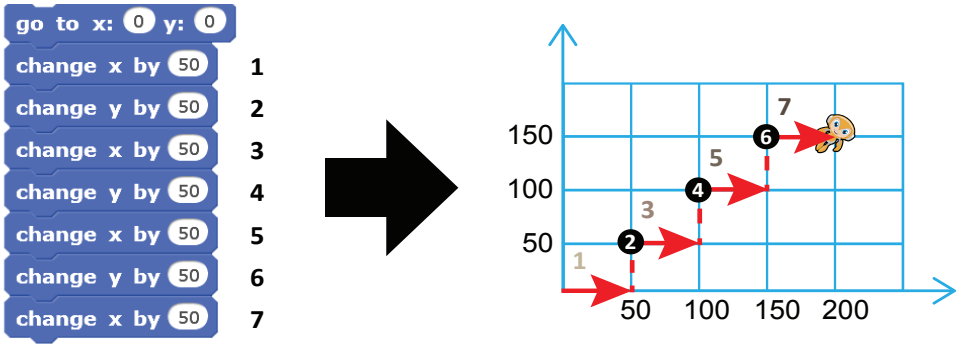

Figure 22-7 Using change x and change y

There are some instances that you just want to move the sprite horizontally or vertically. In this case, you can use the **change x** and **change y** blocks as illustrated in Figure 22-7.

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point towards and set rotation style Commands

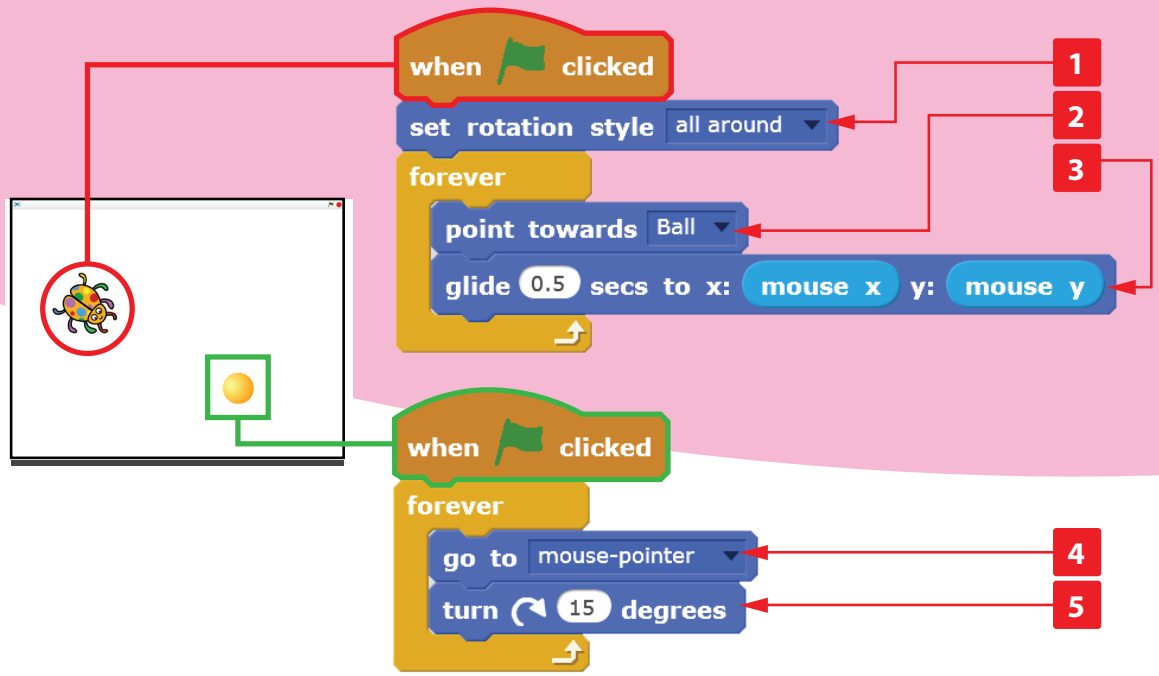

Figure 22-8 Programming a ladybug to run after a ball

Figure 22-8 contains two sprites, Ladybug1 and Ball, with their scripts. When you click the green flag icon, the Ladybug1 sprite continuously follows the Ball.

1. Ladybug1 is set to rotate on the Stage.
2. Ladybug1 continuously points towards the ball; and
3. glides towards the ball at 0.5 second following the x and y coordinates using the mouse x and mouse y commands.
4. Ball is instructed to go where the mouse pointer is located; and
5. turn to the right 15 degrees.

Looks Palette

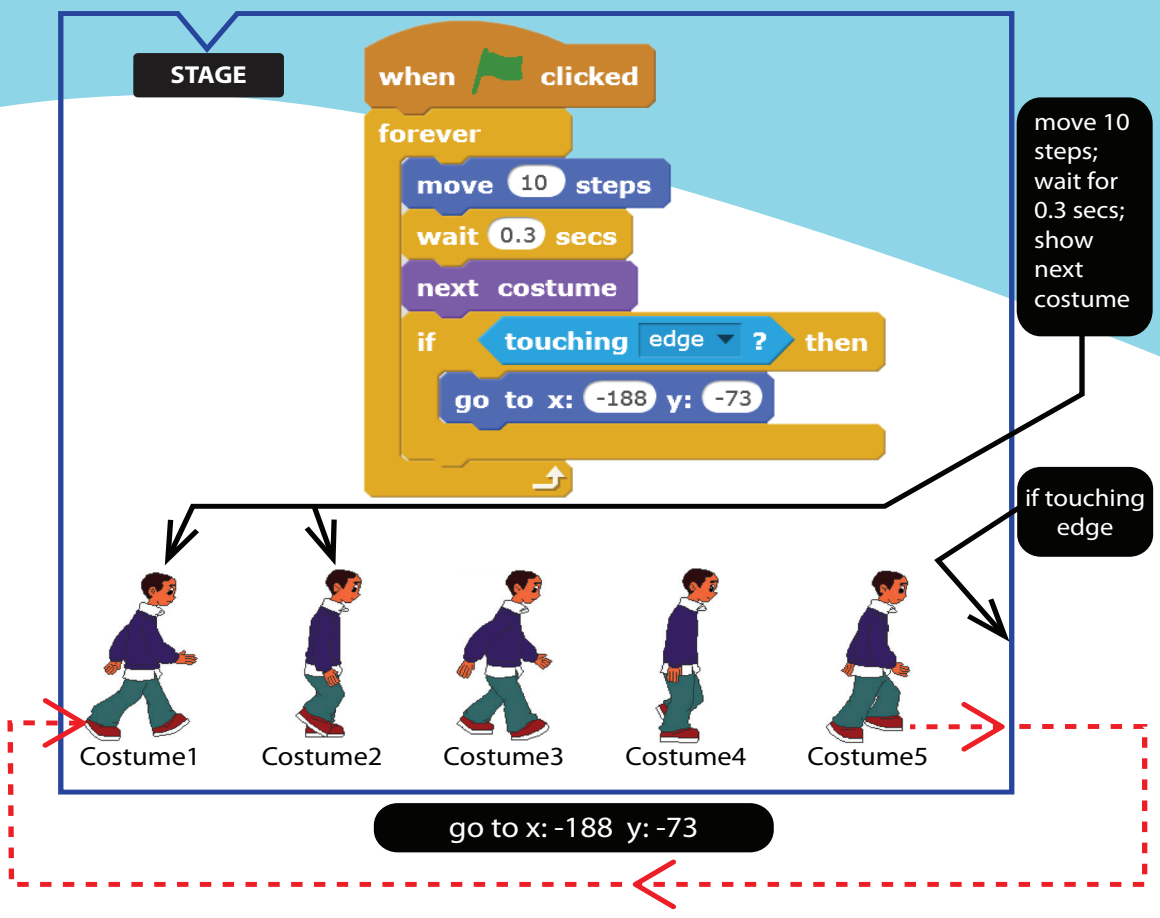

Figure 22-9: Using multiple costumes to animate

From the previous lessons, you learned how to bring a sprite from one point of the Stage to another. Scratch lets you add variety to the sprite through the sprite library, which gives you several costumes for a single sprite just like in Figure 22-9. You can see the 5 costumes in the **Costumes** tab. Duplicate the sprite just like in the figure above. When you run the application by clicking the green flag, the sprite, Boy3 Walking, will appear to walk on the Stage. The key to its motion is the next costume command, which tells the sprite to put on the next costume in its list. If the sprite is wearing the last costume in the list, it will return back to its first costume.

When the green flag is clicked, the script starts a **forever** loop with a **wait** block after the **move** block to create a delay of 0.3 second before each costume change.

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Image Effects

As illustrated in Figure 22-10, you can change the effects of the image. In the **Looks** palette, use the **set effect to** block to choose the effect you want from the drop-down menu. You can also use the **change effect by** block to adjust an effect. For instance, if the current ghost effect is set to 45, changing it to 55 will set the ghost effect to 100, causing the sprite to disappear. When you want to return an image to its original state, use the clear graphic effects.

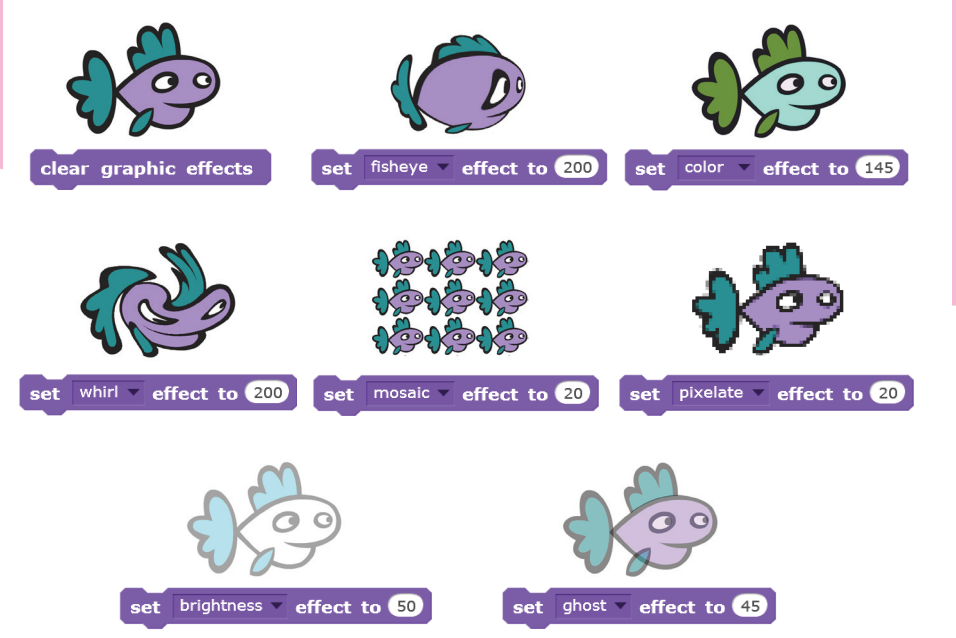


Figure 22-10: Different Image Effects

Say and Think

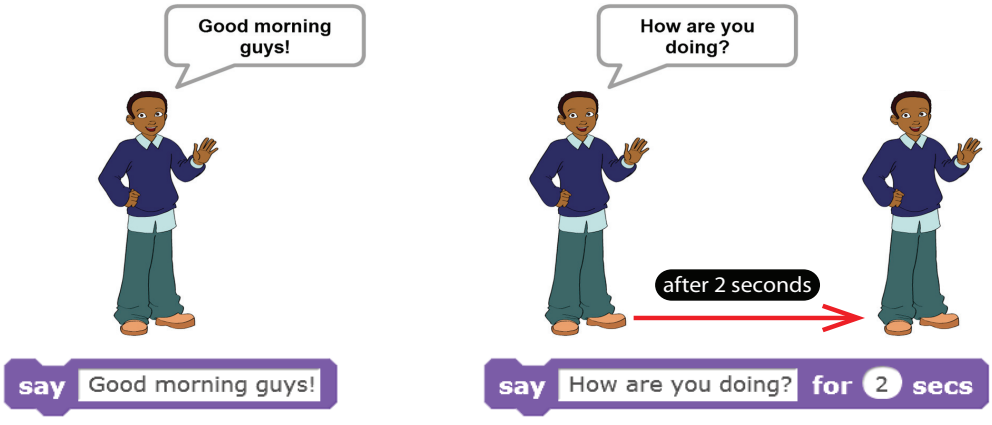


Figure 22-11: Using say command to show the message in a speech bubble

Shown in Figure 22-11 are two illustrations of the **say command** in which the message is displayed permanently or temporarily using a specific time span. If you want to clear the message, use a say block with no text.

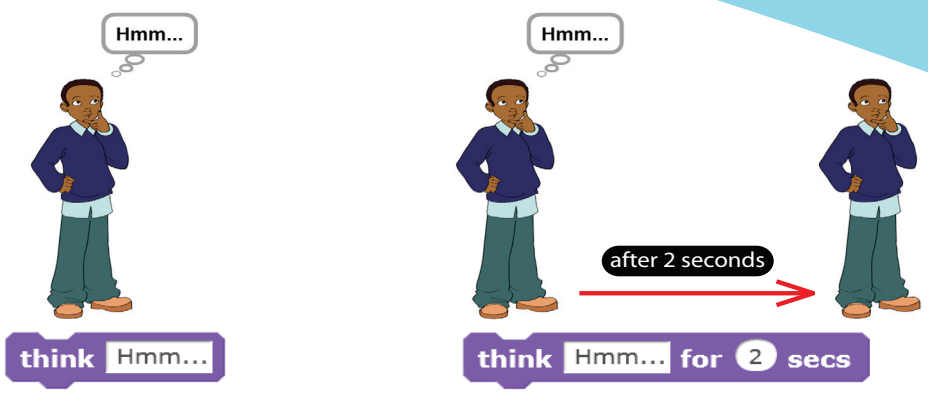
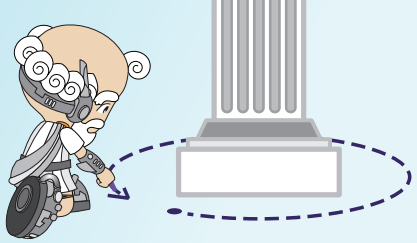


Figure 22-12: Using the think command to show a message in a thought bubble

Shown in Figure 22-12 are two illustrations of the **think command** in which the message is displayed permanently or temporarily using a specific time span. If you want to clear the message, use a think block with no text.

ROUND UP



You use absolute motion commands if you want to move sprites to specific points. You use relative motion commands if you want to move sprites with reference to their own position and directions.

The commands in the **Looks** palette will let you create animations and apply graphic effects like whirl, fisheye, ghost, and so on, to costumes and backgrounds.

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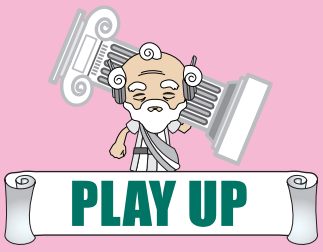
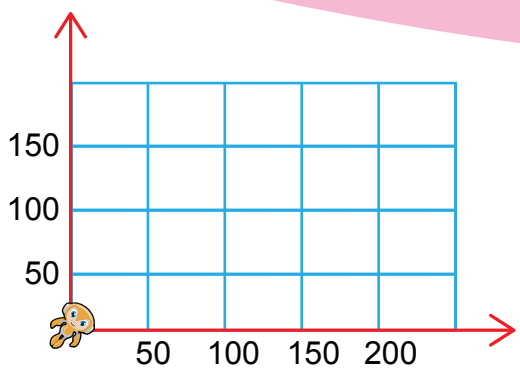
GRADE/SECTION: _____

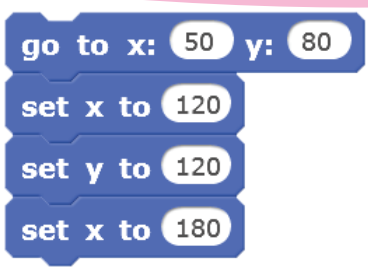
DATE: _____

SCORE



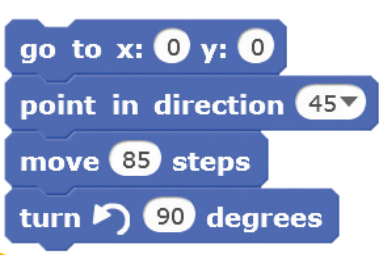
A. List the coordinates of the Tekki sprite after each command in the script shown below.



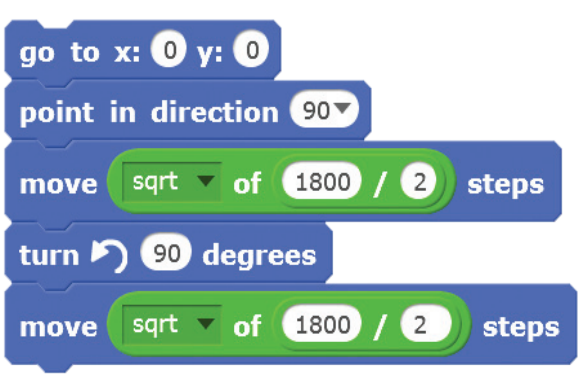


B. Find Tekki's final (x,y) position when it executes each of the scripts shown below.

1



2



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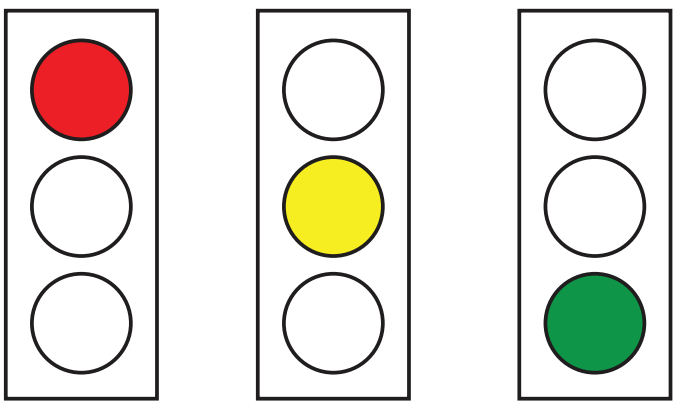
C. In this activity, you will simulate a simple traffic signal system by changing the color of the lights using the switch and wait blocks. You need to create 3 costumes for traffic light similar to the illustration below. Name them STOP, READY, and GO.



STOP READY GO

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Math, Pen, and Sound in Scratch

Arithmetic Operators

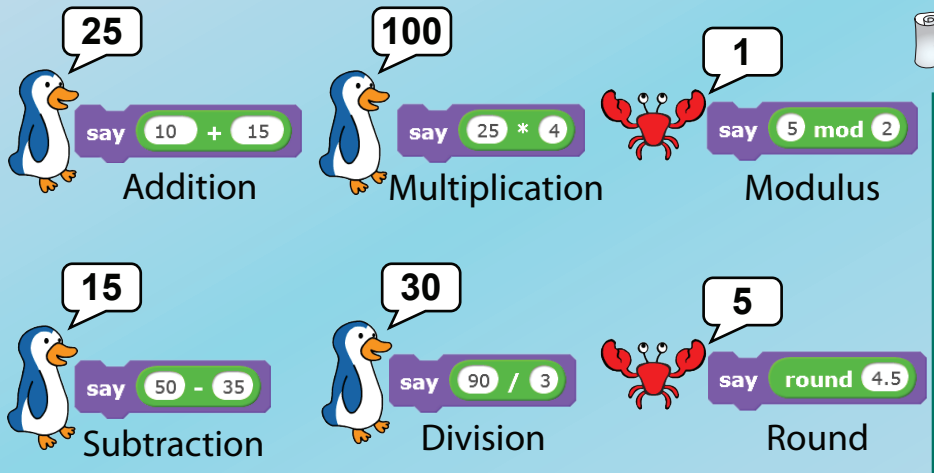

Figure 23-1: Scratch Arithmetic Operators

- Familiarize with Scratch supported arithmetic operators and functions
- Draw artistic and geometric patterns
- Play sound files and compose music

Like any other programming language, Scratch supports basic arithmetic operators such as Addition (+), Subtraction (-), Multiplication (*), Divison (/), Modulus (mod), and Round (round) as shown in Figure 23-1.

The **Modulus** operator returns the remainder of the division of two numbers. For instance, **5 mod 2** returns 1 because the remainder of dividing 5 by 2 is 1. A modulus of 0 shows that larger integer is divisible by the smaller integer.

The **Round** operator rounds the decimal number to the neartest whole number. For example, **round (4.5)** is equal to 5.

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Logical Operators

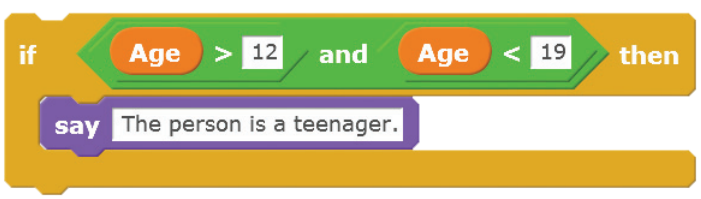
Logical Operators use Boolean Algebra to determine whether the value is TRUE or FALSE.

With the logical operator **AND**, the result is TRUE if condition 1 is true and condition 2 is true as well. For instance, in Figure 23-2, the Age must be greater than 12 and less than 19 to produce a TRUE value.

With the logical operator **OR**, the result is TRUE if one of the two conditions is true. For instance, the Day must either be Saturday or Sunday to produce a TRUE value.

With the logical operator **NOT**, the result is TRUE if the condition is not true. For instance, the Month must not be equal to December to produce a TRUE value.

AND



OR

NOT

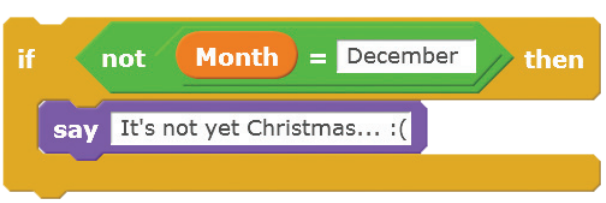


Figure 23-2: Logical Operators

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Random Numbers

As your skills in Scratch improve with complexity, you will encounter problems that need to generate random numbers just like what you did in the Bouncing Ball activity. Scratch provides pick random blocks to represent the purpose.

Examine the examples below.

EXAMPLE	OUTPUT
pick random 0 to 2	{0, 1, 2}
pick random 0 to 10	{0, 1, 2, 3, 4, …, 10}
pick random -3 to 3	{-3, -2, -1, 0, 1, 2, 3}
10 + pick random 0 to 5	{10, 11, 12, 13, 14, 15}
pick random 0 to 2.0	{0, 0.1, 0. 2, 0.345, …, 2.0}
pick random 1 to 10 * 10	{1, 2, 3, …, 55, 56, 57, …, 100}

Figure 23-3: Pick Random Block Examples

Notice the output of pick random 0 to 2 and pick random 0 to 2.0. They have different outputs. The first example will provide you 2, 1 or 0. However, the second example will provide you a decimal value between 0 and 2.

Mathematical Functions

Scratch also supports a large number of mathematical functions such as square root (sqrt), logarithmic (log), and exponential functions (e^ & 10^).

Like other programming languages, Scratch supports Arithmetic and Logical Operators, Random Numbers, and Mathematical Functions.

Figure 23-4: Mathematical Functions

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The Scratch Rainbow

What is unique with Scratch is that each sprite has an invisible pen, which can be used as if you were writing something on a paper. If the pen is down (pen down block), the sprite will draw as it moves. Otherwise, the sprite moves without leaving any mark. There are three commands in the Pen palette that can be used: pen size, pen color, and pen shade.

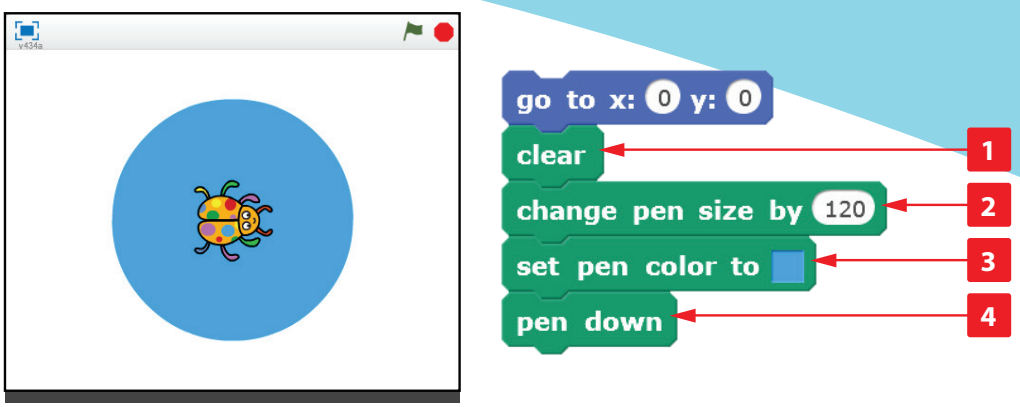

Figure 23-5: Applying **pen size** by and **pen color** to blocks

1. **clear block** is used to clear all pen marks and stamps from the Stage. These are not part of the backdrops.
2. **change pen size by** block is used to change pen thickness.
3. **set pen color to** block is used to set pen color according to the specific color you want.
4. **pen down** block is used to leave a trail mark as soon as the sprite moves.

Try to recreate the script in Figure 23-5 and play with the different sizes and colors.

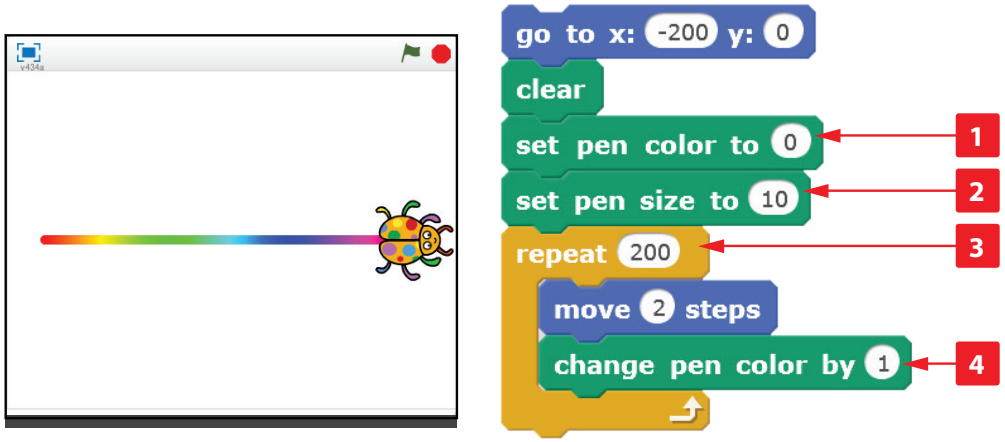

Figure 23-6: Applying **set pen color to**, **set pen size to,** and **change pen color by** blocks

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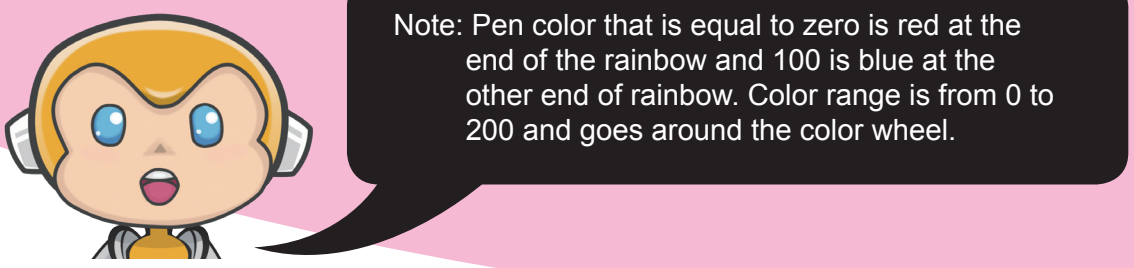
1 **set pen color to** block is used to set color according to specified numeric values (unlike in Figure 36-1). For example, number zero (0) is **red**, number 70 is **green**, number 130 is **blue**, and number 170 is **magenta**.

2 **set pen size to** block is used to set pen thickness.

3 unlike the forever block, **repeat** block is used to run the block/s inside a specific number of times.

4 **change pen color by** block is used to change pen color by a specific level.



Try again to recreate the scripts in Figure 23-6 and play with the different sizes and colors and the number of times they can be repeated.

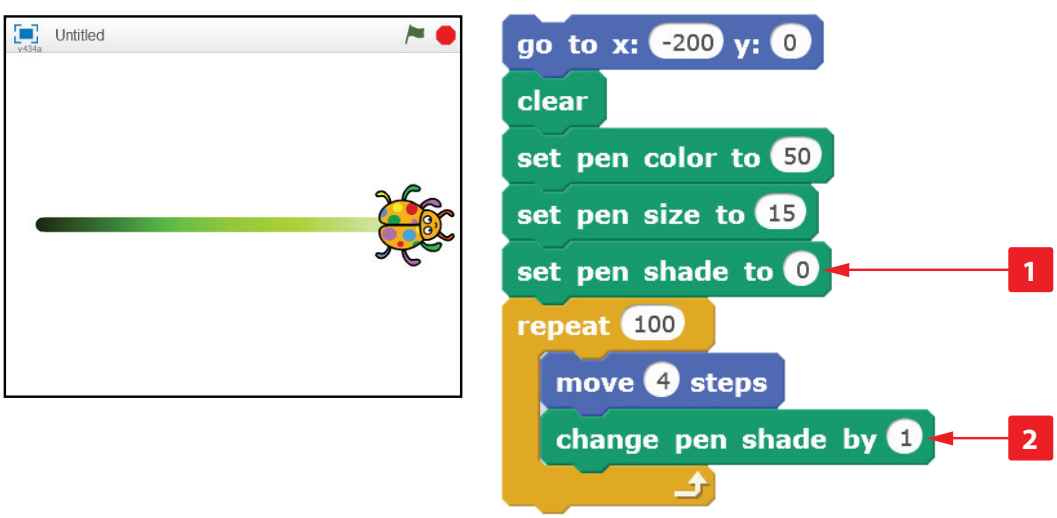


Figure 23-7: Applying **set pen shade to** and **change pen shade by** blocks

1 **set pen shade to** block is used to set pen shade to a specific level. Shade level ranges from 0 to 100 wherein the default is 50. The pen color is close to black if the level is equal to zero (0), and close to white if it is equal to 100.

2 **set pen shade by** block is used to change pen shade to a specific level. Shade level ranges from 0 to 100 wherein the default is 50. The pen color is close to black if the level is equal to zero (0), and close to white if it is equal to 100.

Try again to recreate the scripts in Figure 23-7, run and play with the different pen shades.

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Drawing Using Pen Commands

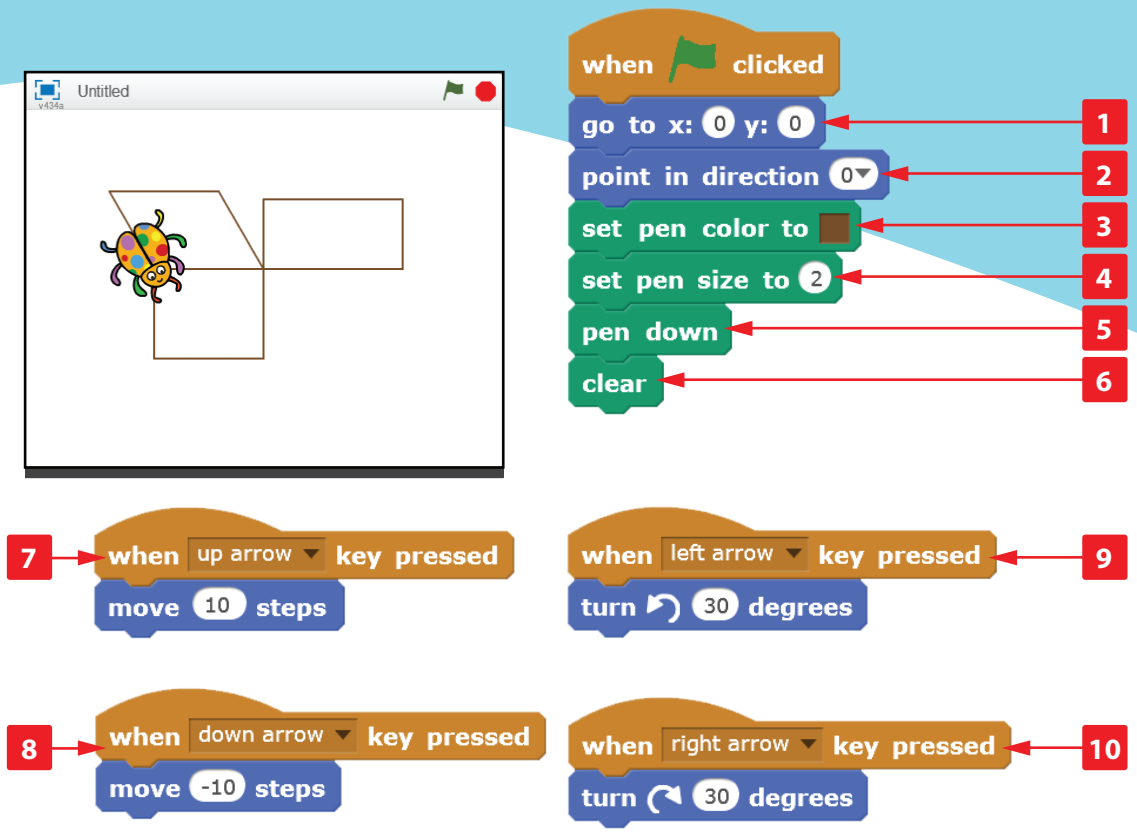

Figure 23-8: Drawing using pen commands

It is more interesting if you can create a simple program to draw pictures with the use of arrow keys on your keyboard. Try to follow the instructions below:

1. the Ladybug1 sprite will be moved to the center of the Stage
2. the Ladybug1 sprite is positioned in an upward direction
3. sets the pen color according to your preference
4. sets the pen size to 2 (you have the option to change according to your preferences)
5. gives the signal that you are now ready to leave a trail mark once you press the UP and DOWN keys

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6. clears any mark once you press the green flag
7. in the Events and Motion palette, when the UP arrow is pressed, the sprite will move 10 steps forward and leave a trail mark
8. in the Events and Motion palette, when the DOWN arrow is pressed, the sprite will move 10 steps backward and leave a trail mark
9. in the Events and Motion palette, when the LEFT arrow is pressed, the sprite will rotate 30 degrees to the left
10. in the Events and Motion palette, when the RIGHT arrow is pressed, the sprite will rotate 30 degrees to the right

Audio Files

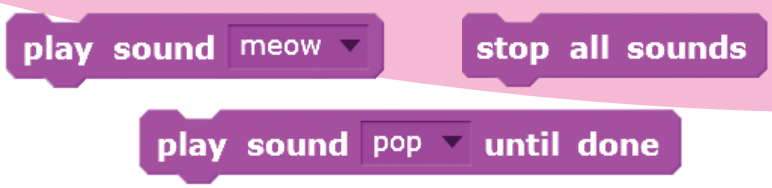

Figure 23-9: Sound files command

Scratch recognizes only two audio formats, WAV and MP3. The **play sound** block is used to start playing a sound and continues to the next block immediately. Whereas, the **play sound until done** block waits until the sound is finished playing before continuing to the next block. The **stop all sounds** block is used to immediately turn off any sound that is playing.

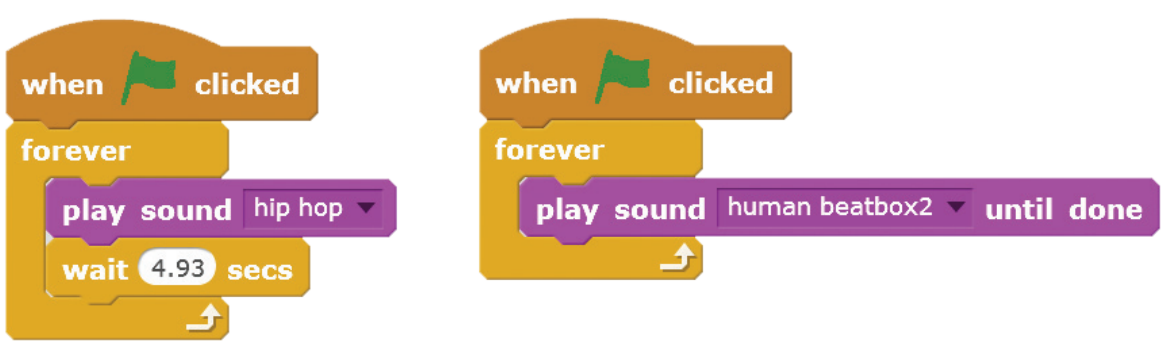

Figure 23-10: Ways of creating background music

Referring to Figure 23-10, you can use create background music in two ways depending on the approach you want, be it short or long. Sometimes it is noticeable that there is a pause between consecutive restarts. Using a wait command, you can control the play duration.

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Drums

You use **play drum for beats** command for a specific number of beats. Scratch offers 22 different beats that you can choose from. For example, in Figure 23-11, we use 2 beats for two drum types.

Figure 23-11: Sample beats

The script contains three repeat blocks with repeat counts of 2, 1, and 5 respectively. The two repeat blocks inside plays two different drum sounds using a different number of beats. Each unit of beat is divided into intervals of 0.2 units. Each loop takes the same amount of time to complete.

Music Composition

Scratch also contains commands that allow you to play music notes and compose your own music. Similar to Figure 23-12, the **play note for beats** command plays the note of your choice, from 0 to 127, for a specific beat. The **set instrument to** block tells Scratch which instruments the note should sound like from the 21 musical instruments available.

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In this case we chose piano.

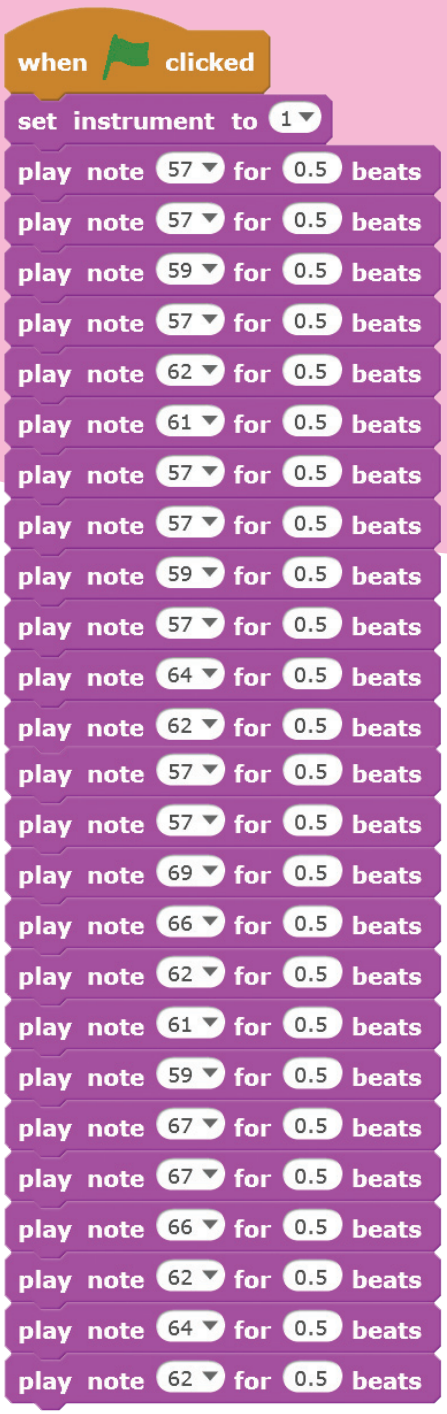

Figure 23-12: Script for Happy Birthday

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Using sound blocks, make a script for this music piece.

E E B B C# C# B

A A G# G# F# F# E

B B A A G# G# F#

B B A A G# G# F#

E E B B C# C# B

A A G# G# F# F# E

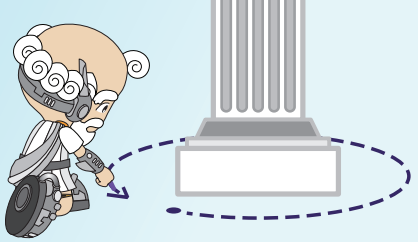
Is this tune familiar to you? What do you think is the title of this song?

ROUND UP

Like other programming languages, Scratch supports Arithmetic and Logical Operators, Random Numbers, and Mathematical Functions.

With the use of pen commands, you can create attractive drawings.

To add excitement, games, and other applications use sound effects and background music.



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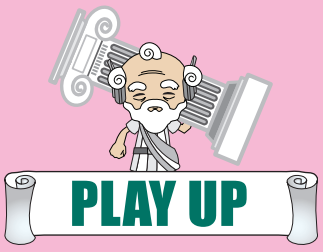
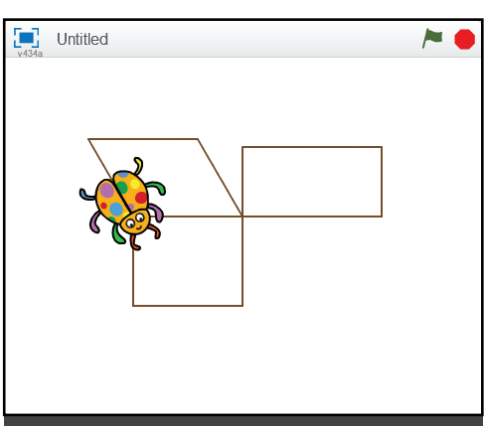
SCORE



A. Complete the following table by writing the value of each expression. After you've completed the table above, use the say command and the appropriate operator blocks to check your answer.

Expression	Value
5 + (2*3)	
(15/3) – 2	
6 + (3 * (8-2))	
(10 + 5) mod 2	
Round (3.2)	

B. Using the same scripts you created in Figure 23-8, add an option to make the drawing pen wide when the letter Z is pressed and narrower when letter N is pressed.



For reference: Figure 23-8

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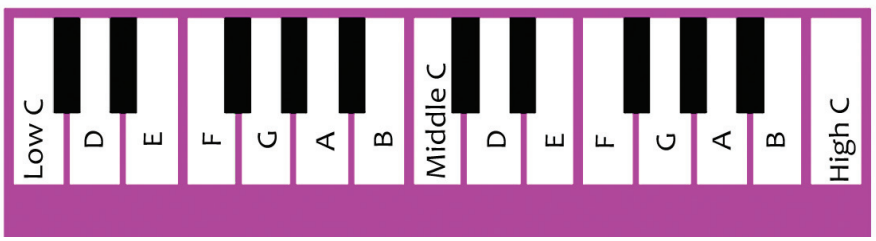
C. Using the play note for beats and set instrument, simulate the *I Love You* Song by Barney.



I Love You (Barney Song)

I love you, you love me
G E G G E G

We're a happy family
A G F E D E F

With a great big hug and a kiss from me to you
E F G C C C C C D E F G

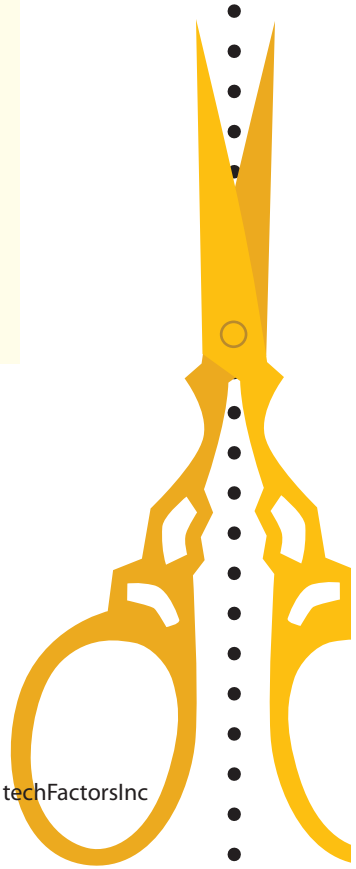
Won't you say you love me too!
G D D F E D G

I love you, you love me
G E G G E G

We're best friends as friends should be
A G F E D E F

With a great big hug and a kiss from me to you
E F G C C C C C D E F G

Won't you say you love me too!
G D D F E D G



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Lesson 24

Creating a Scratch Project

Catch the Falling Stars

Now that you have learned the basic concepts of Scratch, you're now ready to create a project like as shown in Figure 24-1. You will now construct a "Catch the Falling Stars" game. In this game, stars show at random horizontal positions (x-axis) at the top of the Stage at random times and fall to the ground of the moon. The player has to move Tera (game character) to catch the falling stars before they touch the surface of the moon. Each star that Tera catches is equivalent to 1 point.

1. Stars falling from outer space.
2. Using the "A" and "L" keys, move Tera to collect the stars before they reach the surface of the moon.

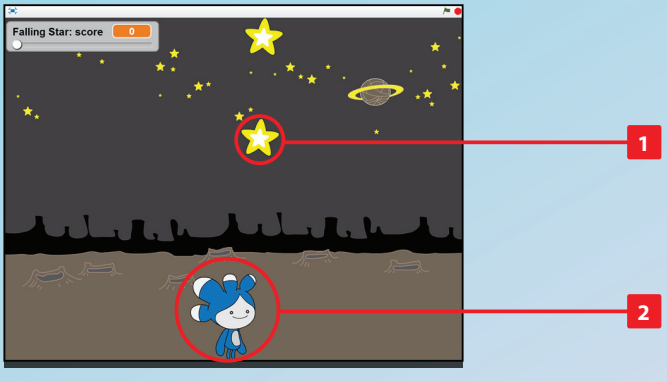

Figure 24-1: Catch the Falling Stars Game

You might wonder how you will be able to produce multiple stars since it was not discussed during the previous lessons. Should you be able to have multiple Star? The answer is NO. In this case, you will be using the **Cloning** feature of Scratch where you can easily create lots of copies of a single sprite. You can easily create lots of copies of a single sprite. It will further be discussed in a while.

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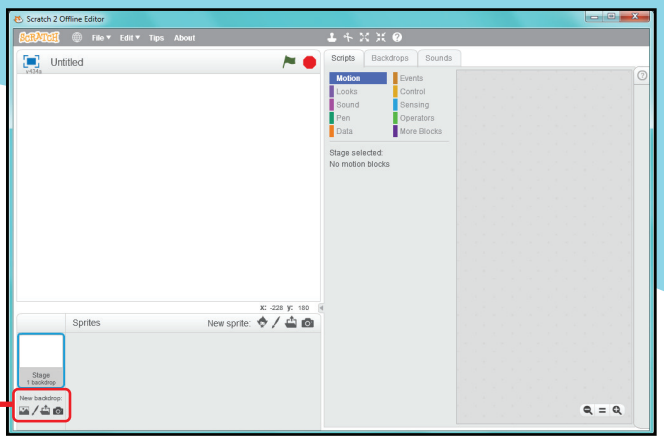
The Stage Backdrop

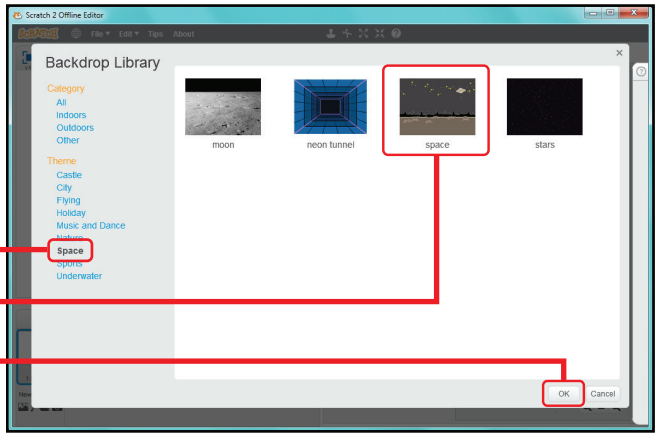
1. Make sure that you delete the sprite before you insert the backdrop Stage. Click the **Choose backdrop from Library** icon.



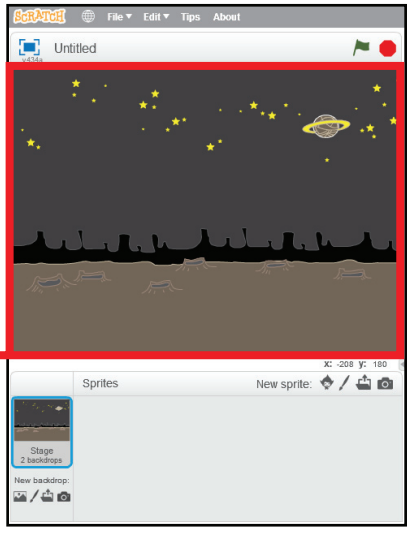
2. Click the **Space** Theme.

3. Choose **space** as your backdrop.

4. Click **OK** button.



5. Your new Stage backdrop.



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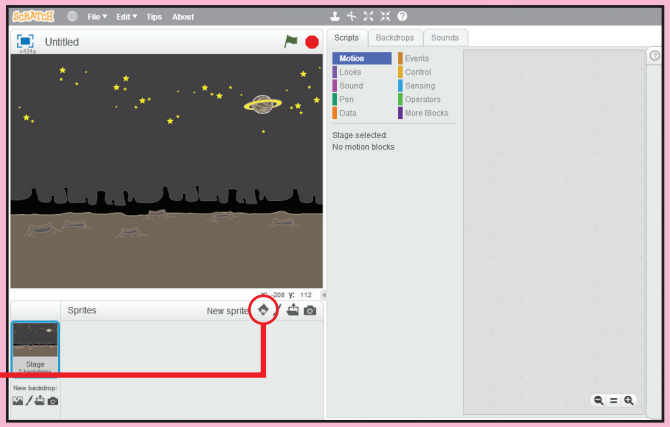
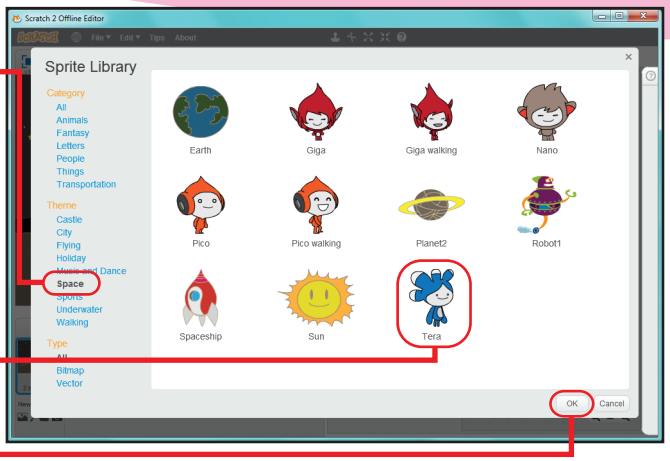
Tera and the Falling Star

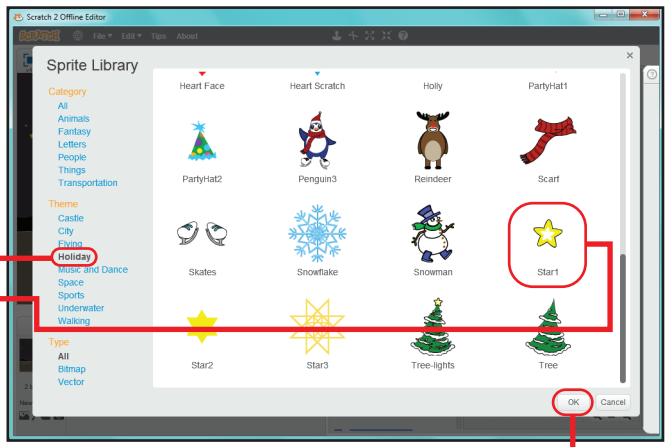
1. Click **Choose sprite from library** icon.



2. Click the **Space** theme.
3. Choose **Tera** as your Sprite.
4. Click **OK** button.



5. Repeat step 1 and choose **Holiday** theme.
6. Choose **Star1** as your second Sprite.
7. Click **OK** button.



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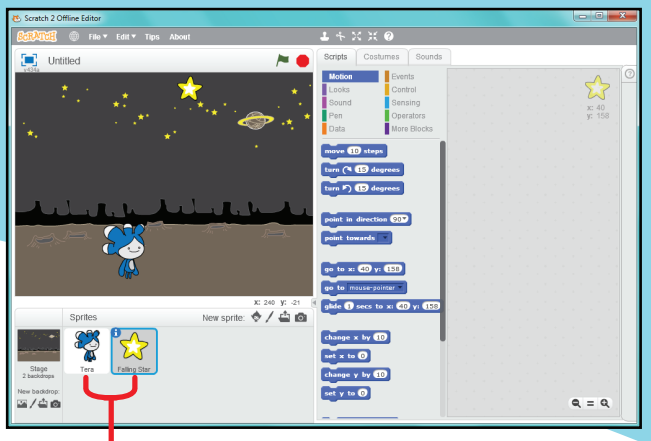
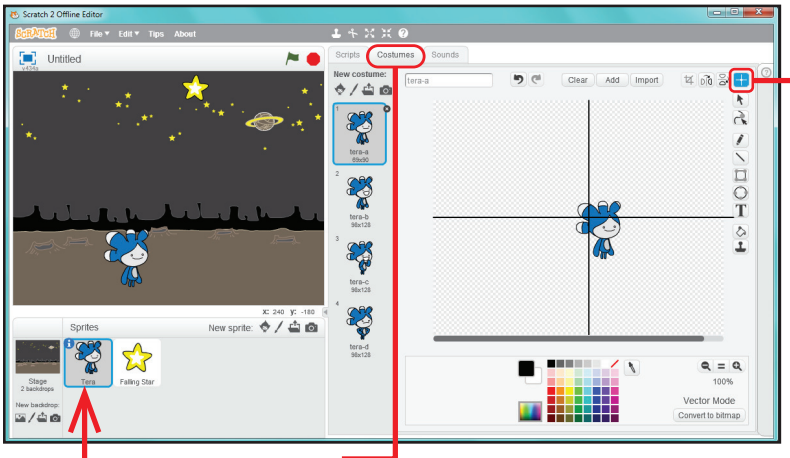
8 For your two new Sprites, rename **Star1** to **Falling Star** and resize your scripts into smaller chunks.



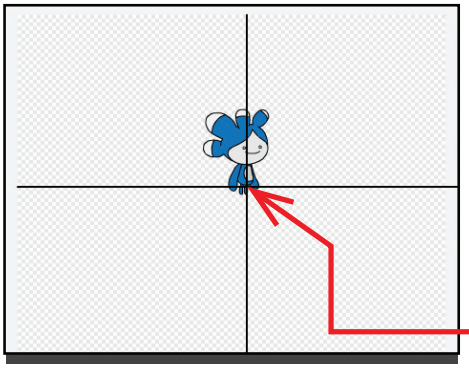
Script for Tera



1 Make sure that Tera has a **light blue border**.

2 Click the **Costumes** tab.

3 Click the **set costume center** button and drag the center, similar to step 4.



4 The **center of Tera's costume** must be positioned here.

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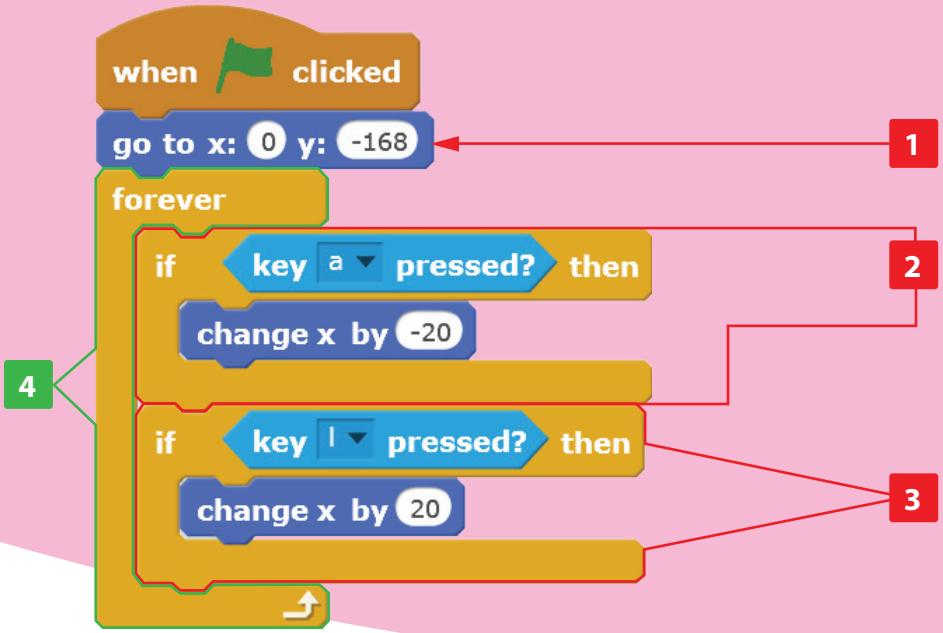
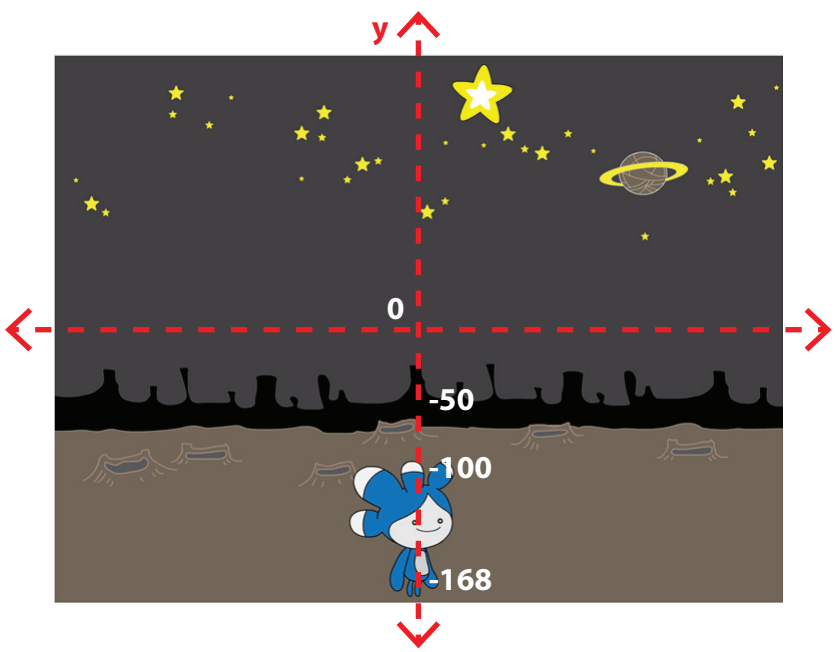


When the green flag is clicked:

1 **Tera** moves to the bottom of the Stage with the position of x = 0 and y = -168.



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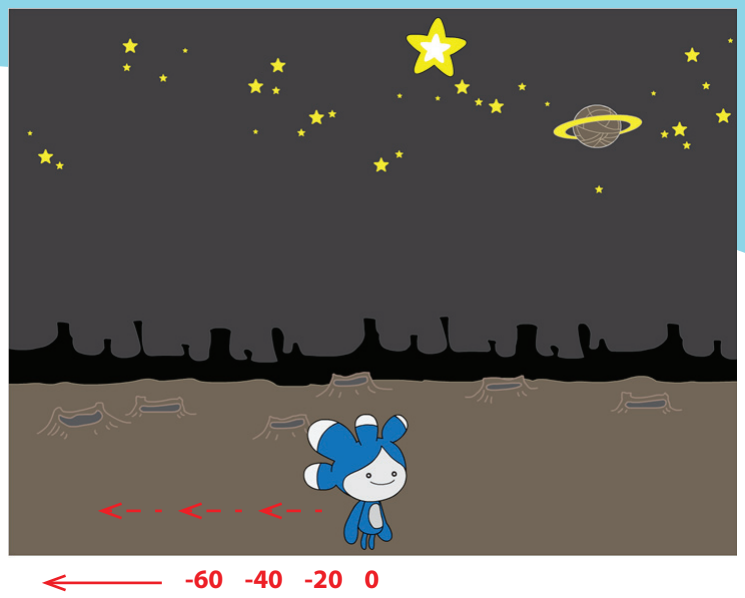
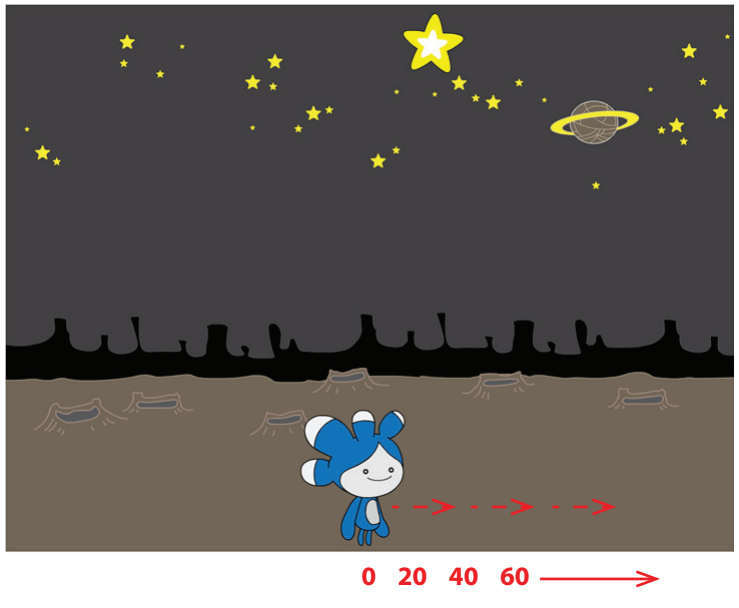
2 2 If '**A'** key is pressed, then the value of x is changed by -20.



3 If '**L'** key is pressed, then the value of x is changed by 20.



4 Blocks inside the **forever control** block will be executed over and over as long as any of the condition still satisfies.

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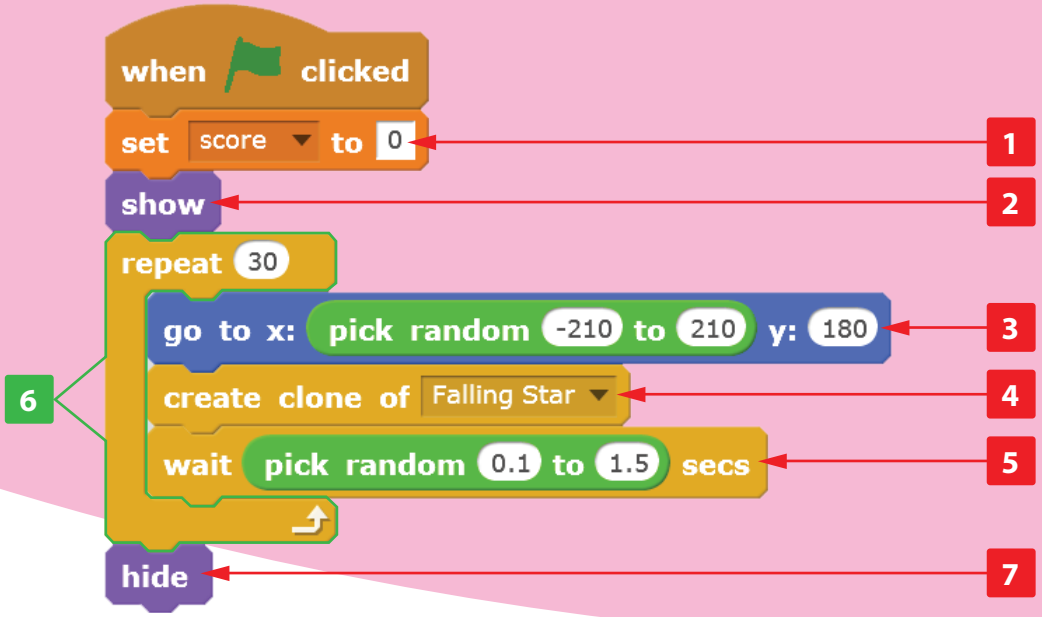
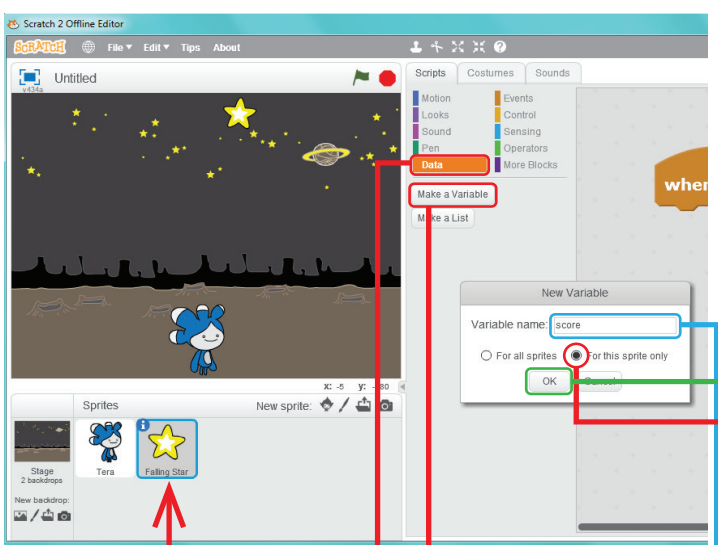
Script for the Falling Star



When the green flag is clicked:

1. A variable named score is set to the value of '0'. This will serve as the initial score when you start the game.



6 Click **OK** button.

5 Choose **For this sprite only** option.

4 Change the variable name to **score**.

1 Make sure that the **Falling Star** has a light blue border.

2 Choose **Data** palette.

3 Click **Make a Variable** button.

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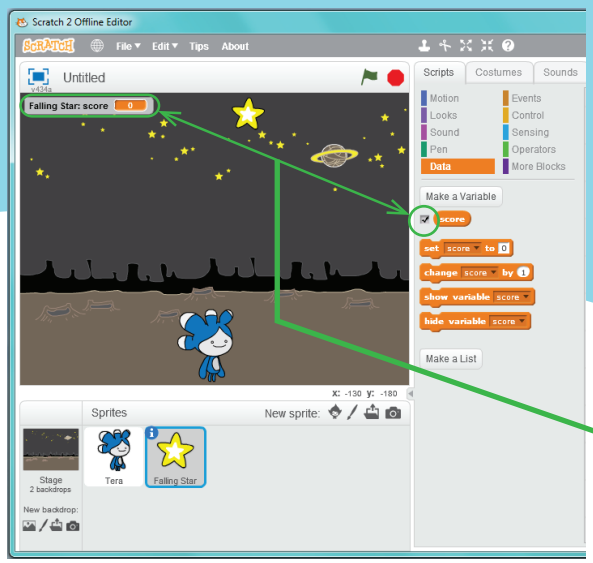
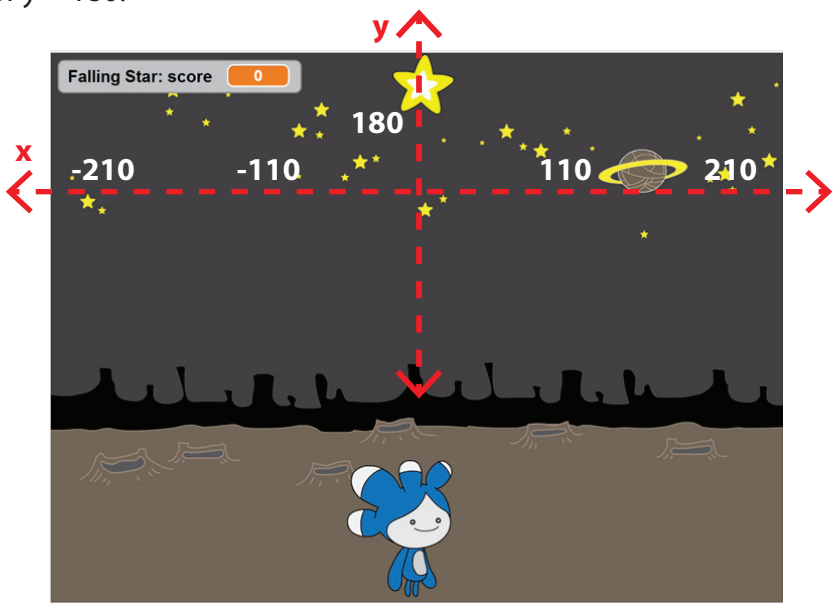


7 Make sure to check the score option to see the value of the variable.

2 Makes the Falling Star appear on the Stage.

3 Moves the Falling Star at a random value of x between -210 and 210 and a fixed value of y = 180.



4 This command allows you to create a temporary clone of the Falling Star.

5 This command allows you to wait for a period between 0.1 to 1.5 seconds before the repeat command is executed.

6 Allows the blocks inside the repeat command to run 30 times. You can change the value if you want.

7 Allows the star to disappear after 30 times.

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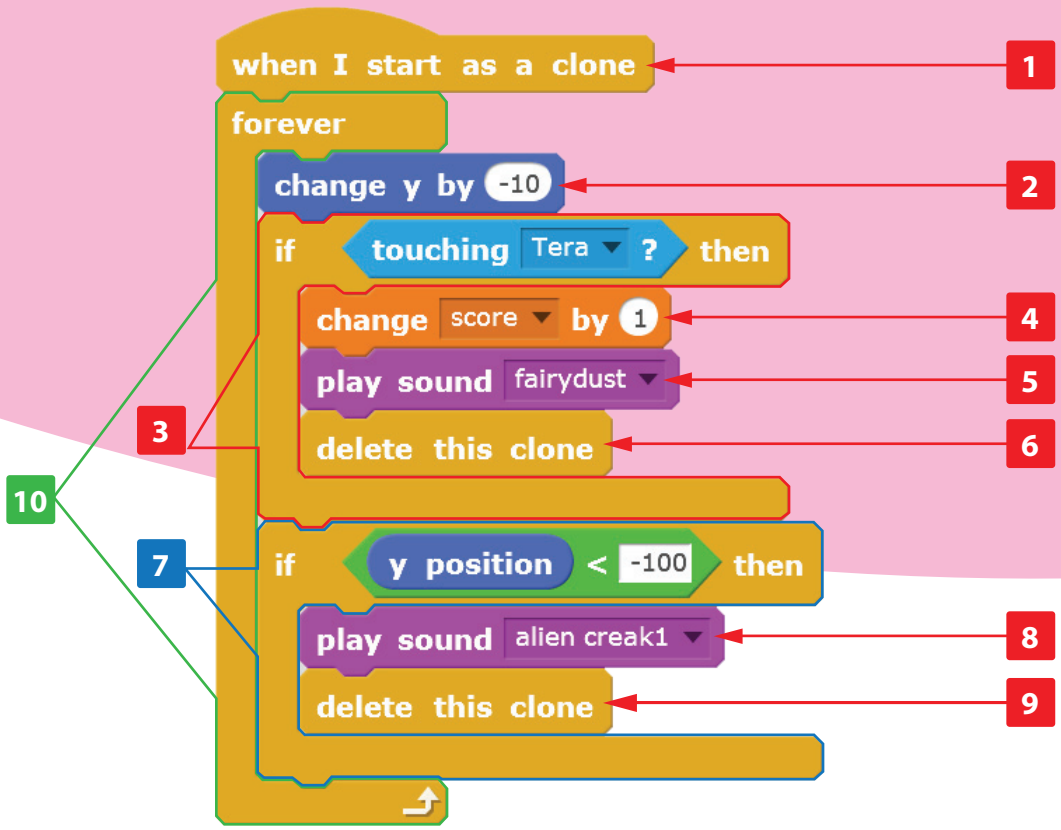
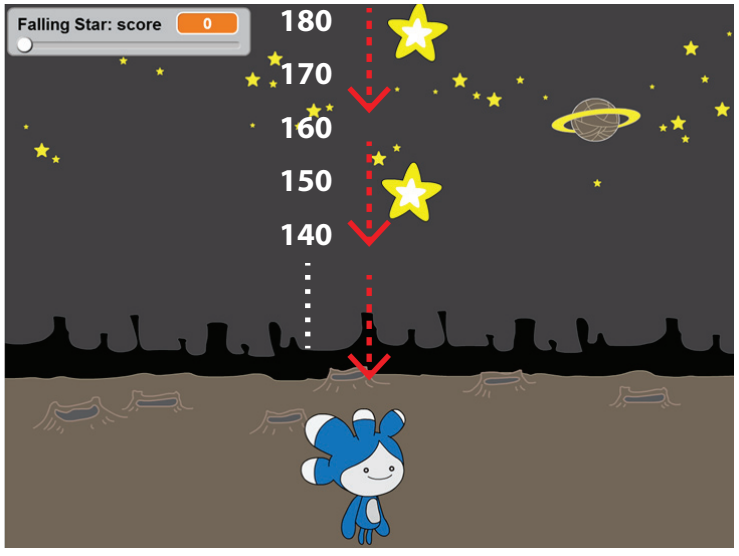
Script for Cloning the Falling Star



1. This event tells the cloned Falling Star what to do once it is created.
2. This command triggers the each of the star to drop from its original position of 180 by -10 steps.



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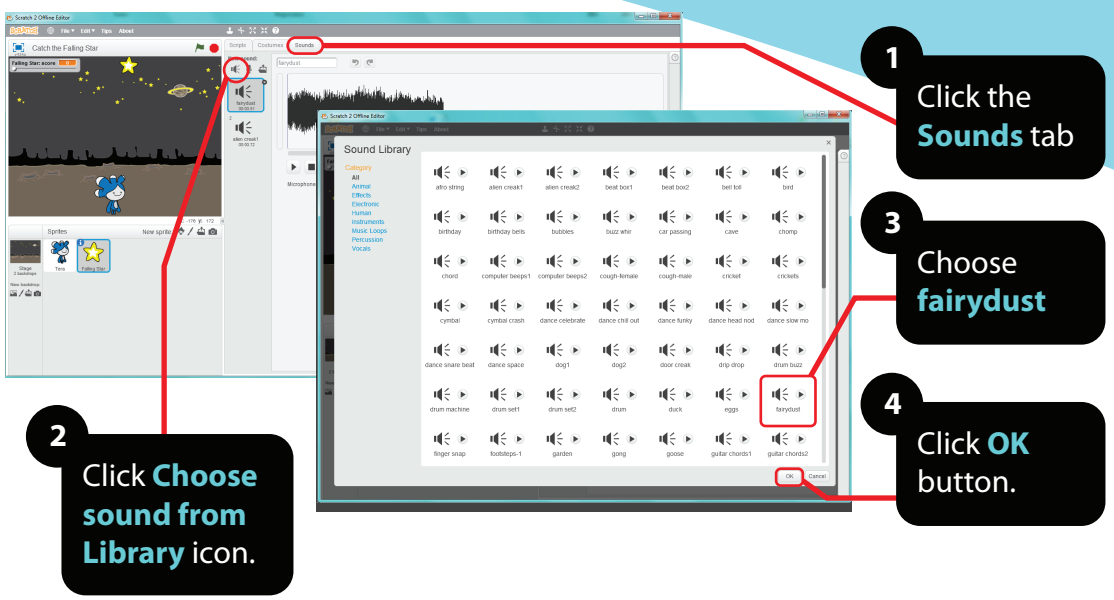
3 If the Falling Star touches Tera, then the blocks inside will be executed.

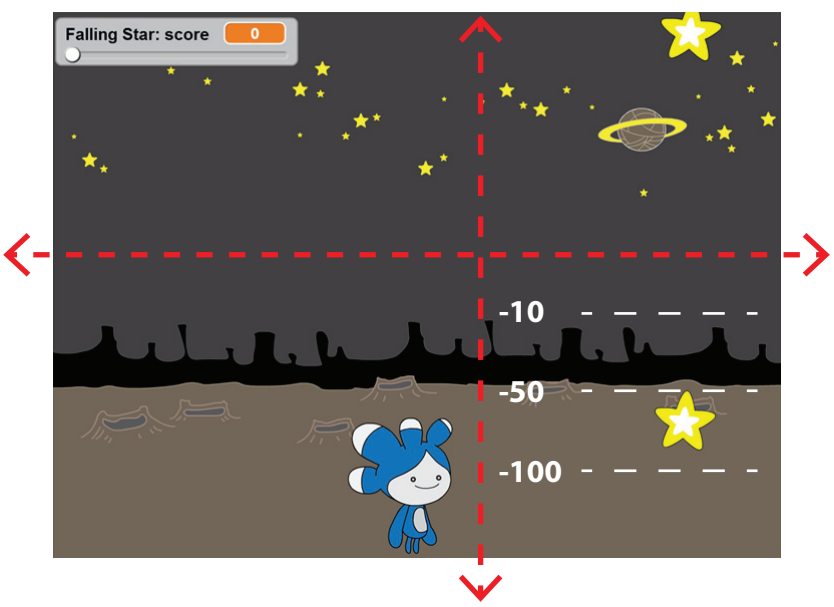
4 Remember that you have the initial score value at zero (0). When the Falling Star touches Tera, the score will increase by 1.

5 To make the game more interactive, a sound is played wherever a star touches Tera.



6 After a star touches Tera, it will automatically be deleted.

7 If the Falling Star's position is less than -100, the blocks inside will be executed.



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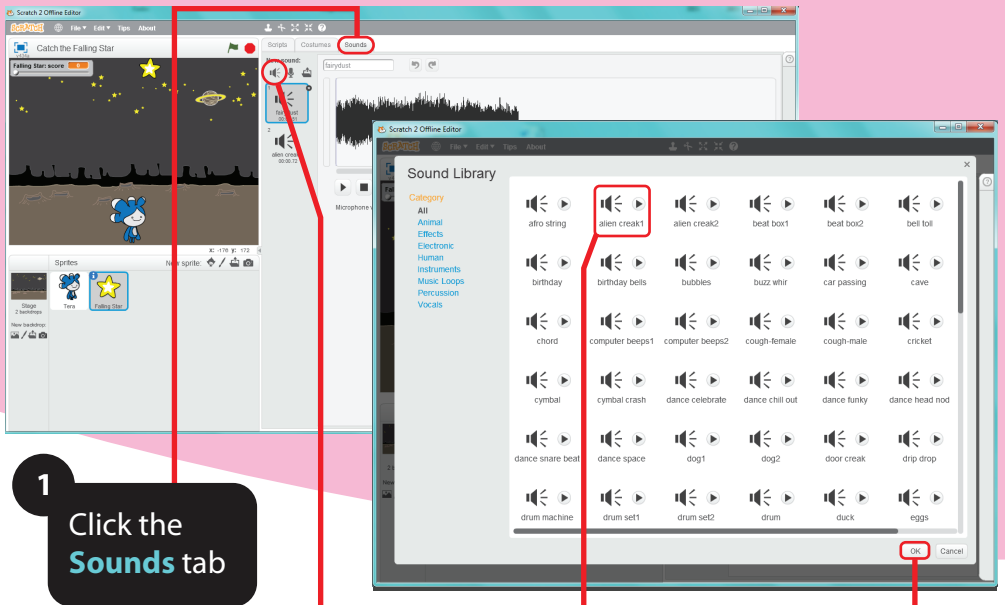
8 A sound is played once the star position reaches -100.



9 After the star reaches the -100 position, it will automatically be deleted.

10 Executions of commands will continue as long as there are still cloned stars being produced.

Now that stars know how to fall, the game is COMPLETED! Test your work by clicking the green flag. If you want to experiment, try changing the wait time between cloning the different stars and the motion speed of Tera. Does that give you ideas for changing the game's difficulty?

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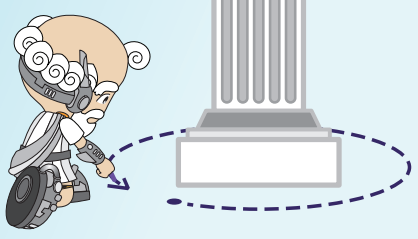
ROUND UP

Now that you have learned the basic concepts of Scratch Programming, you are ready to take the divide and conquer approach in programming.



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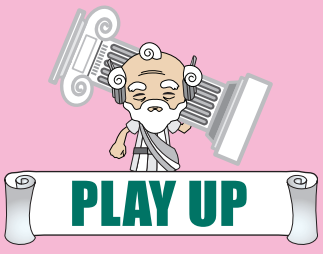
NAME: _____

GRADE/SECTION: _____

DATE: _____

SCORE



The purpose of this last activity is to synthesize your learning in Scratch Programming. Using several activities from the previous lessons, share what you have learned. What surprises you? Has your thinking or perspective in programming issues changed?

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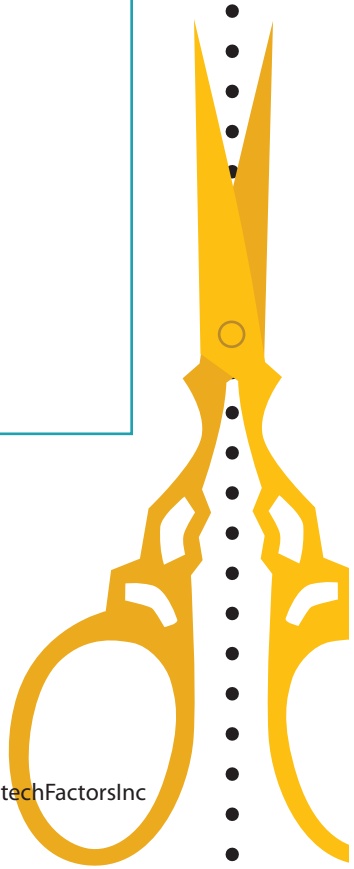

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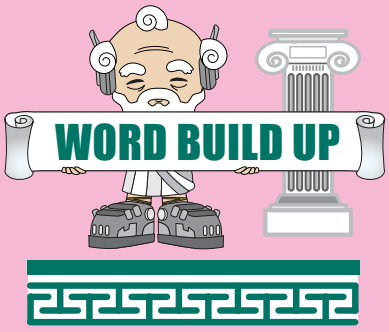

Lesson 1

decimal system
sexagesimal system
abacus
biquinary system
binary arithmetic
touch screen
gestural interfaces
3D technology
3D films
3D TV
3D virtual worlds
motion capture
smartphone
tablet

Lesson 2

data
information
primary memory
secondary memory
instruction
bit
nibble
byte
octet
word
character
ASCII
record
field
field label
file
database
client
server

Lesson 3

microcomputer
minicomputer
mainframe
supercomputer
special purpose computer
microcontroller
embedded computer
general purpose computer
program
analog computer
digital computer
hybrid computer

Lesson 4

I/O operations
sequential file
random access file
origination
input preparation
processing
output preparation
peopleware
information science
information security
information systems
logic
Boolean algebra
speed
accuracy
consistency
reliability
communications
memory capability

Lesson 5

Internet
packet switching
LAN
WAN
WiFi
GPRS
VoIP
multimedia streaming
broadband
cluster/grid computing
e-mail
search engine
chat
blog
P2P
social networks

Lesson 6

bandwidth
SNMP
host computer
network interface card
hub
switch
router
ISP
network services
network socket
socket programming
protocol
TCP/IP
packet
DNS
modem
ping
tracert
proxy server
DHCP

Lesson 7

scripting language
HTML
WYSIWYG
tag
unordered list
ordered list
definition list

Lesson 8

e-mail
e-mail address
snail mail
mail server
webmail
Outlook Express
e-mail etiquette
netiquette
spamming
spider software
emoticons

Lesson 9

MS Word
text box
WordArt

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local printer
network printer
PDF printer
Page Preview
words per minute (wpm)

Lesson 10

MS Excel
cell
freeze/unfreeze

Lesson 11

database software
database
query syntax
drivers
API
MS Access
table
field
record
data type

Lesson 12

database interfacing
E-R diagrams
normalization
primary key

Lesson 13

MS PowerPoint
transparencies
slides

Lesson 14

computer program
algorithm
programming paradigm
imperative programming
object-oriented programming
functional programming
logic programming
symbolic programming
non-symbolic programming

Lesson 15

input
output
source code
machine language code
compilation
compiler program
bytecode

Lesson 16

program development cycle
data structure
algorithmic notation
syntax error
logical or runtime error
external documentation
internal documentation

Lesson 17

program logic formulation
finite
unambiguous
algorithm
recursive algorithm
greedy algorithm
divide-and-conquer algorithm
graph search algorithm

Lesson 18

map
flowchart
terminal symbol
input/output symbol
processing symbol
decision symbol
preparation symbol
predefined process symbol
connector symbol
arrow
decision point

Lesson 19

shorthand
pseudocode
logic
control structures
sequence
condition-selection
repetition/iteration
loop
data structure
array
linked list

Lesson 20

Scratch
History of Scratch
Programming
tinker
YouTube of Interactive Media

Lesson 21

script
costume
backdrop
sprite
Scratch paint editor
blocks

Lesson 22

looks
next
say
think
go to
glide to x,y
set x to
set y to
point in direction
change x
change y
set rotation style

Lesson 23

arithmetic operators
boolean
mathematical functions
pen
pen color
pen size
pen shade
sound
drum
beat
instrument

Lesson 24

Scratch Project
cloning
Catch the Falling Star Game

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