

# Information and Communication Technology

## Grade 9 Reading Book

Educational Publications Department



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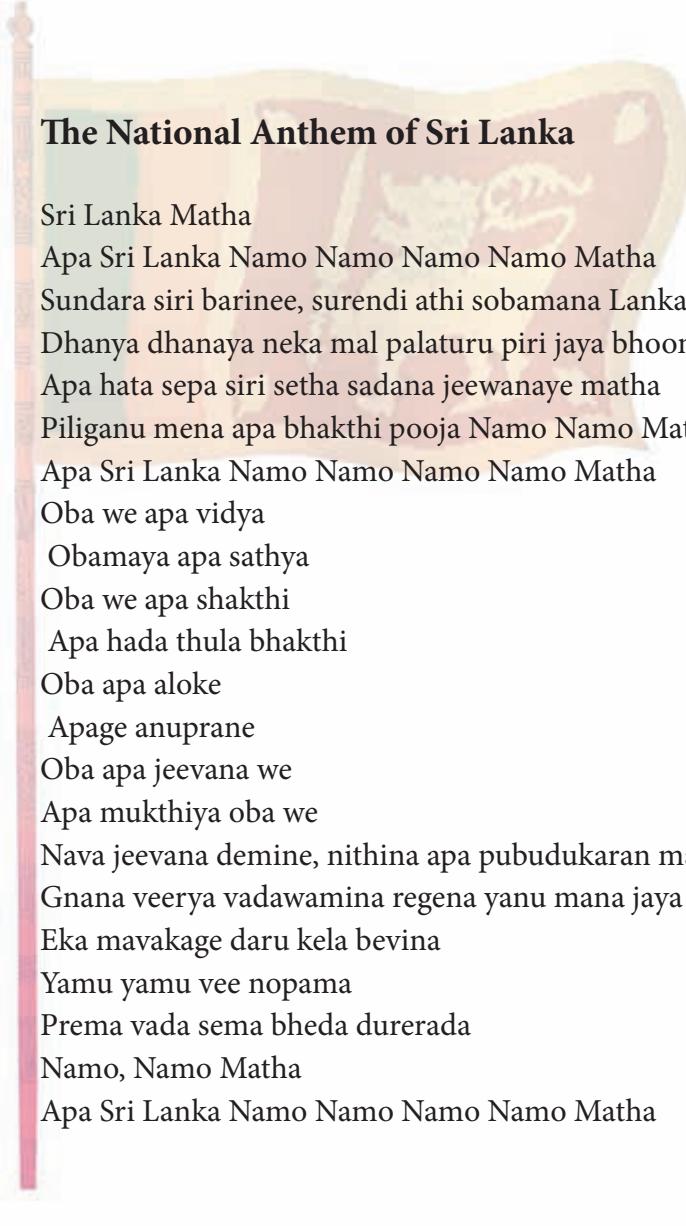
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## The National Anthem of Sri Lanka

Sri Lanka Matha

Apa Sri Lanka Namo Namo Namo Namo Matha  
Sundara siri barinee, surendi athi sobamana Lanka  
Dhanya dhanaya neka mal palaturu piri jaya bhoomiya ramya  
Apa hata sepa siri setha sadana jeewanaye matha  
Piliganu mena apa bhakthi pooja Namo Namo Matha  
Apa Sri Lanka Namo Namo Namo Namo Matha  
Oba we apa vidya  
Obamaya apa sathya  
Oba we apa shakthi  
Apa hada thula bhakthi  
Oba apa aloke  
Apage anuprane  
Oba apa jeevana we  
Apa mukthiya oba we  
Nava jeevana demine, nithina apa pubudukaran matha  
Gnana veerya vadawamina regena yanu mana jaya bhoomi kara  
Eka mavakage daru kela bevina  
Yamu yamu vee nopama  
Prema vada sema bheda durerada  
Namo, Namo Matha  
Apa Sri Lanka Namo Namo Namo Namo Matha

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ஆனந்த சமரக்கோன்  
கவிதையின் பெயர்ப்பு.



Being innovative, changing with right knowledge  
Be a light to the country as well as to the world.

**Message from the Hon. Minister of Education**

The past two decades have been significant in the world history due to changes that took place in technology. The present students face a lot of new challenges along with the rapid development of Information Technology, communication and other related fields. The manner of career opportunities are liable to change specifically in the near future. In such an environment, with a new technological and intellectual society, thousands of innovative career opportunities would be created. To win those challenges, it is the responsibility of the Sri Lankan Government and myself, as the Minister of Education, to empower you all.

This book is a product of free education. Your aim must be to use this book properly and acquire the necessary knowledge out of it. The government in turn is able to provide free textbooks to you, as a result of the commitment and labour of your parents and elders.

Since we have understood that the education is crucial in deciding the future of a country, the government has taken steps to change curriculum to suit the rapid changes of the technological world. Hence, you have to dedicate yourselves to become productive citizens. I believe that the knowledge this book provides will suffice your aim.

It is your duty to give a proper value to the money spent by the government on your education. Also you should understand that education determines your future. Make sure that you reach the optimum social stratum through education.

I congratulate you to enjoy the benefits of free education and bloom as an honoured citizen who takes the name of Sri Lanka to the world.

A handwritten signature in black ink, appearing to read "Akila Viraj Kariyawasam".

**Akila Viraj Kariyawasam**  
**Minister of Education**

## **Foreword**

The educational objectives of the contemporary world are becoming more complex along with the economic, social, cultural and technological development. The learning and teaching process too is changing in relation to human experiences, technological differences, research and new indices. Therefore, it is required to produce the textbook by including subject related information according to the objectives in the syllabus in order to maintain the teaching process by organizing learning experiences that suit to the learner needs. The textbook is not merely a learning tool for the learner. It is a blessing that contributes to obtain a higher education along with a development of conduct and attitudes, to develop values and to obtain learning experiences.

The government in its realization of the concept of free education has offered you all the textbooks from grades 1-11. I would like to remind you that you should make the maximum use of these textbooks and protect them well. I sincerely hope that this textbook would assist you to obtain the expertise to become a virtuous citizen with a complete personality who would be a valuable asset to the country.

I would like to bestow my sincere thanks on the members of the editorial and writer boards as well as on the staff of the Educational Publications Department who have strived to offer this textbook to you.

**W. M. Jayantha Wickramanayaka,**  
Commissioner General of Educational Publications,  
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2019.04.10

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Board of Editors

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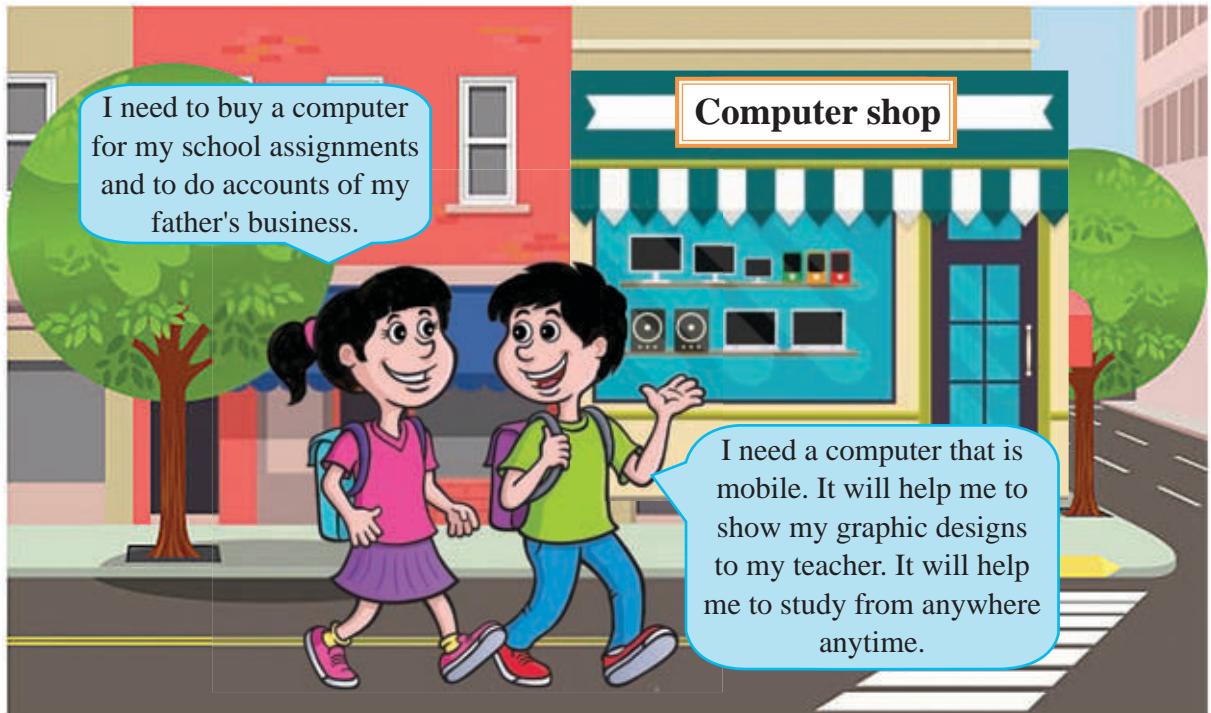


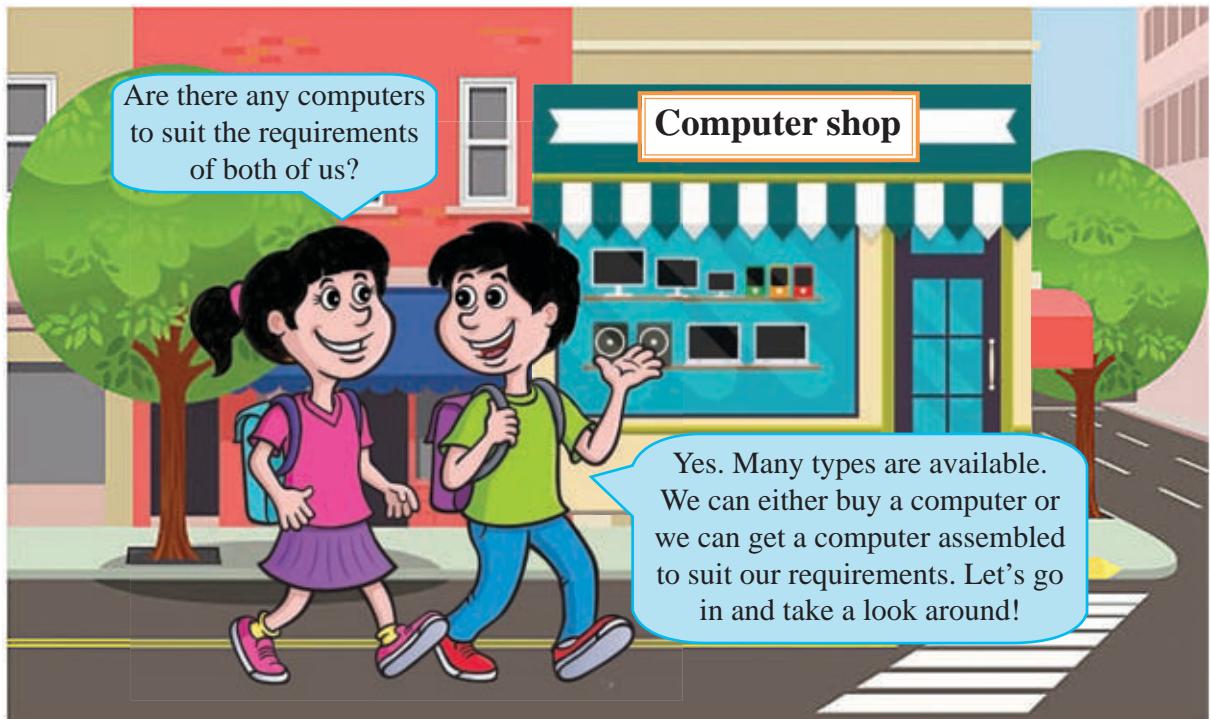
# 1

# Preparation of Computer Specifications

This chapter will cover the following:

- Computers and peripheral devices
- Selection of devices for the user requirement
- Creating computer specifications
- Non-technical factors to be considered in purchasing a computer





## 1.1 Identifying the user

The one who uses a computer is generally referred to as a *user*. Different users working in different areas in Information and Communication Technologies have different designations. The following table shows a few such examples;

Table 1.1 : Types of users and their work

User name	Task
Programmer	Develops computer programs
Network Administrator	Manages and maintains computer networks
System Analyst	Designs information systems
Software Engineer	Develops software
Computer Application Assistant	Uses office application packages for office related tasks
Web Developer	Develops and maintains websites

The sixth chapter presents you a further study on the user.



Note - Users can be classified into mainly two categories: *system users* and *end users*. *End user* uses the software maintained by the *Systems User*.

## 1.2 Selection of a computer to suit user requirements

User requirements relate to tasks that are carried out by using a computer. The following Figure 1.1 provides examples for user requirements.



Figure 1.1 : Some examples for user requirements

A computer to suit user requirements can be selected from those available in the market (Figure 1.2), or a computer can be assembled to suit user requirements. Computers can be classified according to their nature and use as follows;

- **Non - portable computers**

Server computers, workstations, desktop computers and all-in-one computers, are all operated using the main electricity power supply. These computers are large in size and relatively heavy. Therefore, they are installed and used in places like houses, schools or offices.

- **Computers for mobile use**

Laptops, notebooks, tablet computers and a smart phones can be considered for mobile use. They operate with re-chargeable batteries. Therefore, they can be used when traveling in buses, trains, aeroplanes or from any convenient place.



Figure 1.2 : Examples for types of computers that are available in the market



Refer to workbook for Activity 1.1.



**Important** - The following are useful in learning more about computers.

- Printed or electronic commercial advertisements on computers
- Magazines and newspapers about computers
- Websites providing information on computers
- Obtaining information from an expert in computers
- Visiting the computer shops and gathering information



## 1.3 Computer peripheral devices

### What are peripheral devices?

*Input devices* are used to feed data and instructions into a computer. *Storage devices* are used to store data. *Output devices* are used to provide the information processed with the input data. Accordingly, input, storage and output devices are called *peripheral devices*.

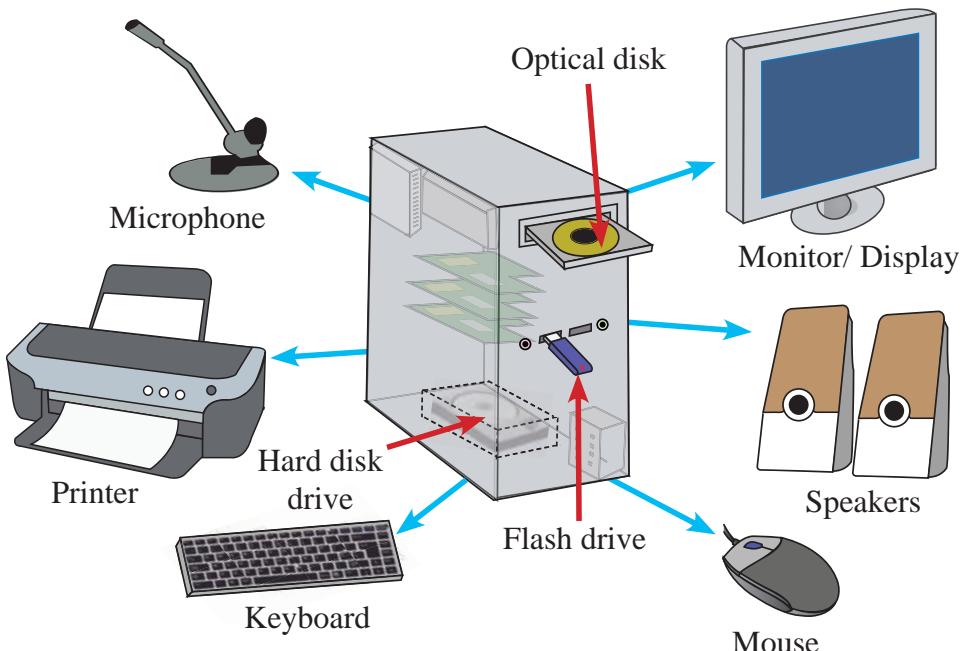


Figure 1.3 : Computer peripheral devices

The peripheral devices shown in Figure 1.3 above are classified in Table 1.2 as *input*, *output* and *storage*.

Table 1.2 : Peripheral devices

Input	Output	Storage
Keyboard	Monitor	Hard disk drive
Mouse	Printer	Optical disk drive
Microphone	Speaker	Flash drive
Touch screen		Magnetic tape drive



Note - The touch screen can be used to input data as well as to display information. Hence, it can be used as an input and output device.



Refer to workbook for Activity 1.2.

## 1.4 Computer specifications

### What are computer specifications?

Before purchasing an item, it is important to be aware of the value and the quality of the item. Specifications are generally about the common features of an item.

For example, length, width and paper thickness, etc. determine quality of an exercise book. Basic specifications for an exercise book are as shown.

#### Basic specifications for an exercise book

Length	: 210 mm
Width	: 148 mm
Number of pages	: 40
Thickness of paper	: 60 GSM
Type	: Single ruled

Similar to the specification of a book, a computer also has its specification.

## Specifications to suit different user requirements

Consider a situation where two students use two types of books for different purposes. For example, a square ruled exercise book for *mathematics* and a large size drawing book for *art*. Specifications for the two types mentioned above are as follows:

### Specifications for an exercise book

Length	: 210 mm
Width	: 148 mm
Number of pages	: 200
Thickness of paper	: 60 GSM
Type	: Square ruled

### Specifications for a drawing book

Length	: 300 mm
Width	: 210 mm
Number of pages	: 20
Thickness of paper	: 70 GSM
Type	: Blank

Different specifications for different purposes may result in price differences as well.

The specifications change according to user requirements in the above example. Similarly depending on the use of a computer its specifications also differs.

1.5

## Specifications of computers and peripheral devices

The following shows some important factors of computer specifications;



**Important** - One can generally assure the quality of an item through its specifications.

1.5.1

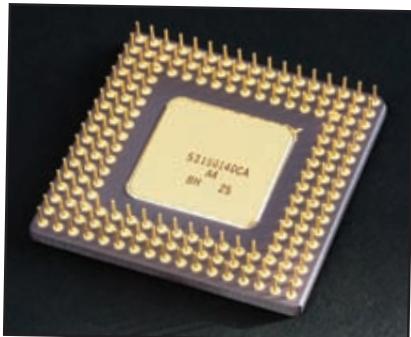
### The processor

Humans are considered the most intelligent among all living beings. The brain (Figure 1.4) helps man to make decisions for actions taken. The brain also has the ability to swiftly respond to all sensations.



Figure 1.4 : the human brain

Much as the brain is most important for humans, the processor (Central Processing Unit) (Figure 1.5) is the most important part of a computer. The processor processes data swiftly. As such, the processor is considered the "Brain" of the computer.



The side that connects to the mother board



View from above

Figure. 1.5 : Central Processing Unit

### Speed of the processor

A machine functions at a slower speed takes a longer time to complete a task while a machine functions at a higher speed takes a shorter or a lesser time to complete a task. Therefore, the amounts of work that could be carried out using these machines during a unit time differs.



Blender working at slower speed



Blender working at higher speed

Figure 1.6 : Preparation of fruit juice using blenders with different speeds

Figure 1.6 shows two blenders working simultaneously. The blender working at higher speed processes a larger quantity of fruit juice per unit time. A machine working at a higher speed provides better results.

The performance of a computer depends on the speed of the processor. A processor running at high speed is able to process more data during a unit time. That is, the performance of the computer increases. Then the software can be run faster. Therefore, when selecting a processor, it is advisable to select one with a greater speed.

The speed of the processor is measured by the number of instructions executed per second.



**Important** - The speed of a computer is determined by the number of instructions execute per second.

The speed is measured in Hertz (units such as MHz or GHz).

$$1000 \text{ MHz} = 1 \text{ GHz}$$

## Processor manufacturers

Several processor manufacturing companies, Apple, Intel and AMD (Advanced Micro Devices) exists.



Figure 1.7 : Different processors

## Types of processors

Generally, the number of processors in a central processing unit is used to classify the Central Processing Unit. The following table shows examples of some Intel Central Processing Units with multiple processor units.

Table 1.3 : Types of processors

No. of CPUs	Type
1	Single Core
2	Dual Core
4	Quad Core



When the number of processors in a central processing unit increases its capacity also increases. Table 1.4 shows examples for Intel processors.

Table 1.4 : Different processors and their names

Type	Name	Examples
Single Core	<i>Pentium I, II, III, IV</i>	
Dual Core	<i>Dual Core/Core 2 Duo</i>	
Quad Core	<i>Core i3, i5, i7, i9</i>	



Refer to workbook for Activity 1.3.

### 1.5.2 Hard disk

The hard disk provides permanent storage space for storing data and to installing all software. The hard disk is the main secondary storage device in a computer.

For example, an exercise book with 160 pages provide more writing space than a book with 40 pages. Similarly, more data can be stored in a hard disk with a greater storage capacity. (see figure 1.8).

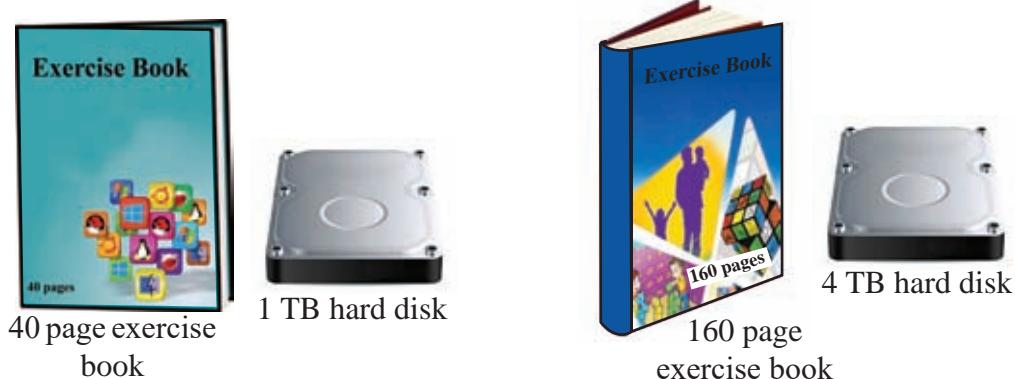


Figure 1.8 : An analogy for hard disk capacities



Refer to workbook for Activity 1.4.

### 1.5.3 The monitor display

The main output device of a computer is its monitor display. Most often, a user interacts with a computer via its monitor/ display.

#### Monitor size

For examples, a wall clock is larger than a wrist watch. Time is easily seen on a wall clock because of its size. Similarly, larger monitors have better visibility.



A larger monitor size is useful in viewing a larger picture. The monitor size is measured in terms of its diagonal length in inches. (Figure 1.9).

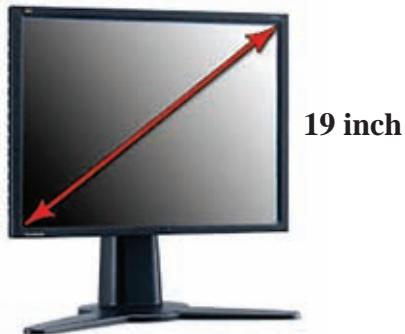


Figure. 1.9 : Monitor Size

#### Monitor technology

Monitors can be classified into the following types according to the technology used by them:

- CRT (Cathode Ray Tube) Monitor
- LCD (Liquid Crystal Display) Monitor
- LED (Light Emitting Diode) Monitor



Fig.1.10 : CRT and LCD /LED monitor

CRT monitors consume more electricity than the other two types. Further they are heavier and occupy more space due to its size. Hence, light weight LED and LCD monitors which consume less electricity are commonly used today. (See figure 1.10).

#### 1.5.4 Main memory

Let us consider a shelf which is used to keep books and bags when entering a library (See figure 1.11). Students who enter the library keep their school bags in compartments. They takes their bags as they leave the library.

In a similar manners data and instructions are stored temporarily in the main memory (See figure 1.12) when the computer functions. A bigger rack for storage in a library can hold more school bags. Similarly, a higher capacity in the main memory stores more data and instructions. Therefore, a computer with a higher main memory capacity is better.



Figure 1.11 : Rack for school bags



Figure 1.12 : Random Access Memory (RAM) card act as the main memory



**Important** - The capacity of the main memory is measured in units of bits. (Mega Byte (MB) or Giga Byte (GB) etc).

$$1024 \text{ MB} = 1 \text{ GB}$$



Refer to workbook for activity 1.5.

### 1.5.5 Video Graphic Adapter (VGA)

The Monitor is the main output device of a computer. The output is fed to the monitor via the Video Graphic Adapter (VGA). There are two types of Video Graphic Adapter (VGAs). On board VGA is fixed to the mother board and Separate VGAs card can be fixed to mother board manually. The separate VGA card has a separate video memory and a processor. Separate VGA cards are useful for playing computer games.



Figure 1.13 : VGA card

Modern computers use DVI or HDMI ports instead of VGA port (See Figure 1.14).



Figure 1.14 : Types of video ports

When HDMI cables are connected to a computer, a television screen or multi media projector, both sound and video signals are transmitted. When a VGA is used for the same purpose, only images are transmitted and a separate cable is required for sound.

## 1.5.6 Sound cards

Many computer are widely used for entertainment today. A sound card is required for listening to music and recording audio. A microphone connected to the sound card can be used to record (input) sounds while a speaker connected to the sound card can be used to play (output) sounds.

Most computers have the sound card built into the motherboard (See figure 1.15). A user can also connect external sound card to the computer if necessary.

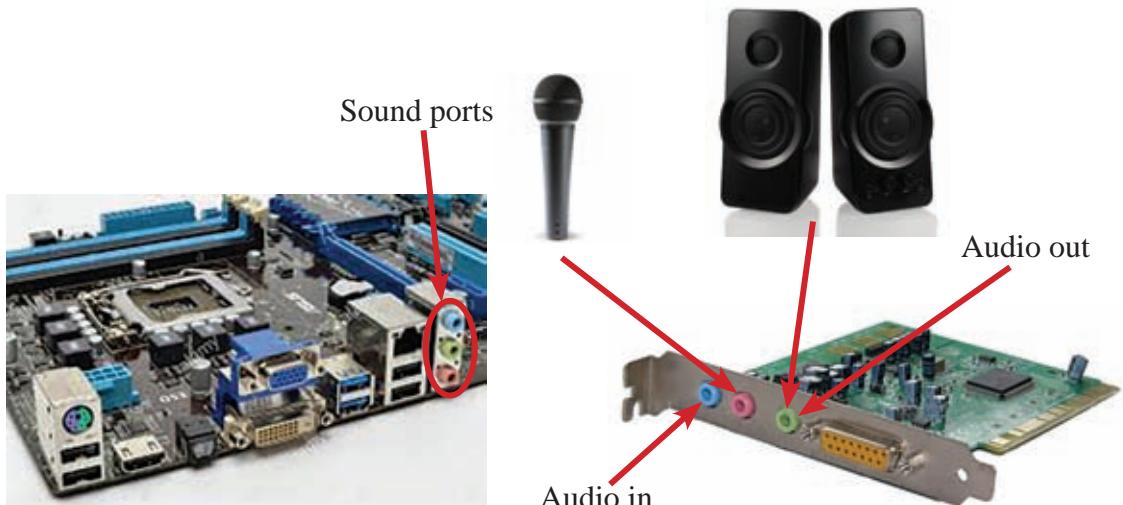


Figure 1.15 : Built in sound card on mother board

Figure 1.16 : External sound card

The ports of a sound cards use standard colour scheme for identification purpose.

- |             |   |   |
|-------------|---|---|
| Light green | - | Audio out (to connect speaker or headphone)   |
| Light pink  | - | Mic in (to connect microphone)                |
| Light blue  | - | Line in (to feed sound with external devices) |

### 1.5.7 Pre-Installed software

An operating system provides the interface between the user and the hardware. The operating system is essential to run application software. Once the operating system is installed in a computer, the necessary application software can be installed.

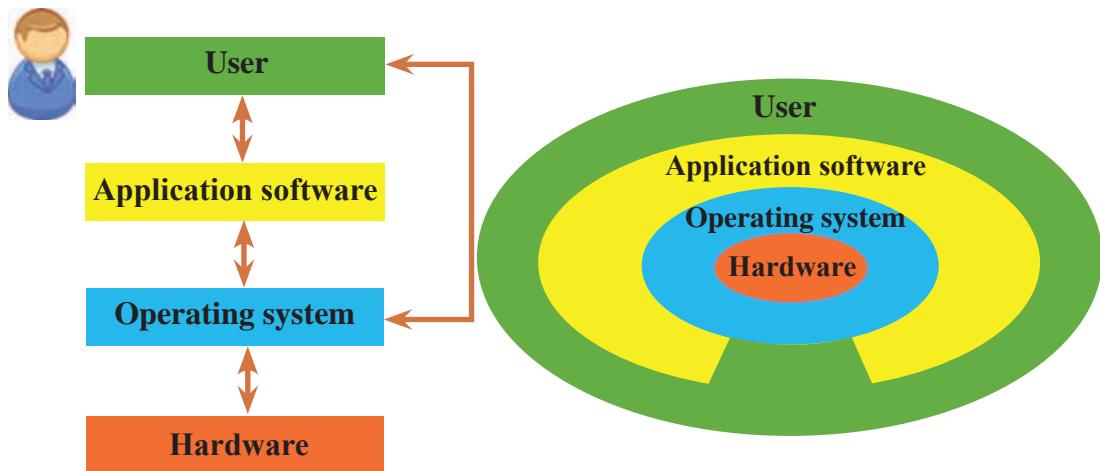


Figure 1.17 : Hardware, software and user

Free and open source operating systems such as Linux, Ubuntu can be obtained free of charge. Licensed operating systems such as Windows 8, Windows 10 to purchase. A trial version of an operating systems such as trail version of Windows 10 can be used only for a limited period. Required application software depends on the requirement of the user.

In buying a desktop computer or a laptop computer it is important to check whether an operating system has been pre-installed. Most often only DOS or LINUX computer systems are pre-installed. A computer with licensed software installed is more expensive than a computer with a free and open source operating system.

## 1.6

# Non-technical features to be considered in purchasing a computer

Non-technical specifications such as manufacturer, type of book and price are considered in purchasing an exercise book. This applies to the purchase of a computer as well. Therefore, in purchasing a computer, non-technical specification must also be considered.

### 1.6.1

#### Warranty

Warranty is an important factor to be considered when purchasing a computer. Warranty given by the vendor and the manufacturer assures to cover the defects for a certain period. Customer can get this warranty in many different ways.

##### a. Manufacturer warranty

The warranty which is given by the manufacturing company is known as the manufacturer warranty. If the device malfunctions during the warranty period, it is either repaired or replaced with a new one.



##### b. Extended warranty

Extended warranty is a prolonged warranty given to customers in addition to the standard warranty. Customer needs bearing additional cost for extended warranty.



##### c. On-site warranty

If a customer obtains an on-site warranty, technicians from the respective company visit the place of work to repair the product. They generally maintain, replace faulty parts and examine the operations of the machine.



There is a standard warranty when purchasing a computer, but, the warranty for the parts of the computer may differ from the standard.

For instance, a laptop computer with standard warranty for 3 years, may have only one year warranty for the battery.

## 1.6.2 Price

The price of a computer can vary according to the customer requirements.

e.g.

1. The price of a computer is rather high with a high speed processor.
2. A computer with a large monitor is comparatively high in price.
3. Price is low of a computer with a lesser memory capacity.
4. A computer inclusive high capacity hard disk drive is high in price.

It is advisable to compare prices to suit one's requirements from different places and select the computer with the lowest price.



Refer to workbook for Activities 1.6 and 1.7



**Important** - It is not advisable to purchase a computer considering only its price.

## 1.6.3 Services after-sale

Computer sales centers provide the following after-sales services to customers;

1. Technical advice
2. Technical assistance
3. Telephone, e-mail and website information (i.e. contact information) of the vendor

It is advisable for a user to consider the given information in purchasing a computer. Customer needs preparing specifications first. Then, a computer must be bought from a vendor with a reputed name and must be from a recognized manufacturer.



Refer to workbook for Activity 1.8

## 1.6.4 Ports and network connections

Ports are used to connect the peripheral devices to a computer. A user may select peripheral devices to suit one's requirements. However, the computer should have the necessary ports to connect them. A few such ports are given below;

### a. Universal Serial Bus (USB)

The USB is the most widely used port to connect peripheral devices to the computer. Therefore, it is essential to have several USB ports.

**Some peripheral devices that can be connected via USB Port;**

- Printer
- Keyboard
- Mouse
- Scanner
- External hard disk
- External DVD drive
- Digital camera
- Web camera
- Bar code reader
- Memory card
- Pen drive



Refer to workbook for Activity 1.9

### b. Network ports/RJ45 connector

The computer uses RJ45 connector to connect to a network. (See Figure 1.18)

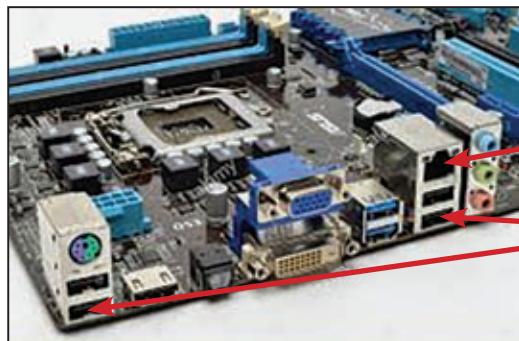


Figure 1.18

### c. Bluetooth and Wi-Fi facilities

Bluetooth and Wi-Fi facilities provide cable free (i.e. wireless) network connections to computers. (See Figure 1.19)



Given below are a few basic specifications in purchasing a computer;

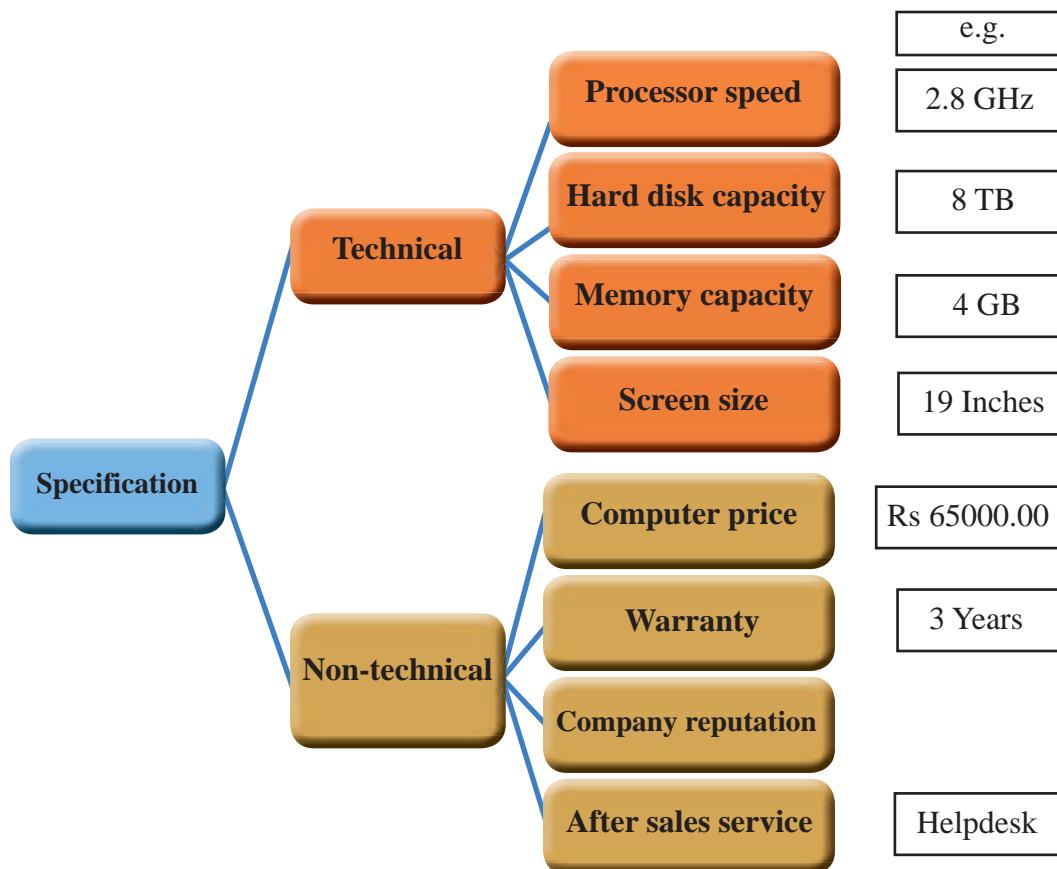


Figure 1.19 : Technical and non-technical specifications to be considered in purchasing a computer



Refer to workbook for Activity 1.10

## Important factors of technical specifications

Central processing Unit	Type	Single Core/ Dual Core/ Quad Core
	Speed	2.8/ 3.0/ 3.2/ 3.4 GHz
Main memory	Capacity	512 MB/ 1GB/ 2GB/ 4GB/ 8GB
	Generation	1 <sup>st</sup> , 2 <sup>nd</sup> , 3 <sup>rd</sup> , 4 <sup>th</sup> etc.
Hard disk	Capacity	500 GB, 750 GB, 1 TB, 2 TB, 4 TB
Monitor	Size	17", 19", 21"
	Type	CRT/ LCD/ LED
Video Graphic Adapter	Type	VGA/ DVI/ HDMI
Sound card	Type	Onboard, Separate



Refer to workbook for Activity 1.11

## Summary

- Several types of computers are available to suit user requirements;
  - Server
  - Workstation
  - Desktop
  - All-in-one
  - Laptop
  - Notebook
  - Tablet
  - Smart phone
- Computer peripheral devices are input, output and storage devices.
- Specification is a detailed description of a material with respect to its quality or quantity.

- Basic specifications for a computer and peripheral devices are:
  - Processor type and speed
  - Random Access Memory (RAM) capacity
  - Hard disk capacity
  - Monitor size and technology
  - Video Graphic Adapter and sound
- Other non-technical factors to be considered in purchasing a computer;
  - Warranty
  - Pre-installed software
  - After-sales services

# 2

# Electronic Spreadsheets

This chapter will cover the following:

- What spreadsheets are
- Special features of a spreadsheet
  - Workbook, worksheets, cells, columns, rows
  - Name boxes
  - Functions, formulas
  - Data selection
  - Graphs

## 2.1 What are spreadsheets?

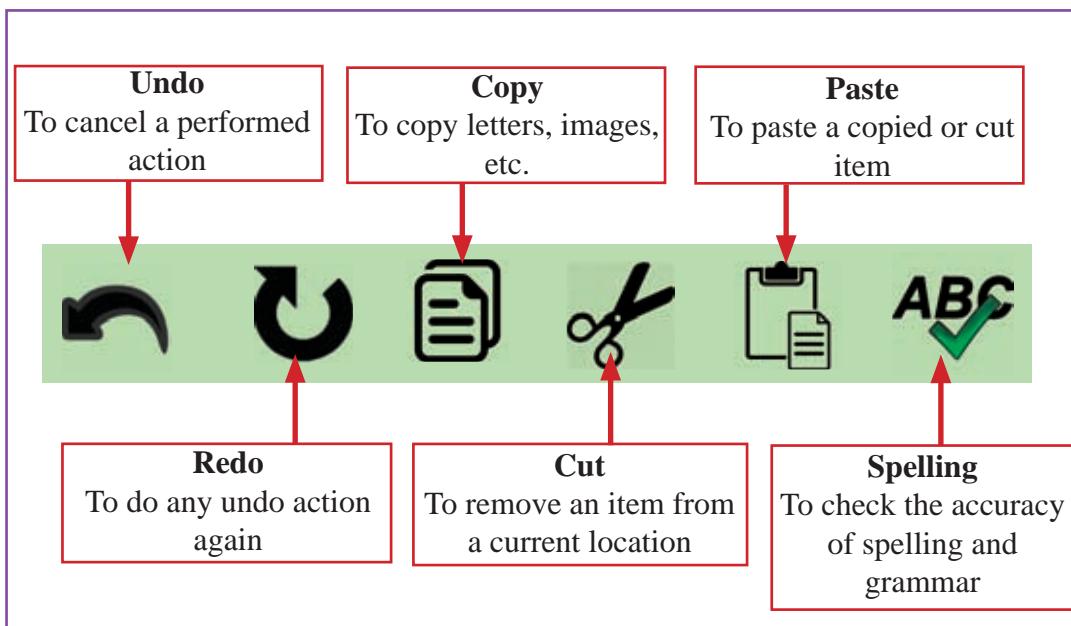
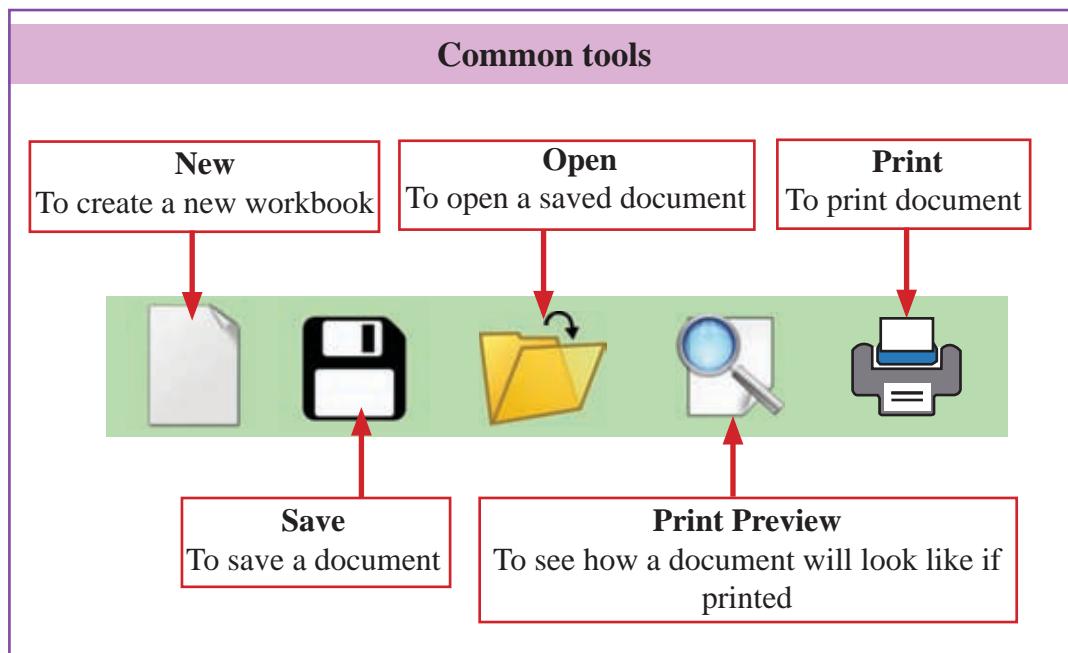
A spreadsheet means an electronic version of the paper based accounting sheets used by accountants in the past.

An electronic spreadsheet is an interactive computer application for organization, analysis and storage of data in a tabular form. Data are entered in cells of a table and the spreadsheet provides the facility of functions, formulas, sorting and charting.

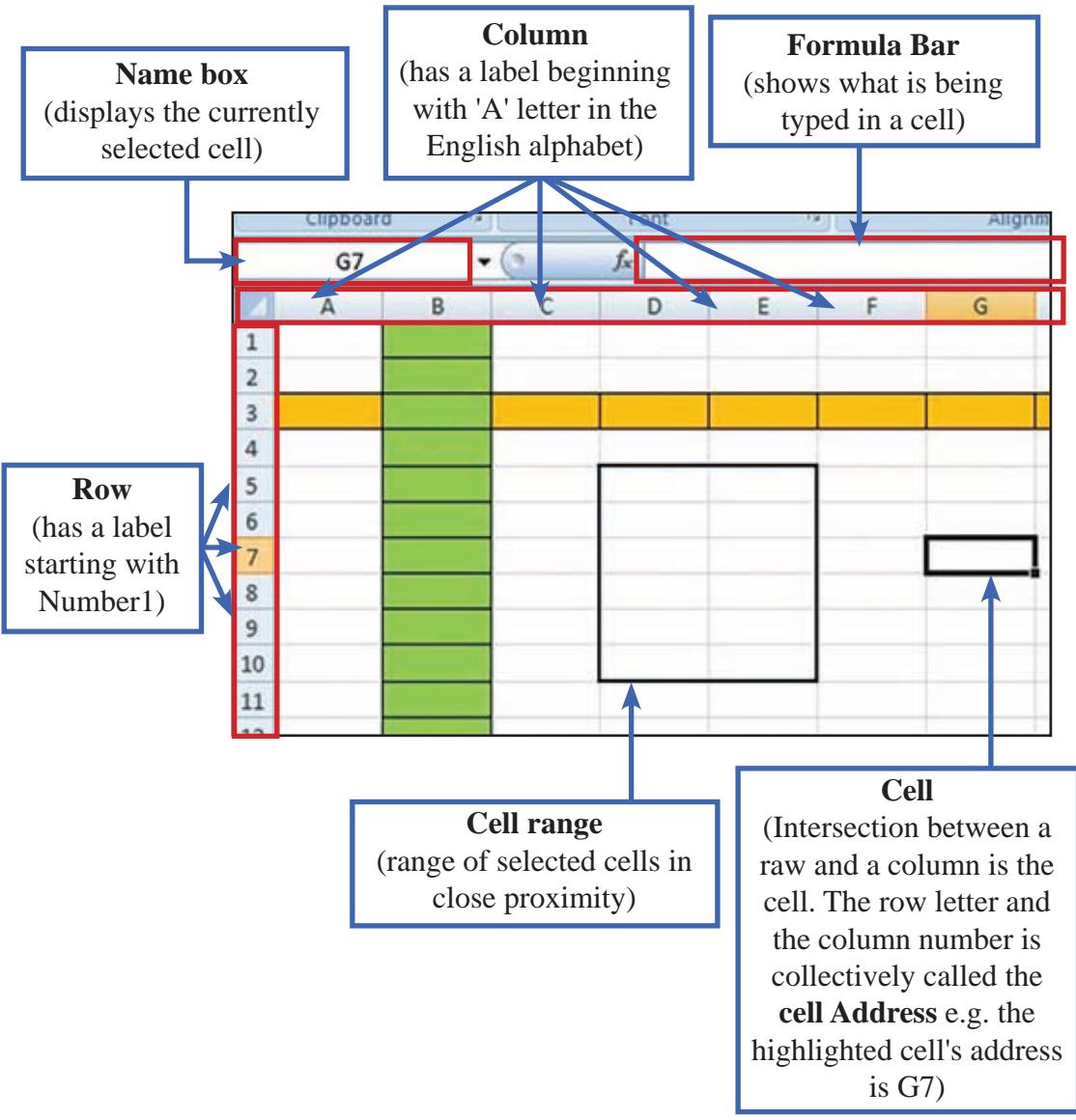
In electronic spreadsheets, *workbooks* can be used for document creation. A workbook may contain multiple *worksheets*.

## 2.2 Spreadsheet features

Let us learn about the functions provided in spreadsheet package.



## Special features of a spreadsheet



## Cell formatting tools

Size  
(changes size of letters)  
heading,  
sub-heading and  
normal letters)

**Bold**  
To make letters  
darker than normal

Color  
To add colours to letters

*Italic*  
To make letters slanted

Borders  
To apply borders

Font

Font  
Times New Roman  
Cambria  
Nirmala UI  
Malayalam

Font

Times New Roman

Cambria

Nirmala UI

Malayalam

**B**

*I*

U



Underline  
To have line beneath  
the letters

Fill colour  
To change cell background  
colour

## Alignment and positioning tools

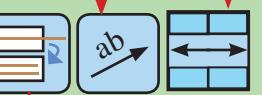
Left align  
(aligns left)

Right align  
(aligns right)

Middle  
(aligns to the  
middle)

Orientation  
(changes text  
direction)

Merge and Center  
(to combine multiple  
adjacent cells to  
single larger cell and  
align center.)



Centre align  
(aligns to middle)

Top  
(top align)

Bottom  
(bottom align)

Wrap Text  
(To make all content  
visible within a cell)

## Number tools

The screenshot shows the 'Number' tab selected in the 'Format Cells' dialog box. At the top, there are three red boxes: 'Currency' (with a money icon), 'Percentage' (with a percent icon), and 'Increase and decrease decimals' (with a decimal separator icon). Below these are three icons: a green 'General' button, a blue currency icon, a blue percentage icon, and a blue decimal separator icon with arrows. To the right of the 'General' button is a dropdown arrow.

Format	Description
Number	Numbers - e.g. 10, 25, 100, ...
Currency	Money - e.g. Rs. / \$ / ¥ - 10.00
Accounting	Lines up currency symbols and decimal points in a column / \$ / ¥ - 10.00
Short Date	Short date - e.g. 02/25/2018 (MM / DD / YYYY)
Long Date	Detailed date - e.g. Tuesday, February 25, 2018
Time	Time - e.g. 1:30 p.m., 10:00 a.m.
Percentage	Percentage - e.g. 23%, 45%, 75%
Fraction	As fractions - e.g. 2/9, 4/5
Scientific	In scientific notation - e.g. 5677=5.68E+03

## Symbols used in spreadsheet formula

Used before a formula or function



Subtract



Divide



Add

Multiply

## Function

To find the total of a range of cells

**Sum**

To find the highest value in cell range

**Average**

**Max**

**Min**

To find the average of cell range

To find the lowest value in a cell range

## Charts

Can be used to display spreadsheet date graphically.

Column graph



Column

Pie chart



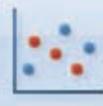
Pie

Area chart



Area

Other charts



Other Charts

Line chart



Line

Bar chart



Bar

Scatter chart



Refer to workbook for Activities from 2.1 to 2.10.

## Summary

- A spreadsheet is a document containing rows and columns where functions and formulas could be used for computations and where sorting and charting of data is possible.
- A cell is a specific location defined by the intersection of a row and a column.
- An individual cell is identified by starting with column name 'A' and raw 'number 1'.
- New, Open, Print, Print Preview, Re-do, Undo, Cut, Copy, Paste and Spell check are common tools used in spreadsheets.
- Computations are done using functions/formulas.
- SUM, AVERAGE, MAX, MIN etc. are some basic functions that are available.
- Bar charts, column charts, line charts, pie-charts, etc. could be used for analysis of data.

# 3

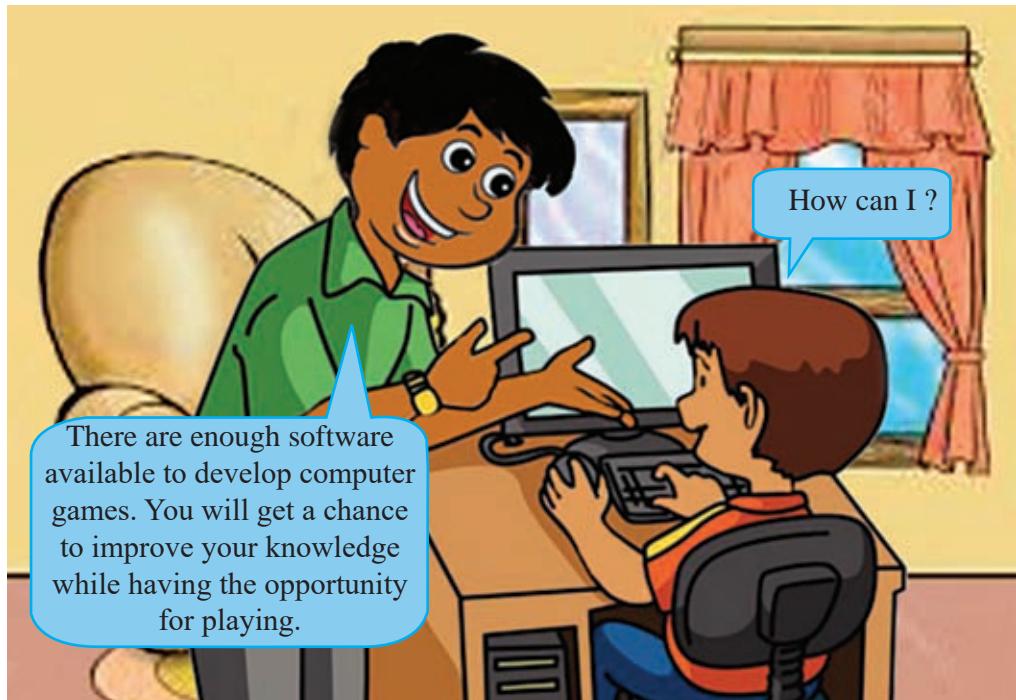
## Programming

This chapter will cover the following:

- Multi-condition selection control structures
- Use of flowcharts to solve problems with many conditions
- Repetition control structures
- Use of flow charts to solve problems with repetition procedures
- Development of Scratch program using selection and repetition control structures
- Solutions with flow charts having nested loops
- Arrays and their usage

Download Scratch software from <http://www.scratch.mit.edu> as mentioned in Information Communication Technology Reading book of Grade 7.



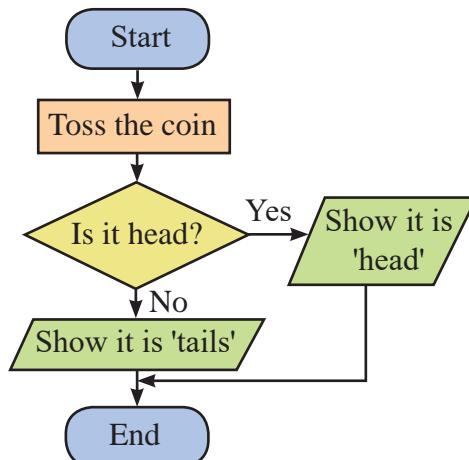


## 3.1 Simple selection

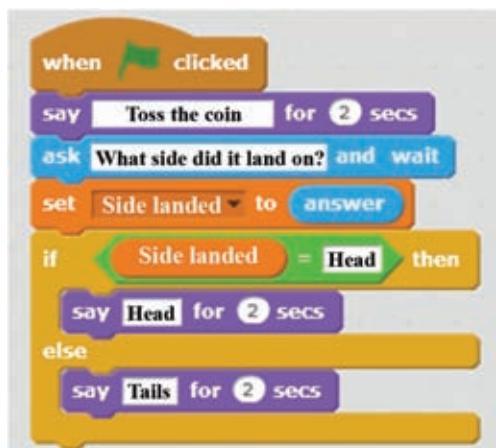
You learnt in programming chapter of Grade 8, ICT textbook that a simple selection is selecting one option out of two given options under a certain condition. For example, one such choice is the selection of “head” or “tail” with the toss of a coin.



Head and tail of a coin



Flowchart 1 : Getting “head” or “tail” of a coin



Scratch program 1

Simple selection has one condition with two options. A selection is made out of the two conditions. If the condition is true, one option is selected and if not, the other option gets selected.

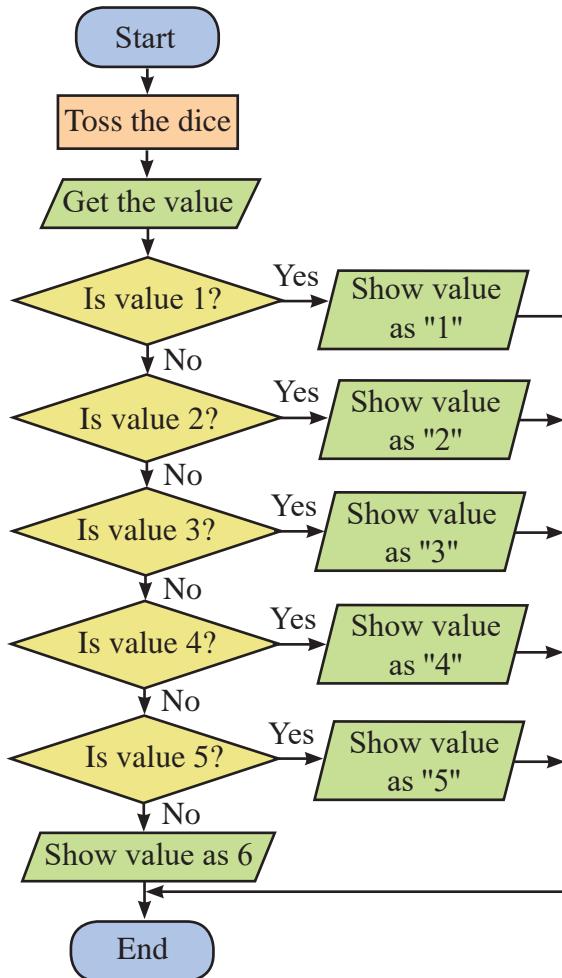


Refer to workbook for Activity 3.1.

## 3.2 Selection out of many options

Selection out of many options is about selecting one out of more than two options.

**Example** Tossing a dice for values of 1 to 6



```

when green flag clicked
  say [Toss the dice v] for (2) secs
  ask [What is the value?] and wait
  set [Value v] to [answer]
  if [Value = 1] then
    say [1] for (2) secs
  else
    if [Value = 2] then
      say [2] for (2) secs
    else
      if [Value = 3] then
        say [3] for (2) secs
      else
        if [Value = 4] then
          say [4] for (2) secs
        else
          if [Value = 5] then
            say [5] for (2) secs
          else
            say [6] for (2) secs
          end
        end
      end
    end
  end
end
  
```

Scratch program 2

Flowchart 2 : Getting value from a tossed dice

In the above, a number will be displayed if one of the five conditions is satisfied or if none of the five conditions is satisfied.



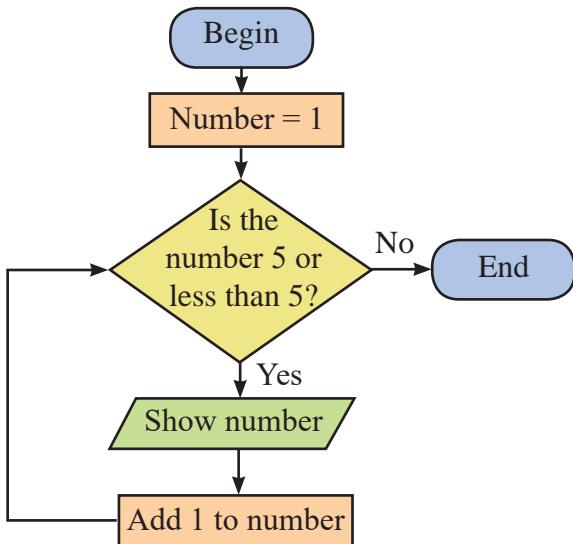
### 3.3 Control structure with repetition

Repetition is about an action getting repeated again and again.

With repetition, both beginning and end is based on a condition.



#### Example 1 Displaying numbers 1 - 5



Flowchart 3 : Display numbers 1 - 5

In this flowchart the condition is, “Is the number equals 5 or less than 5”?

At the beginning, condition is checked and since the condition is true, the repetitive work commences.

Once the number is shown, 1 is added to it and the condition is checked again.

When the number exceeds five, condition is not satisfied and the repetition ends.

#### Example 2 Consider a water pump filling water into a tank. The pump is operated until the tank becomes full.

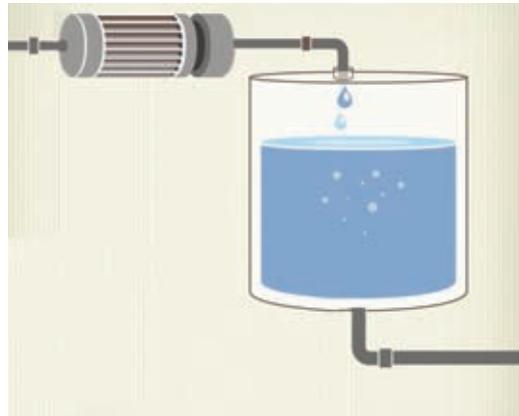
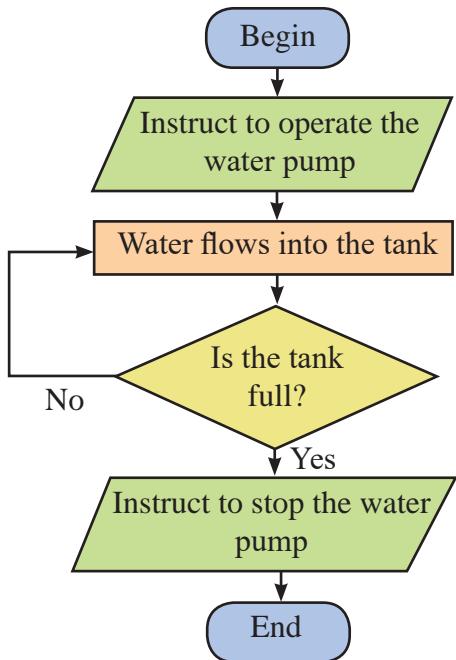
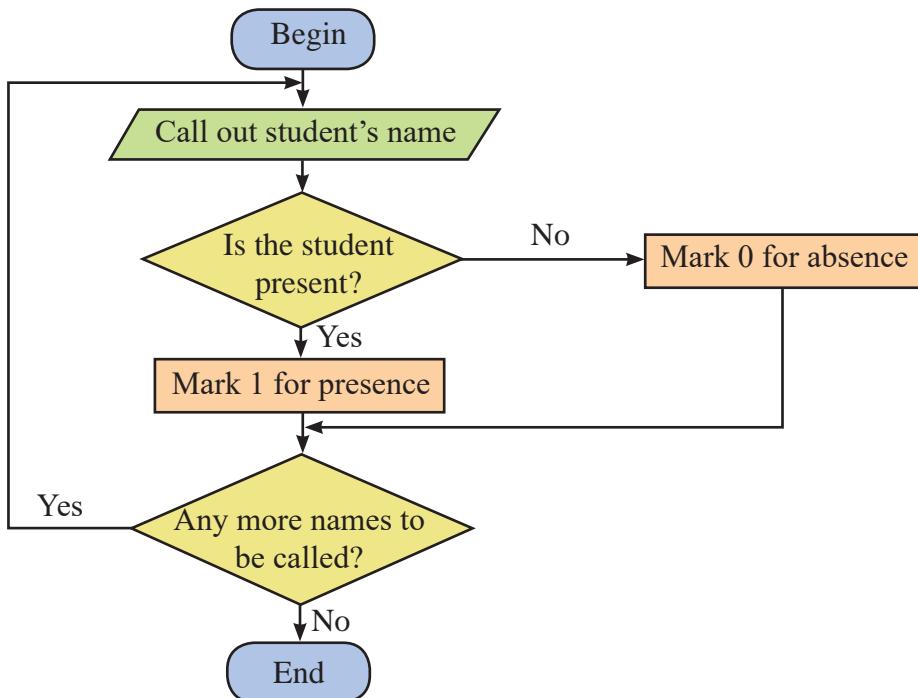


Figure 3.1 : A water pump filling a tank

Flowchart 4 : Filling a tank with water

**Example 3** Consider marking attendance of students. If the student is present, the register is marked with 1. If student is absent it is marked with 0.



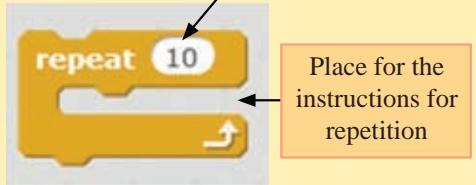
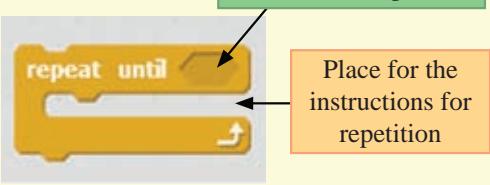
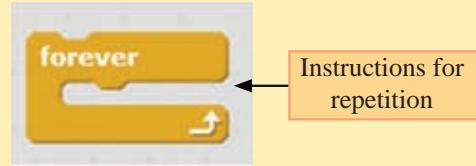
Flowchart 5 : Marking attendance register

## 3.4

## Scratch repetition control structures

Three repetition control structures are available to build Scratch programming. They are shown below;

Table 3.1 : Repetition control structures

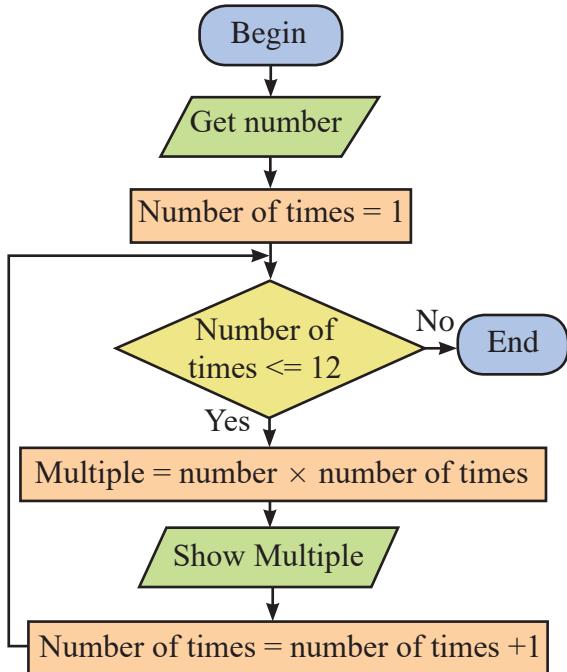
Repetition type	Example
<p>Repetition with definite number of times</p>  <p>The slot to place number of times for repetition</p> <p>Place for the instructions for repetition</p>	 <p>Scratch program 3</p> <p>Displaying numbers 1 - 10 in 10 seconds</p>
<p>Repeating till a given condition is satisfied</p>  <p>The slot to place the condition for repetition</p> <p>Place for the instructions for repetition</p>	 <p>Scratch program 4</p> <p>Displaying all positive integers 1 - 5</p>
<p>Repeating infinite number of times</p>  <p>Instructions for repetition</p>	 <p>Scratch program 5</p> <p>Displaying all positive integers from 1</p>

## 3.5 Developing visual programs involving repetition

**Example 1** Showing the first multiples of 12 of any number.



Note - For example, for number 2, the first 12 multiples are 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24 and for number 3, the first 12 multiples are 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36



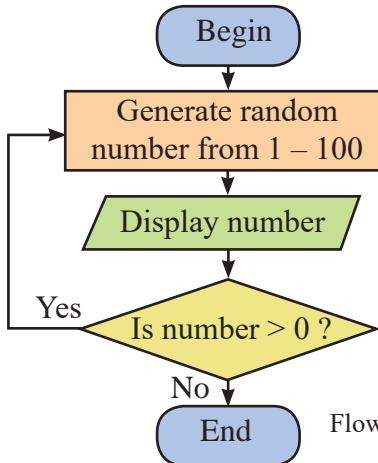
```

when green flag clicked
set [Frequency v] to [1]
ask [Number of times] and wait
set [quantity] to [answer]
repeat (12)
    set [Multiple v] to [quantity * frequency]
    say [Multiple] for (2) secs
    change [frequency] by (1)
end
  
```

Scratch program 6

Flowchart 6

**Example 2** Displaying random number from 1 to 100, an infinite number of times



```

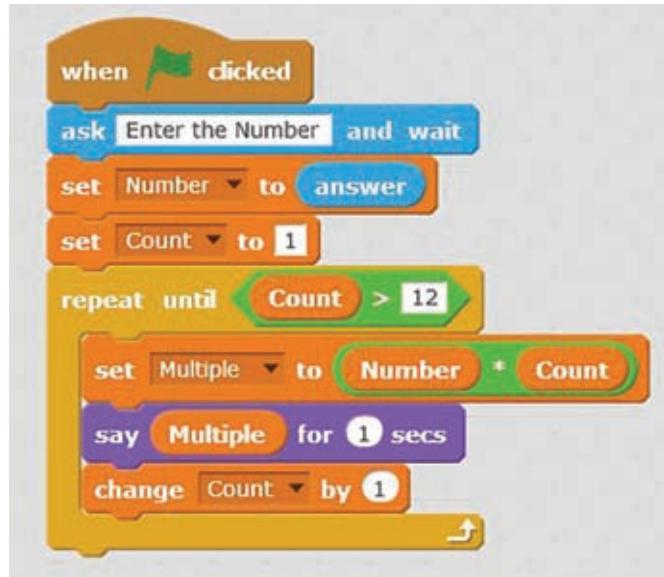
when green flag clicked
forever
    set [x] to [pick random 1 to 100]
    say [x]
    wait (1) secs
end
  
```

Scratch program 7

Flowchart 7 : Displaying random numbers between 1 -100

Condition in the above flowchart always remains true. It never changes to false. Therefore, continuous repetition takes place.

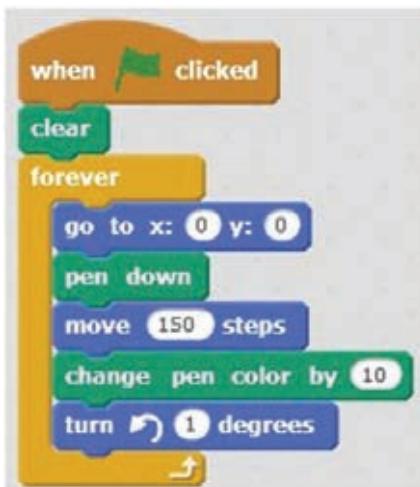
**Example 3** Display the first multiples up to 12 of given number.



Scratch program 8

This is another program to display the same output of the flowchart 6 discussed earlier.

**Example 4** Creating a multi-coloured circle using coloured lines



Scratch program 9

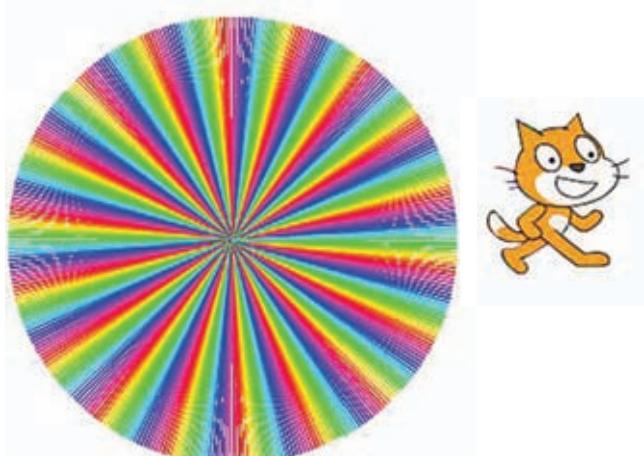


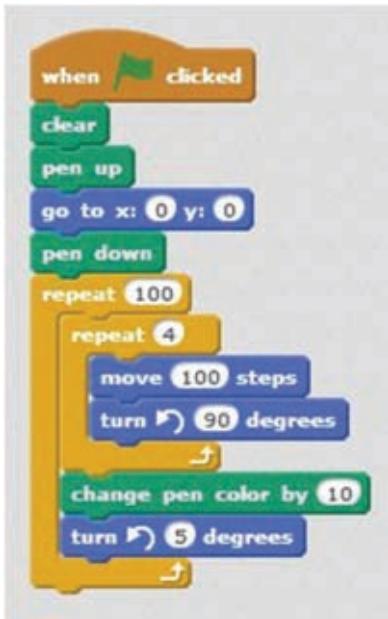
Figure 3.2 : The multi-coloured circle

## 3.6 Programming with nested repetition

Here, there are repetitions within repetitions.

### Example 1 Repetition within a repetition

Consider the program to create the following line diagram in figure 3.3.



Scratch program 10

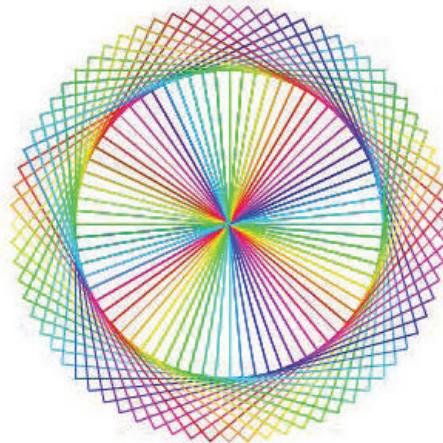


Figure 3.3

It shows repetition within repetition.

### Example 2 Repetitions with selection

The flowchart and the Scratch program for a complete Snakes and ladders game is shown below. It includes repetitions with selections.

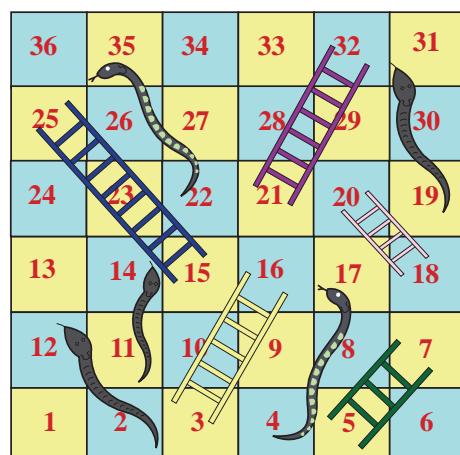
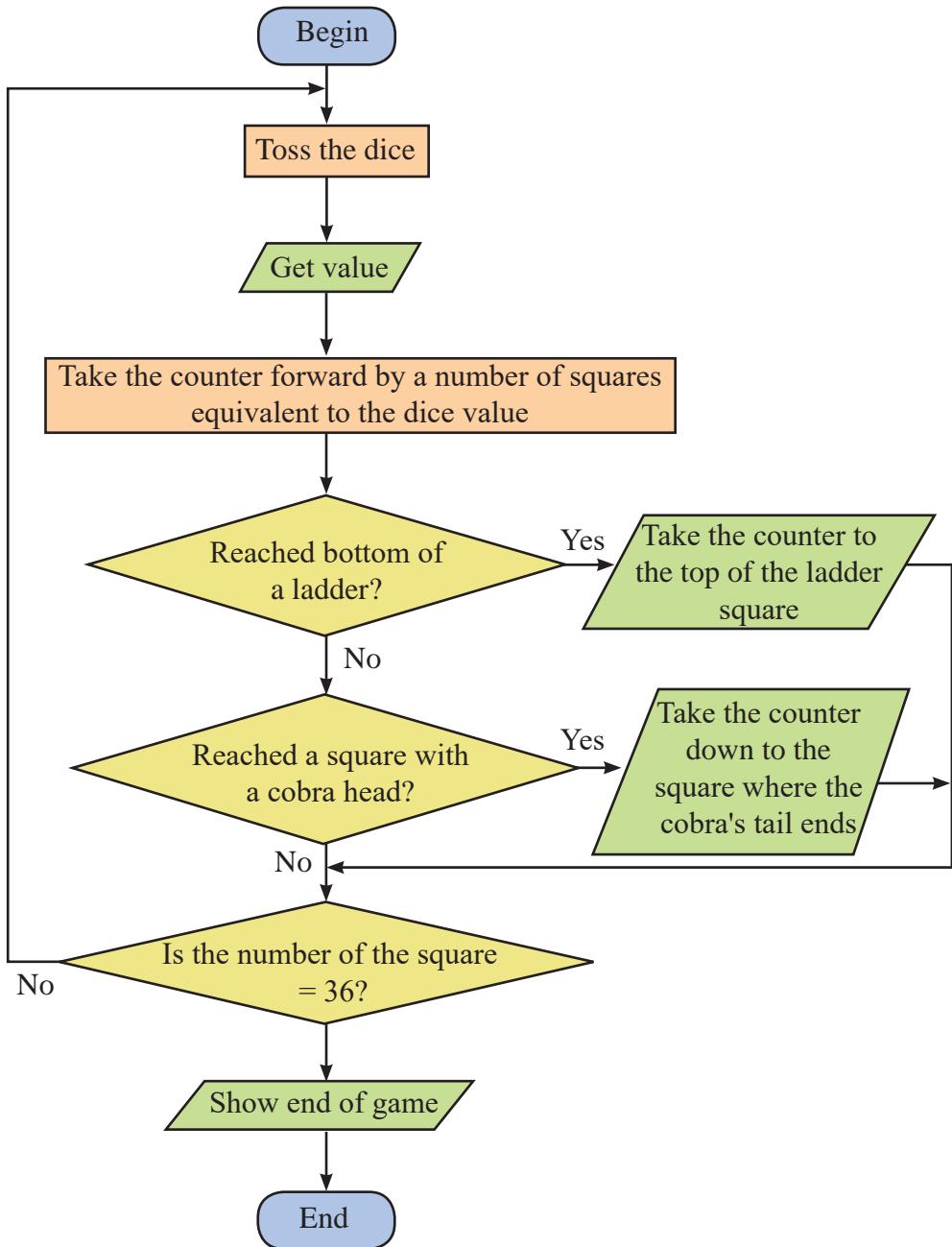


Figure 3.4 : Snakes and Ladders



Flowchart 8 : Snakes and ladders game

```

when green flag clicked
set Number of the square to 0
set Value to 0
repeat until [Number of the square > 36 or Number of the square = 36]
    say [Toss the dice] for [2] secs
    ask [What is the value?] and wait
    set Value to answer
    set Number of the square to [Number of the square + Value]
    say [join [Value] [Move the counter forward]] for [4] secs
    ask [Did it land at the bottom of a ladder?] and wait
    if [answer = Yes] then
        say [Move the counter up to the top]
        ask [What is the number of the ladder of the square?] and wait
        set Number of the square to answer
    else
        ask [Did the counter land on the head of a snake?] and wait
        if [answer = Yes] then
            say [Slide down to the bottom of the snake]
            ask [What is the number of the square?] and wait
            set Number of the squares to answer
    end
end
say [Game is over] for [2] secs

```

Scratch program 11



Refer to workbook for Activities 3.2 and 3.3.

### 3.7

## Programming with arrays

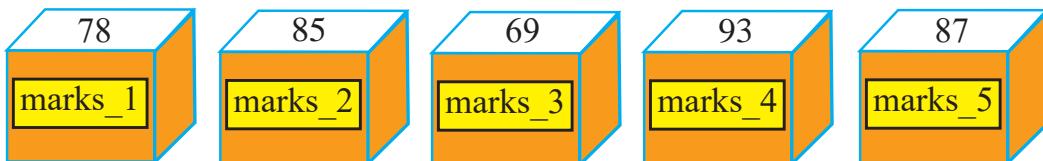
### What is an array?

In Grade 7, we learnt that to store values in programming, variables are needed. We need a number of variables that is equivalent to the number of values to be stored.

For example, consider storing marks gained by a student for five question papers on general knowledge.

Five variables are required to store marks for the five question papers.

Name the variable as marks \_ 1, marks \_ 2, marks \_ 3, marks \_ 4 and marks \_ 5. Marks earned by a student can be stored in these variables. Consider 78, 85, 69, 93, 87 to be the marks scored.



Each variable needs giving a name when variables are used to store values. This is difficult when a large number of variables are used. Further, the program become complicated and large with large number of variables. In such instances, arrays are used to get over this problem.

An *array* is a data structure that can store any number of items using a single variable name. By using arrays, programs become less complex and the number of instructions can be reduced.

### Building up arrays

Lists are used for arrays in Scratch. Lists can be built as follows in Scratch.

e.g. - Using arrays to enter names of animals:

1. Select ‘Make a List’ from data
2. Give array a name
3. Select ‘For this sprite only’
4. Click 'OK'

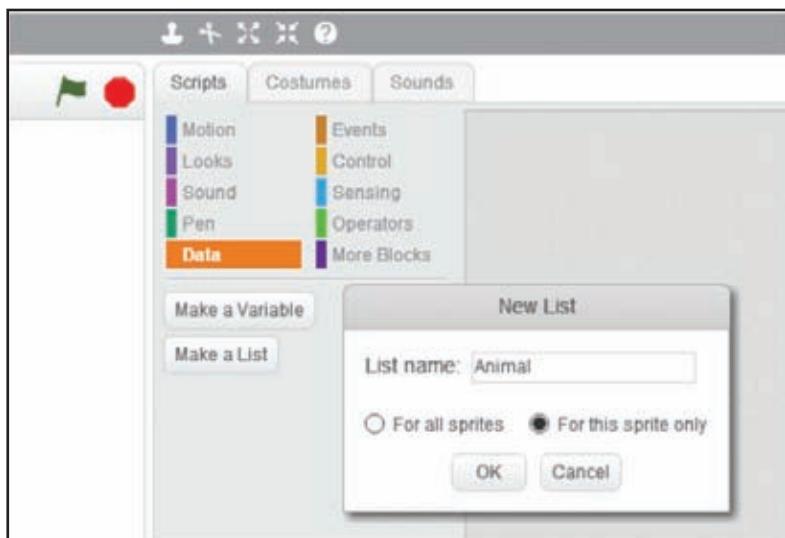


Figure 3.4 : Building up an array in Scratch

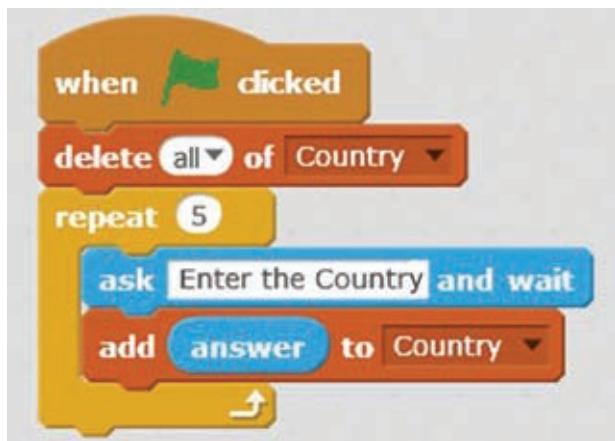
After following the steps above, instructions blocks for Animal array appear as shown below;



Scratch program 12

## Assigning items into arrays

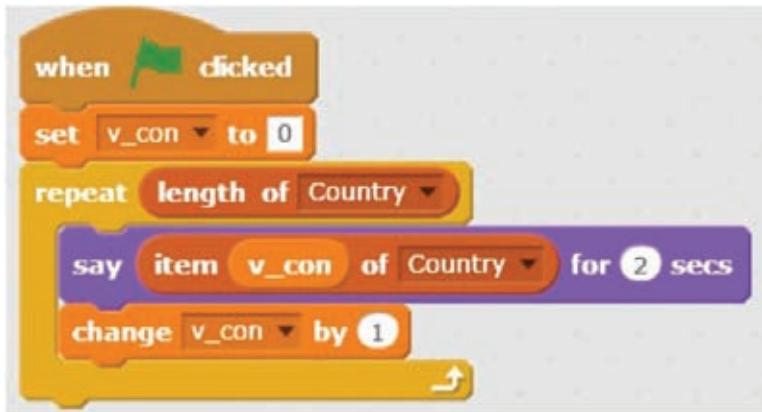
For example, after building an array named 'Country' to enter the names of five countries, the following code can be used to enter items to it.



Scratch program 13

## Displaying items in an array

After entering data into an array named 'Country', the following program can be used to display its content to produce the output.



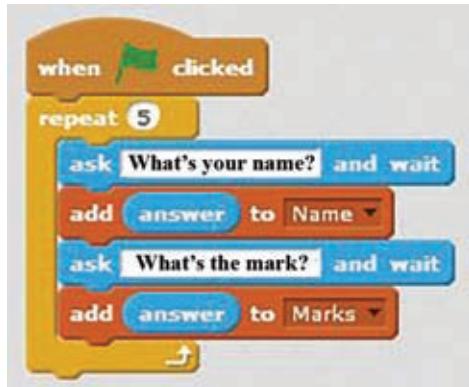
Scratch program 14

In the above program, `v_con` is a variable and "Country" is the name of the array.

Let us consider an example where two Scratch programs to store the names and the marks of five students are processed. The first one uses multiple variables whereas the second one uses two arrays.



Scratch program 15 : Program with variables



Scratch program 16 : Program with repetition

Sprite2: Name		Sprite2: Marks	
1	Nayana	1	74
2	Pawani	2	65
3	Radha	3	87
4	Paushi	4	42
5	Saman	5	60
+ length: 5		+ length: 5	

Array with names

Array with marks

With the arrays in use, it is possible to use a repetition construct. This helps reduce the size of the program.

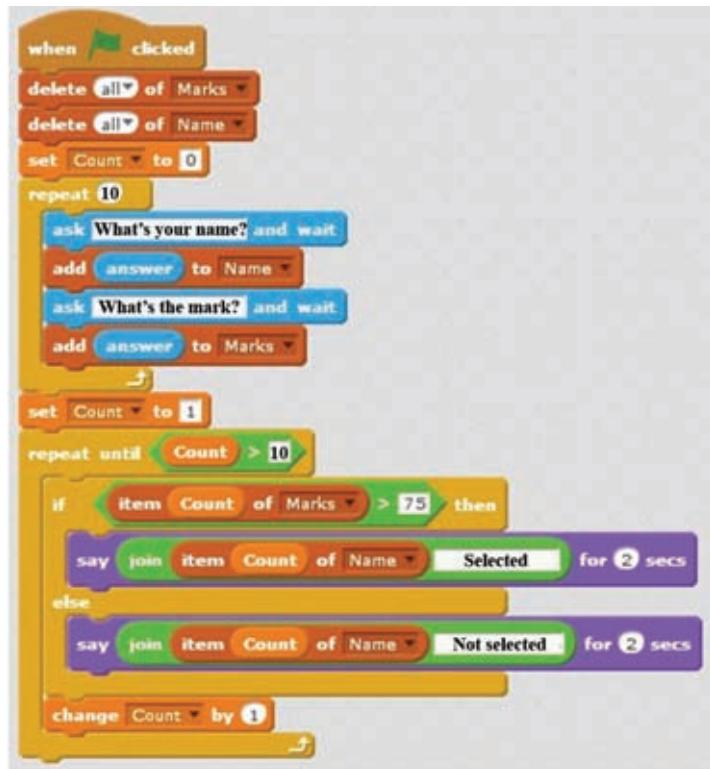


Note - An array is termed a list in Scratch programming.

Let us consider another example;

A school conducted a competition to select students for a general knowledge contest. The principal decided to select students who gained over 75 marks for the interview.

Five students are to face the interview. In the code shown below, using two arrays named 'Name' and 'Marks' the names of students having marks greater than 75 are shown.



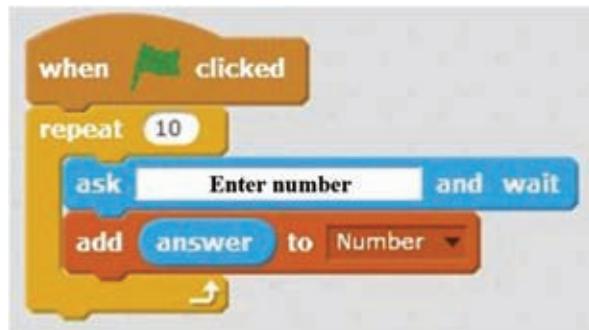
Scratch program 17

## 3.8 Programming with problem analysis

Dividing a problem into sections makes it easier to solve.

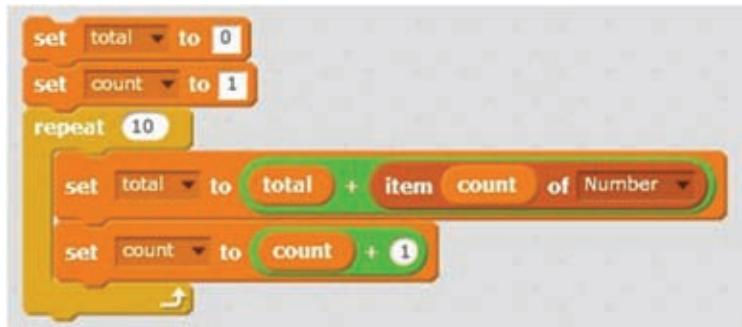
For example, Let us consider finding the average of ten numbers. This problem can be divided into sections as shown below;

1. Input ten numbers.



Scratch program 18

2. Find the total of the ten numbers



Scratch program 19

3. Divide the total by ten to find the average



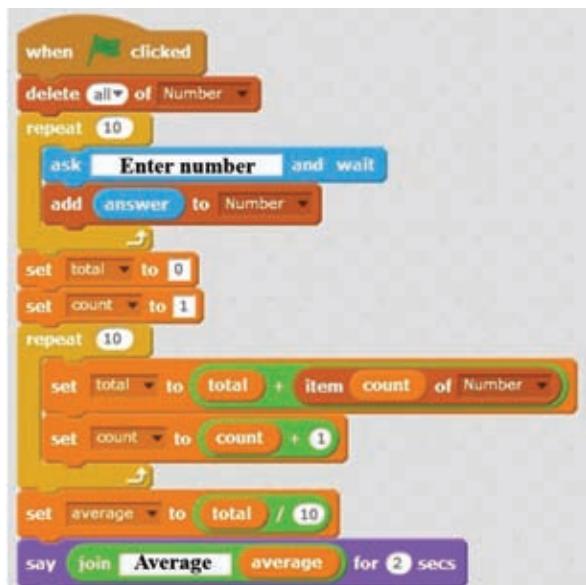
Scratch program 20

4. Output average



Scratch program 21

Based on the sections written, it is possible to develop a Scratch program easily for the entire problem as follows;



Scratch program 22



Refer to workbook for Activity 3.4.

## Summary

- Repetition is about repeating a statement or a set of statements.
- A condition is necessary to begin and end a repetition.
- There are Scratch repetition control structures.
- There are three repetition control structures in Scratch:

- i. Control structure for repetition a set number of times (e.g. for 10 times)



- ii. Control structure for repetition based on a condition



- iii. Control structure for endless repetition

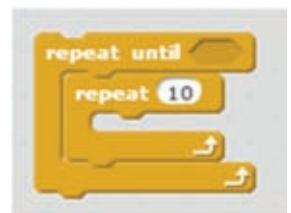


- Repetition within a repetition is called a *nested repetition*.
- There are a few nested repetition types:

- i Repetition to satisfy a given condition

- ii. Continuous repetition a fixed number of times

- iii. Continuous repetition to satisfy a given condition



- An *array* is a data structure to store many items using a single name.
- Dividing a problem into smaller selections makes problem development easier.

# 4

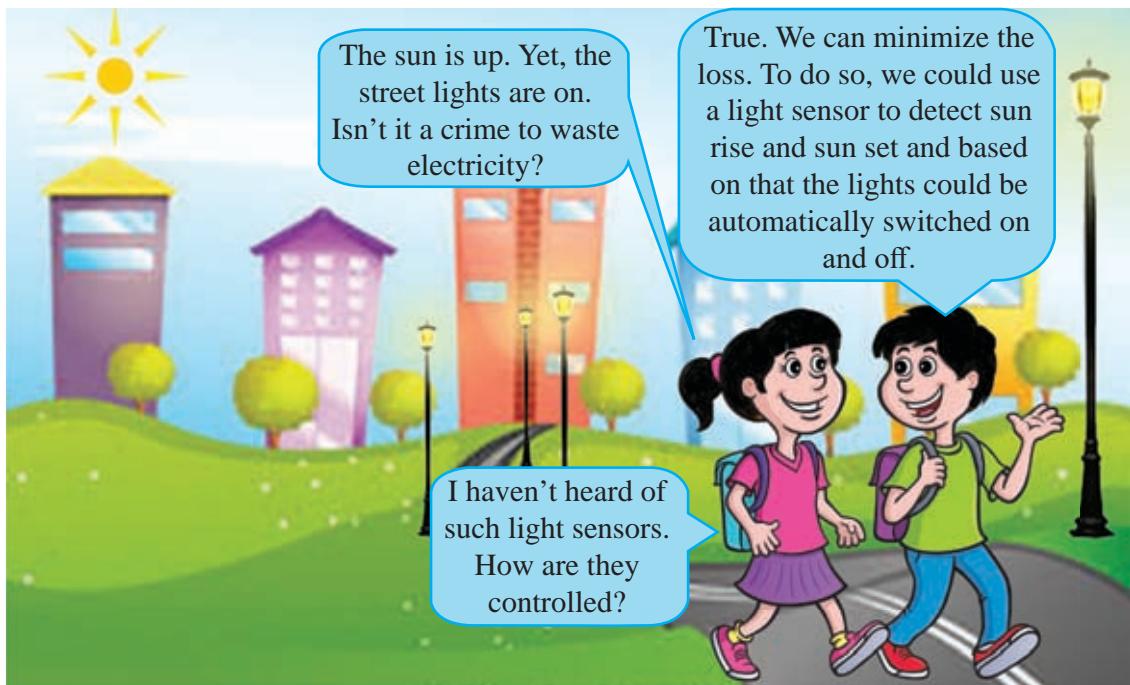
## Use of Microcontrollers

This chapter will cover the following:

- Identifying devices that use sensors
- Introducing the control of processing and output of data collected from sensors and developing codes for the purpose.



### 4.1 Microcontrollers





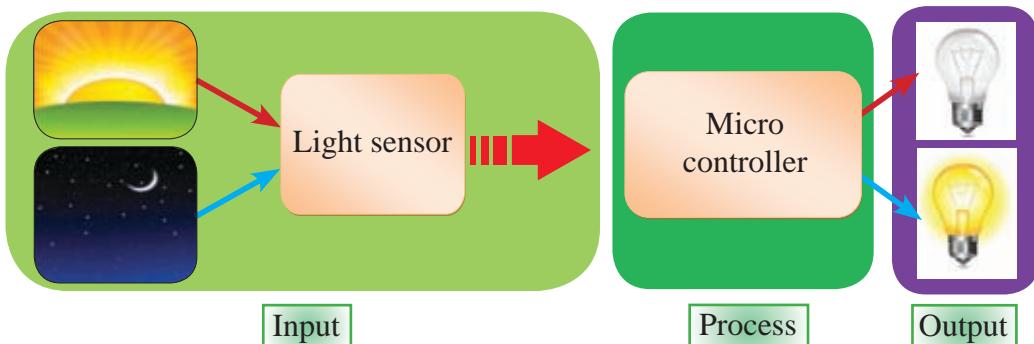
### Use of sensors to identify environmental changes

To use sensors to detect environmental conditions and to set related information, they must be connected to a computer.

The basic functions of a computer are to input or collect data, process data according the given instructions and to output necessary information.



The microcontroller processes data collected from sensors according to the given instructions and releases necessary output. An example for microcontroller operation is shown below;



The microcontroller processes data gathered by the light sensors to light the bulb or to put it off. For this purpose, the microcontroller needs to be fed with program instructions in a program.



Refer to workbook for the Activity 4.1



### Note - Microcontroller

A micro controller is actually a chip design to perform some operations according to the given instructions.



### Components of microcontroller

A microcontroller consists of four basic components;

#### 1. Central Processing Unit - CPU

This processes data into information in order to provide the output.

#### 2. Memory

There are two types;

##### i. Non-volatile memory

The data in the non-volatile memory does not get erased even if there is no electricity. The program that the microcontroller should execute is stored in it.

##### ii. Volatile memory

Data in the volatile memory gets erased if there is no electricity. It functions as the Random Access Memory (RAM). This is used to store data as well as other results that are related when the microcontroller is at work. Data and instructions for the CPU are also held here.

#### 3. System clock

The system clock is an electronic device. It synchronizes all components.

## 4. Peripheral devices

Small pins used to input data or output information belong to this category. Data is collected in both in analog and digital forms. Output is released in digital form.

### Use of sensors and micro controllers

#### Solar lamp

This contains solar cells, sensors and microcontroller. Solar cells, microcontroller and light sensors cooperate to light the lamp. The solar lamp turns on automatically with the dark and turns off when there is light. Use of such solar lamps can minimize the waste of electricity.



#### Washing machine

Pressing buttons, the user gives instructions to the microcontroller for the wash. The microcontroller operates accordingly.



#### Microwave oven

The microcontroller in the microwave oven holds the heat for a specified period and stops. The user has to instruct regarding the required temperature and the duration.



#### Important:

#### Single Board Computer (SBC)

A single-board computer has a single circuit board with memory, input, output and microcontroller.

e.g. - Raspberry pi

#### Single Chip Computer (SCC)

Central processing unit, input, output and memory are all built into a single integrated circuit. (IC)

e.g. - Arduino clip

## 4.2 Use of microcontrollers

A microcontroller based kit can be used to obtain the required outputs. A few such microcontroller based kits are shown below:

- micro:bit
- Arduino
- Raspberry pi

The following websites will help with more information about these kits;

[www.microbit.co.uk](http://www.microbit.co.uk)  
[www.arduino.cc](http://www.arduino.cc),  
[www.raspberry.org](http://www.raspberry.org)

This chapter is more about the use of Micro:bit and Arduano microcontrollers.

### Micro:bit

The BBC institute has developed this microcontroller module to get inputs, process them and produce outputs. This contains a memory too. Hence this board has the basic features of a computer. Further, it contains sensors also. The architecture of the micro:bit module is as follows;

#### Front view of the micro:bit module

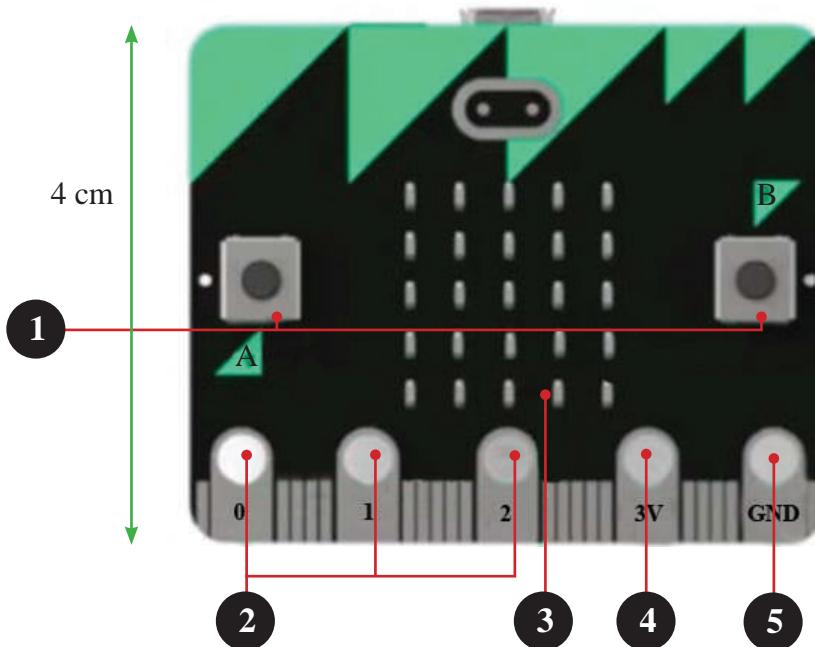


Figure 4.1 : Front view of micro:bit module

- 1** Two programmable buttons as A and B
- 2** Digital and analog input/output pins
- 3** Individually programmable LED bulbs. The LED bulbs are built into the module so additional LED bulbs are not necessary.
- 4** Port to connect power
- 5** Ground back port

### Rear view of the micro:bit microcontroller module

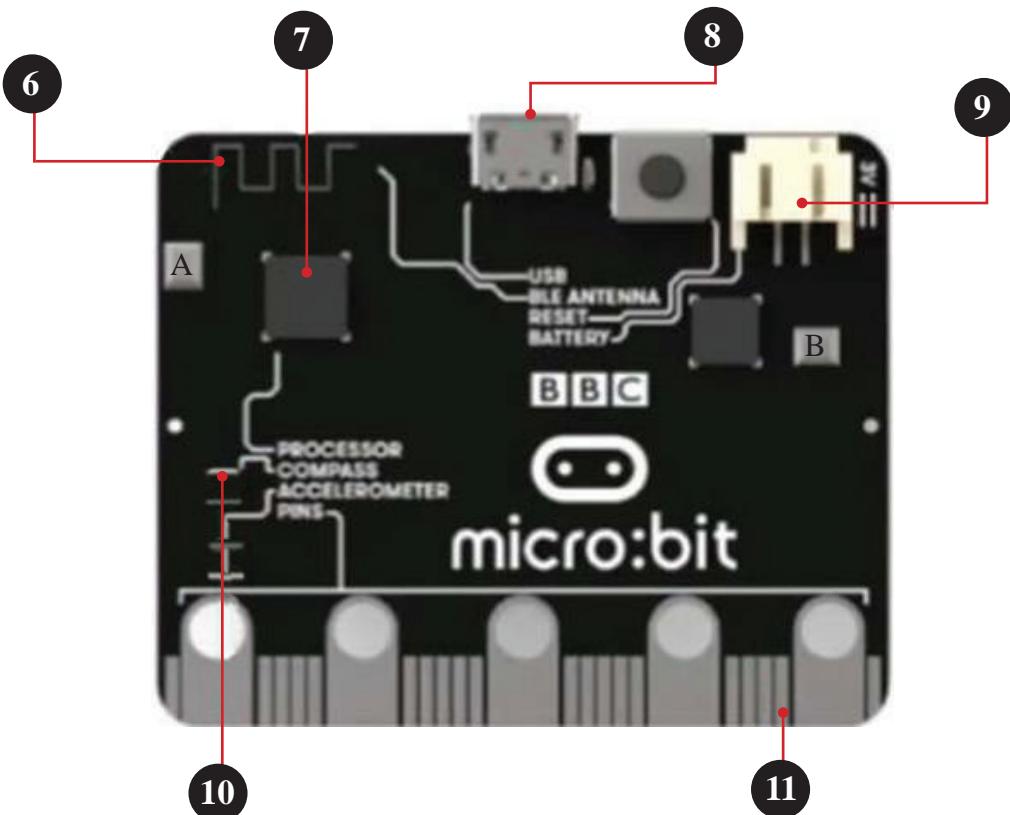


Figure 4.2 : Rear view of micro:bit microcontroller module

- 6** Bluetooth smart antenna to connect devices using bluetooth and to transmit radio waves
- 7** Central Processing Unit
- 8** Micro USB port to connect to a computer
- 9** The battery connector to connect 3V external power supply
- 10** Accelerometer and compass (The module contains a few embedded sensors)
- 11** Pin edge connector

### Connecting micro:bit module to computer

The module has to be connected to the computer with a micro USB cable as shown below;

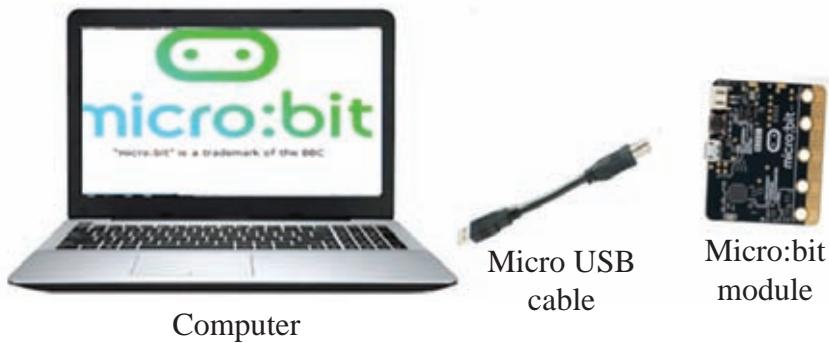


Figure 4.3 : Connecting micro:bit module

When connected, the computer shows it as a storage unit.

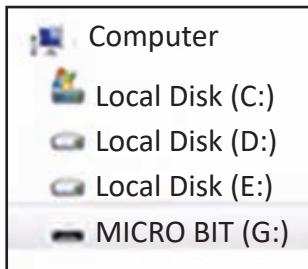


Figure 4.4 : Micro:bit shown as a storage unit

## Coding the micro:bit module

Coding micro: bit module is done online. To code micro: bit module, access micro:bit code in the website [www.makecode.com](http://www.makecode.com). This features a drag-and-drop facility to speed up programming.

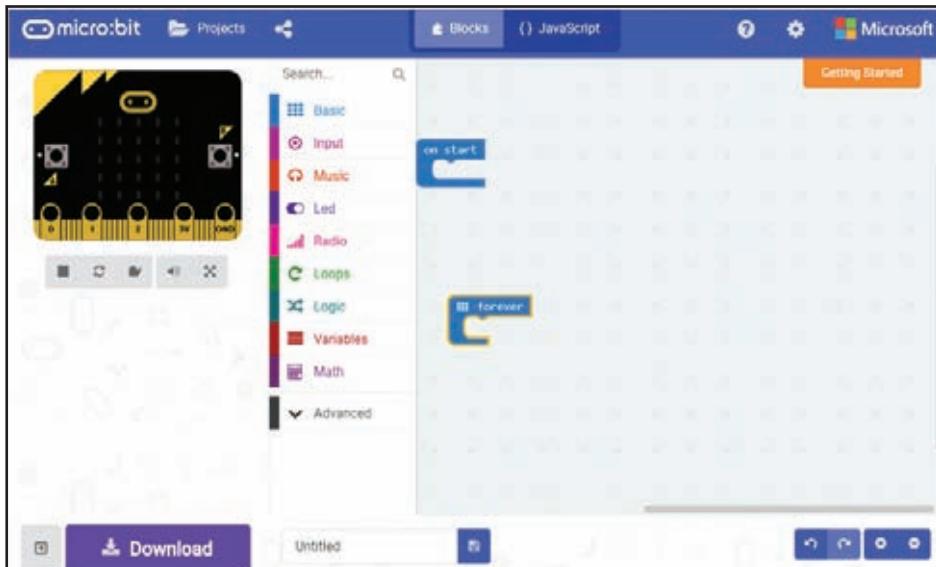


Figure 4.5 : Micro:bit coding

Therefore, it is possible for even a beginner to follow the process. A specialty in this connection is the ability to access even in Sinhala as shown below;

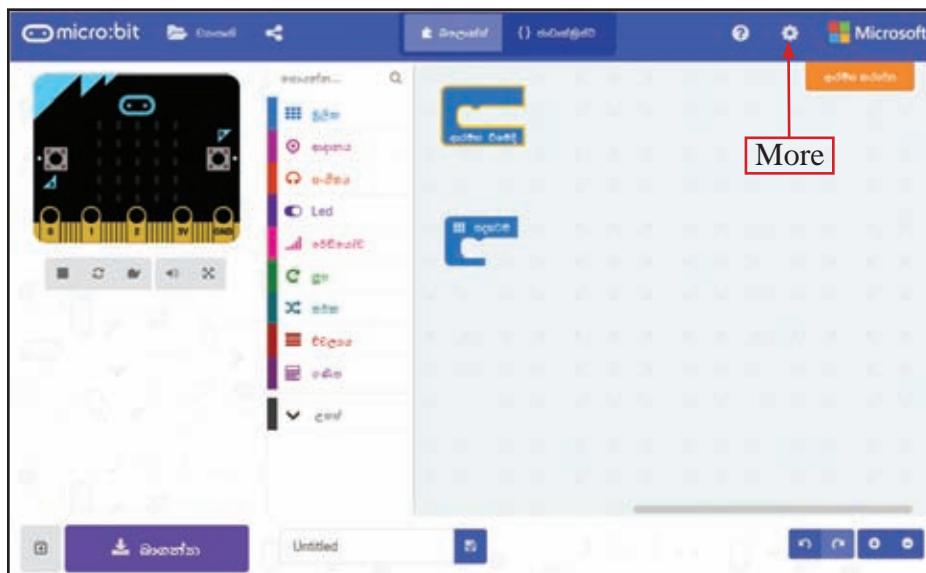


Figure 4.6 : Micro:bit code in Sinhala

To do this, the steps *More* → *Language* → *Sinhala* have to be followed.

Once the coding is done, it can be displayed in micro:bit model in Block Editor.

### Practical usage of the micro:bit module

Access the website [www.makecode.micro:bit.org](http://www.makecode.microbit.org). to get a new project with Projects → New Project. Refer figure 4.7.

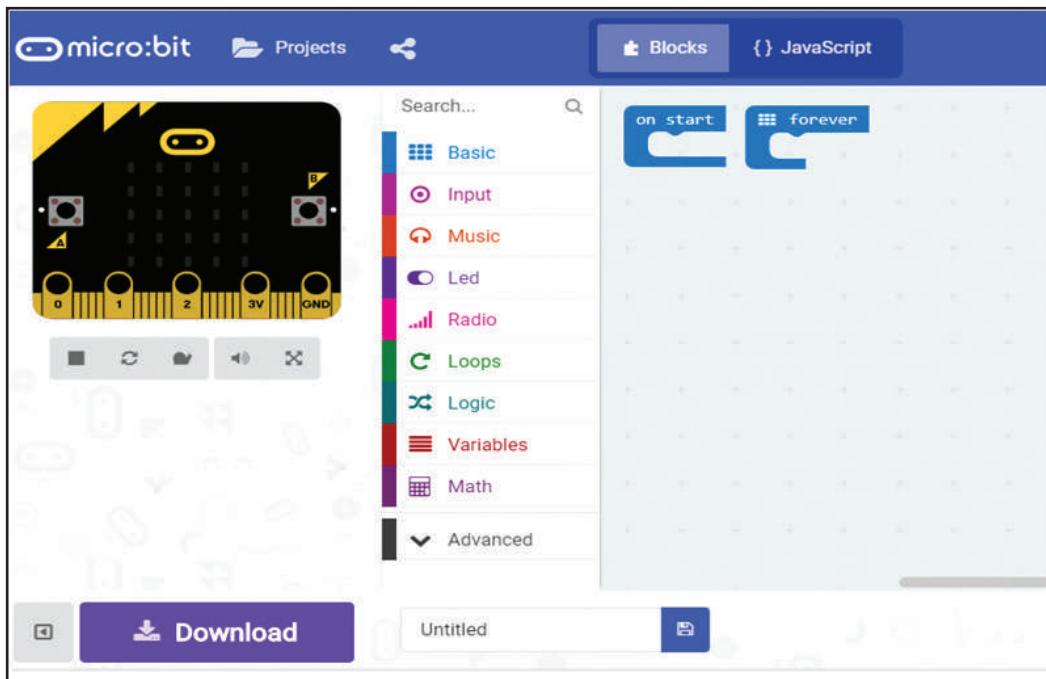


Figure 4.7 : Starting a new project in micro:bit

An image similar to figure 4.7 is shown. Click ‘blocks’ on it. Coding can be easily done by connecting blocks. Or else, computer programming languages like Java scripts, Python C++, etc. can be used for programming.

When starting a new project, the block editor shows two blocks as shown in Figure 4.8.

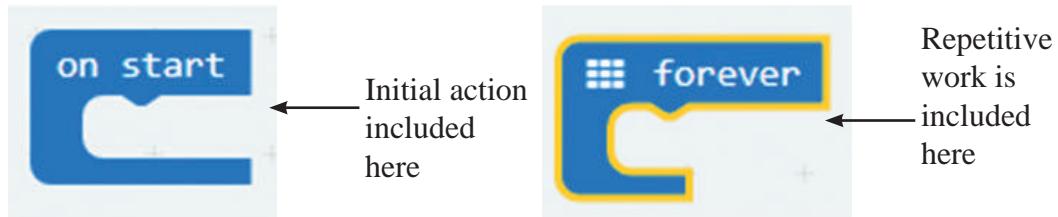


Figure 4.8 : Blocks inside the code editor

To get more block types, click on the menu in block editor (Figure 4.9).



Figure 4.9 : Block editor menu

The basic menu above provides the following:

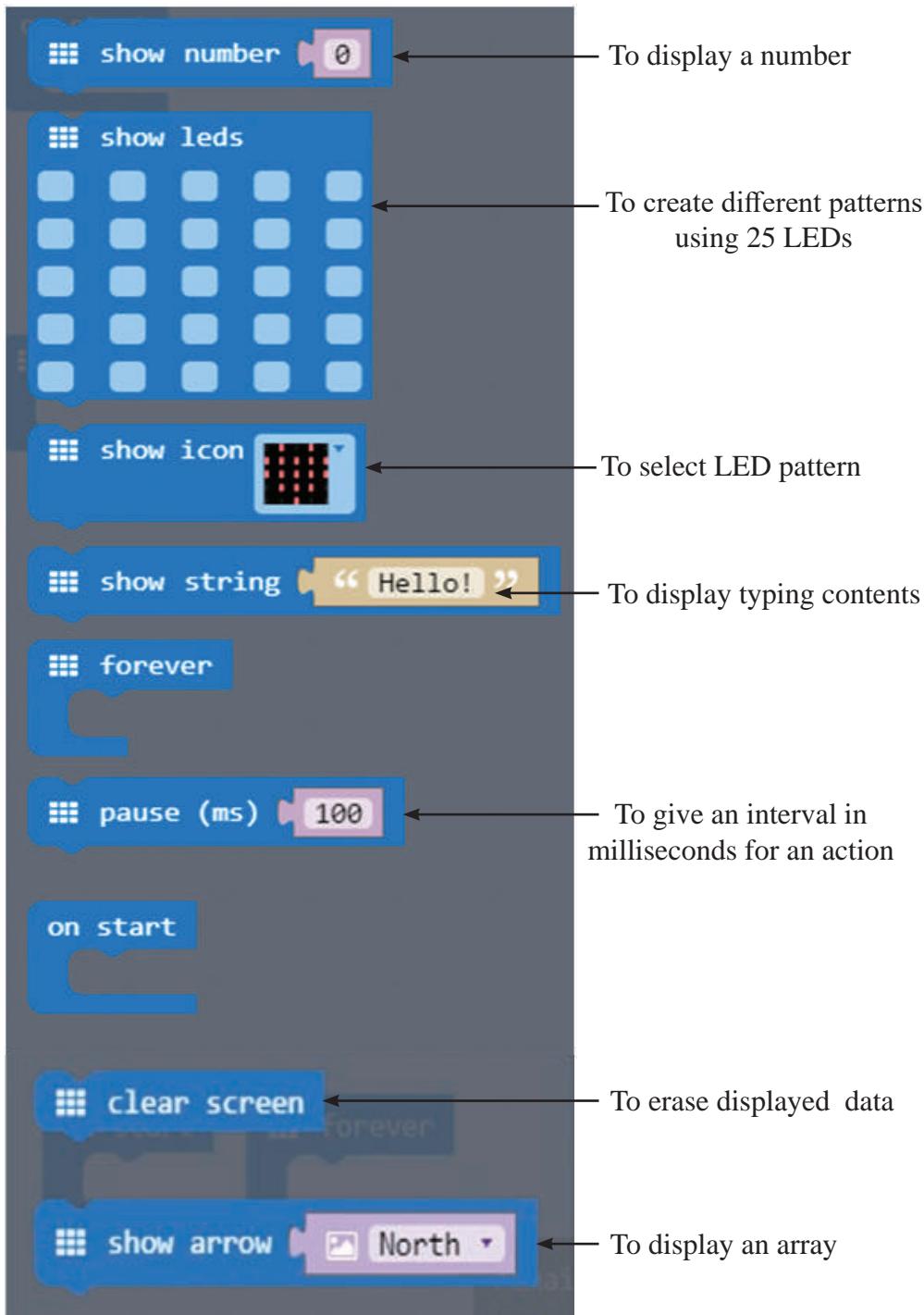


Figure 4.10 : Features in basic menu

The input menu above provides the following blocks:

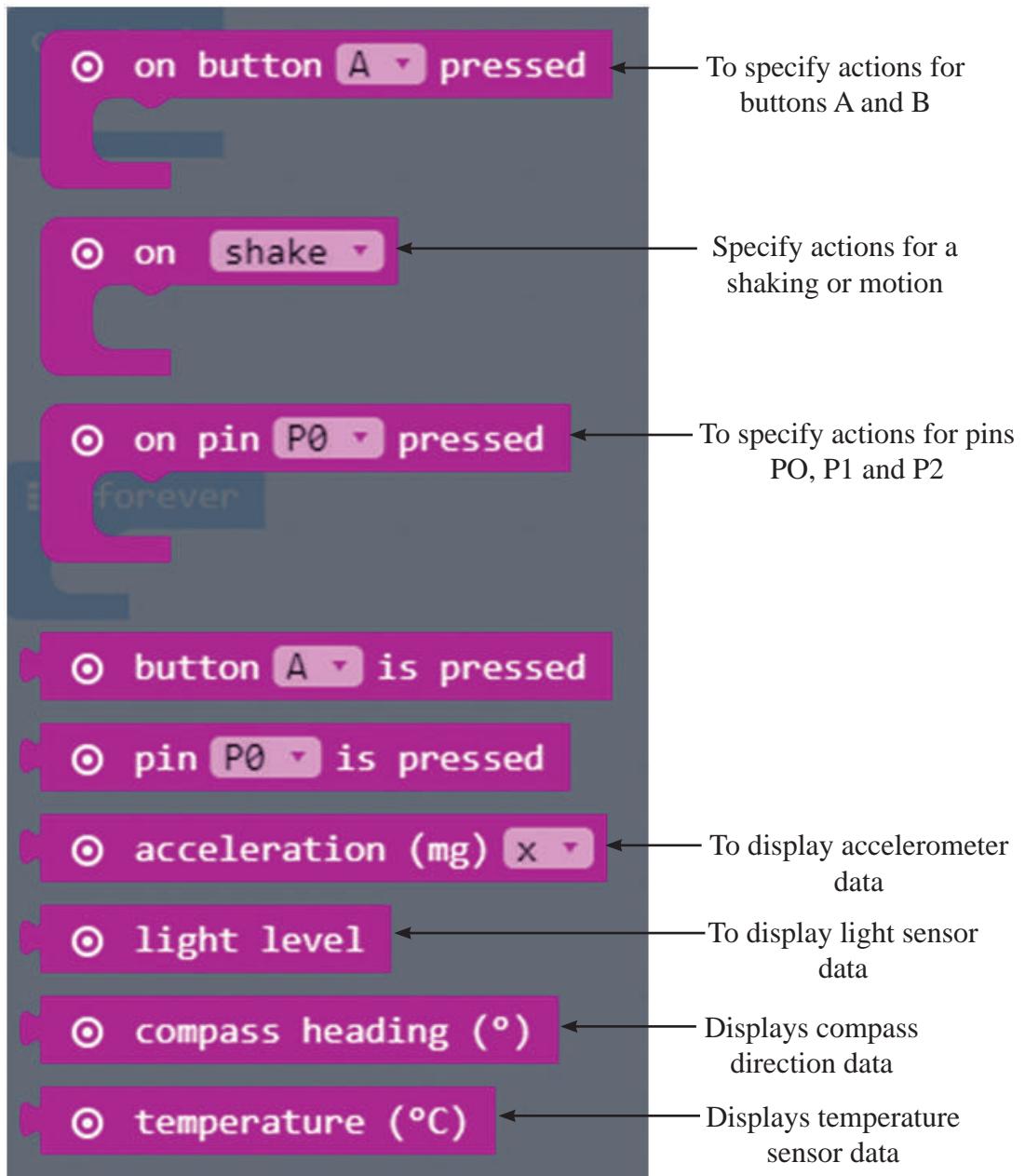


Figure 4.11 : Features in input menu

Other types available in block editor and other menus are used in the activity.



Refer to workbook for Activities 4.2 and 4.3

## Arduino

Arduino is a microprocessor developed by Atmel company. It consists of the components shown below (Figure 4.12). It can receive input, process it and release output. It contains a memory as well. Therefore, this board is similar to a basic computer.

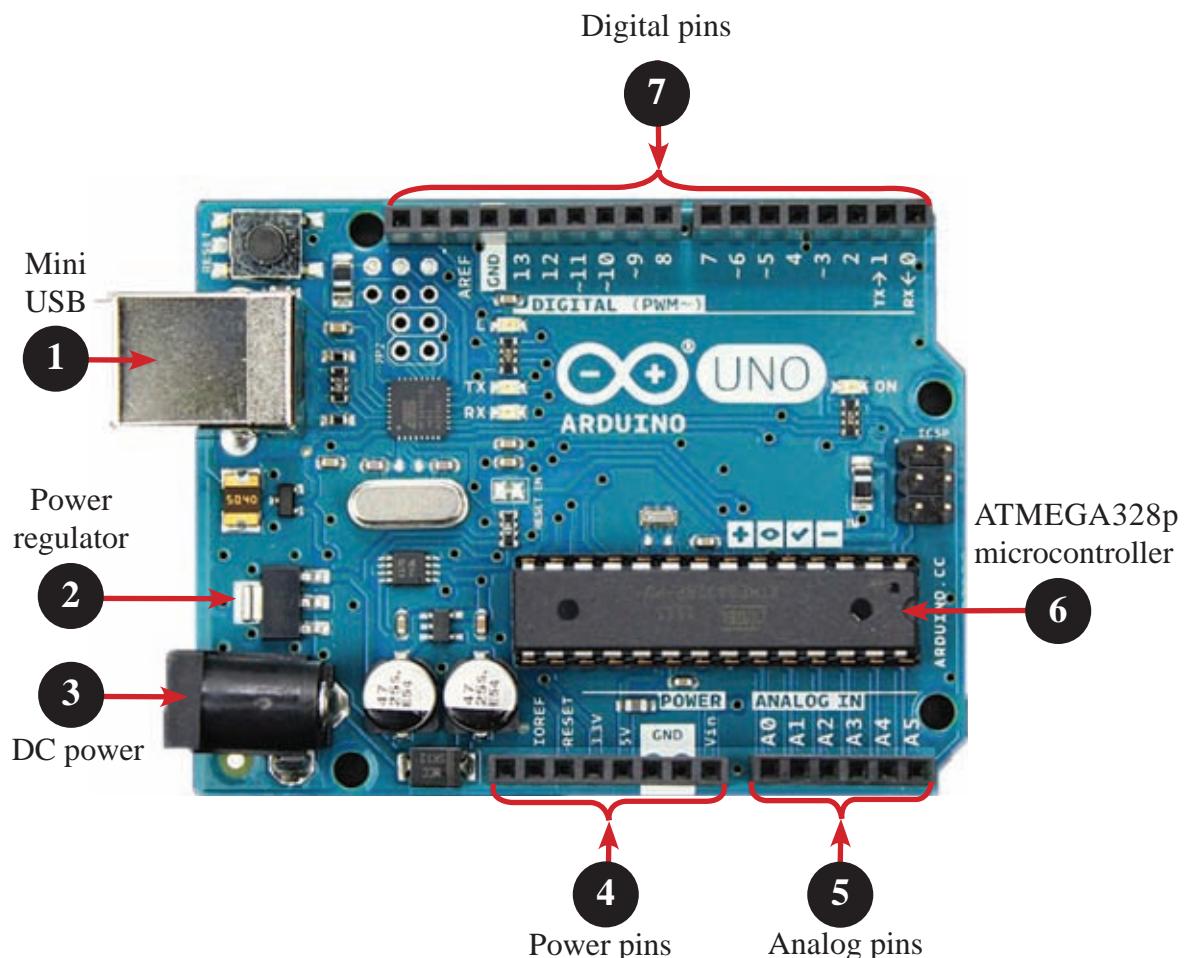


Figure 4.12 : Arduino board

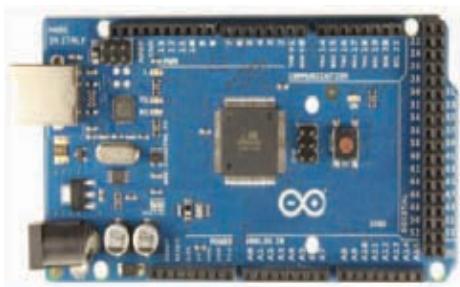
Table 4.1 : Components on the Arduino board

<b>1</b>	Mini USB 	Can be used to connect to a computer.
<b>2</b>	Electric controller 	Controls the voltage given to the Arduino board.
<b>3</b>	DC power supply 	When the Arduino board is connected to a computer it gets its required 5V voltage from the computer. However, when it is not the case, this port can be used to supply external power.
<b>4</b>	Power Pins 	These pins can be used to provide electricity from the board to an external circuit. It is also used to control some operations.
<b>5</b>	Analog pins 	Used to send analog inputs (e.g. sensor reading) to the board.
<b>6</b>	ATMEGA328p 	This is a micro controller chip in the Arduino Uno board. It is produced by Atmel company.
<b>7</b>	Digital pins 	Can be used to get digital inputs and to provide digital outputs.

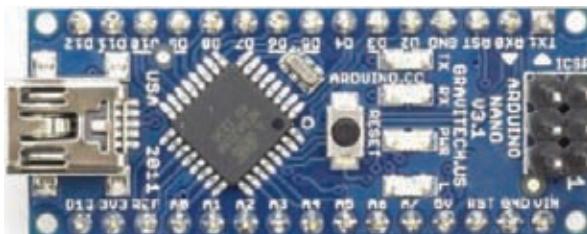
A few Arduino boards used today are shown below;



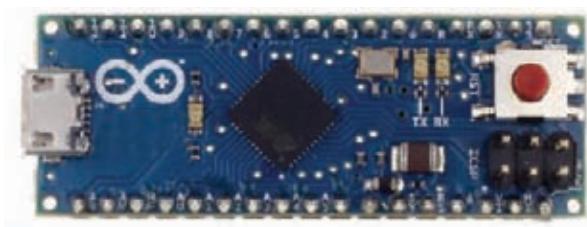
Arduino Uno board



Arduino Mega board



Arduino Nano board



Arduino Micro board

Out of the above Arduino boards, we use the Arduino Uno board for the activities in this unit.

## Other peripherals connected to microcontrollers

### 1. Bread-board

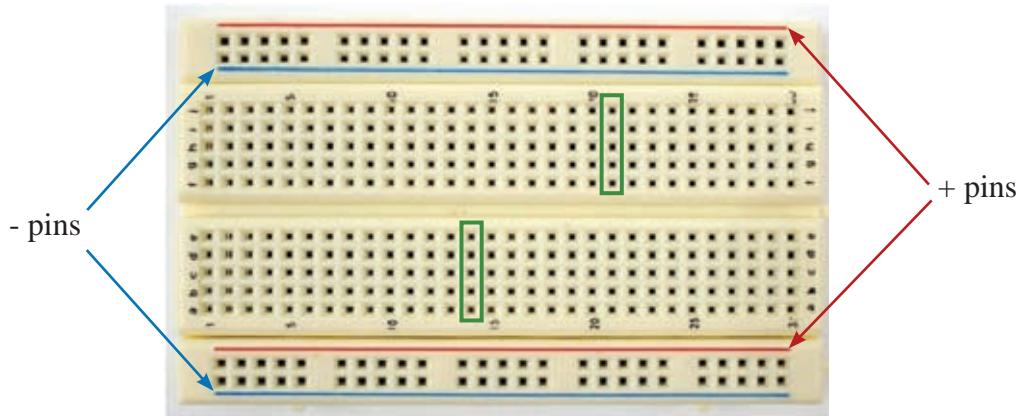


Figure 4.13 : A breadboard

Breadboards can be used to make circuits without resorting to welding to connect the circuit components.

On a breadboard;

- All holes marked (+) ve (red) are connected together.
- All holes marked (-) ve (blue) are connected together.
- As shown in Figure 4.13 holes in each green coloured section are connected together.

### 2. Light Emitting Diode - LED

A Light Emitting Diode (Figure 4.14) emits light when electricity passes through it.

In a diode, electricity travels only in one direction.

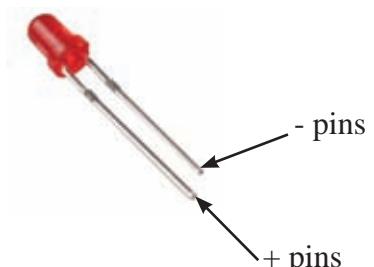


Figure 4.14 : A Light Emitting Diode

### 3. Sensors

A sensor is a device which detects or measures a physical property and records, indicates or otherwise responds to it.

### (i) Passive Infrared Sensor (PIR) Sensor

This is an electronic sensor that measures infrared objects (e.g. humans) in its field of view and gives an output voltage accordingly (Figure 4.15).

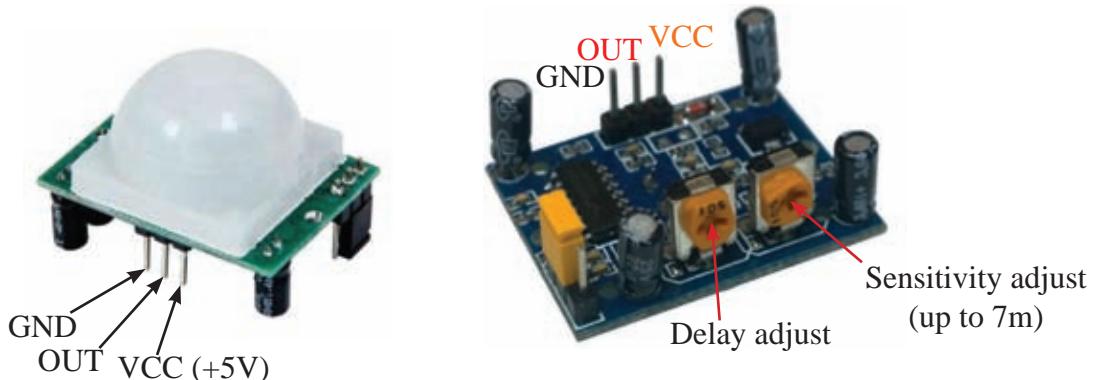


Figure 4.15 : Front and rear views of PIR Sensor

- GND : is the negative terminal
- VCC : is the positive terminal (need 5V)
- OUT : the output terminal (outputs 3.3V)

Out of the two trimpots marked colour yellow, one enables adjusting the distance covered by the sensor, while the other indicates the time delay to release the output.

### (ii) Ultrasonic sensor

An ultrasonic sensor is used to estimate the distance from it to an object. This is done by ultra sound signals to the object and then interpreting the reflected signals (Figure 4.16).

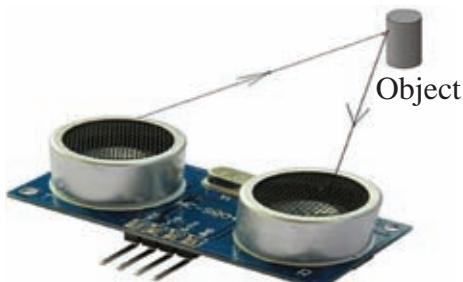


Figure 4.16 : How an ultrasonic sensor works

This sensor functions in a way similar to that of a bat finding its route. (Figure 4.17).

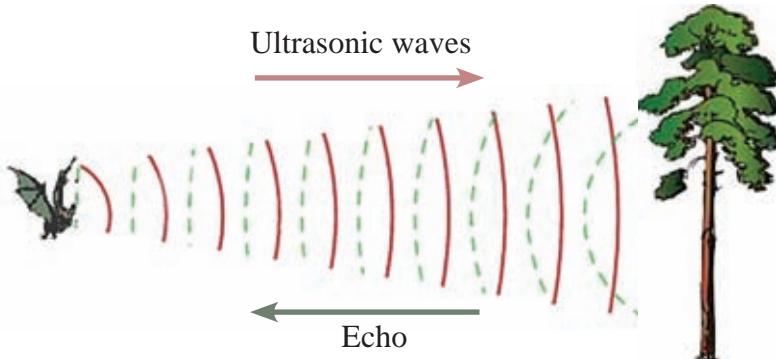


Figure 4.17 : An example similar to the ultrasonic sensor functions

The pins on the Ultrasonic sensor are as shown below.

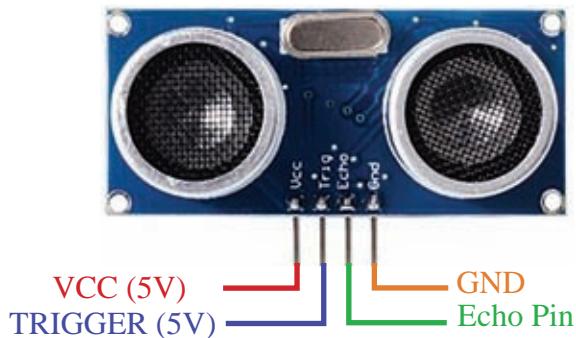


Figure 4.18 : Pins on the ultrasonic sensor

- GND : the negative terminal
- VCC : the positive terminal (5V must be supplied to it)
- TRIGGER : for input
- ECHO provides output : for output



Refer to workbook for Activities 4.4, 4.5 and 4.6

## Summary

- Components of a microcontroller:
  - Central Processing Unit
  - Memory
  - System clock
  - Peripherals
- Some devices using microcontrollers:
  - Microwave ovens
  - Washing machines
  - Solar lamps
  - Traffic lights
  - Computer printers
  - Remote controllers
- Different boards containing microcontrollers (Microcontroller based kits)
  1. micro:bit
  2. Arduino
  3. Raspberry pi
- To code the above controllers must be connected to a computer. In using micro:bit, block editor helps with easy coding.

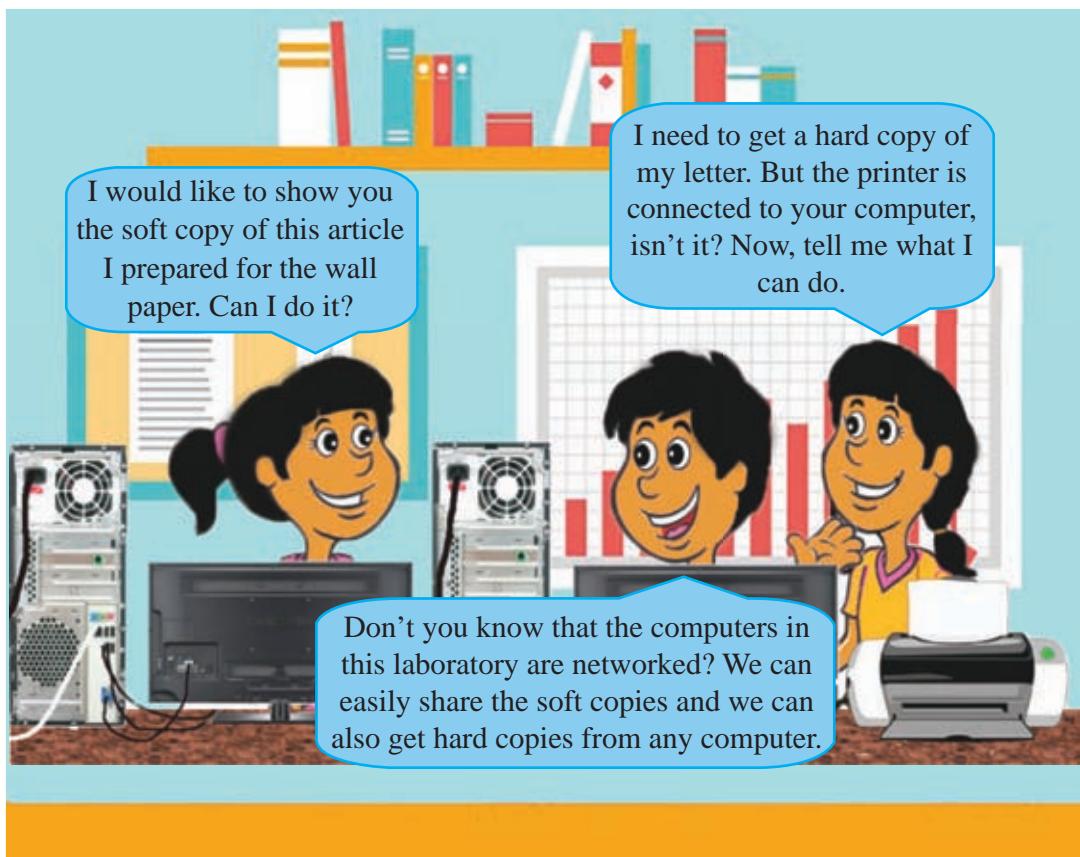
# 5

# Computer Networks

This chapter will cover the following:

- Computer networks and their basic devices
- Communication using computer networks
- How resources can be shared in computer networks

## 5.1 Computer networks



A collection of computers in a school computer laboratory or an organization, etc. connected together is called a *computer network*.

### Several advantages of computer networking

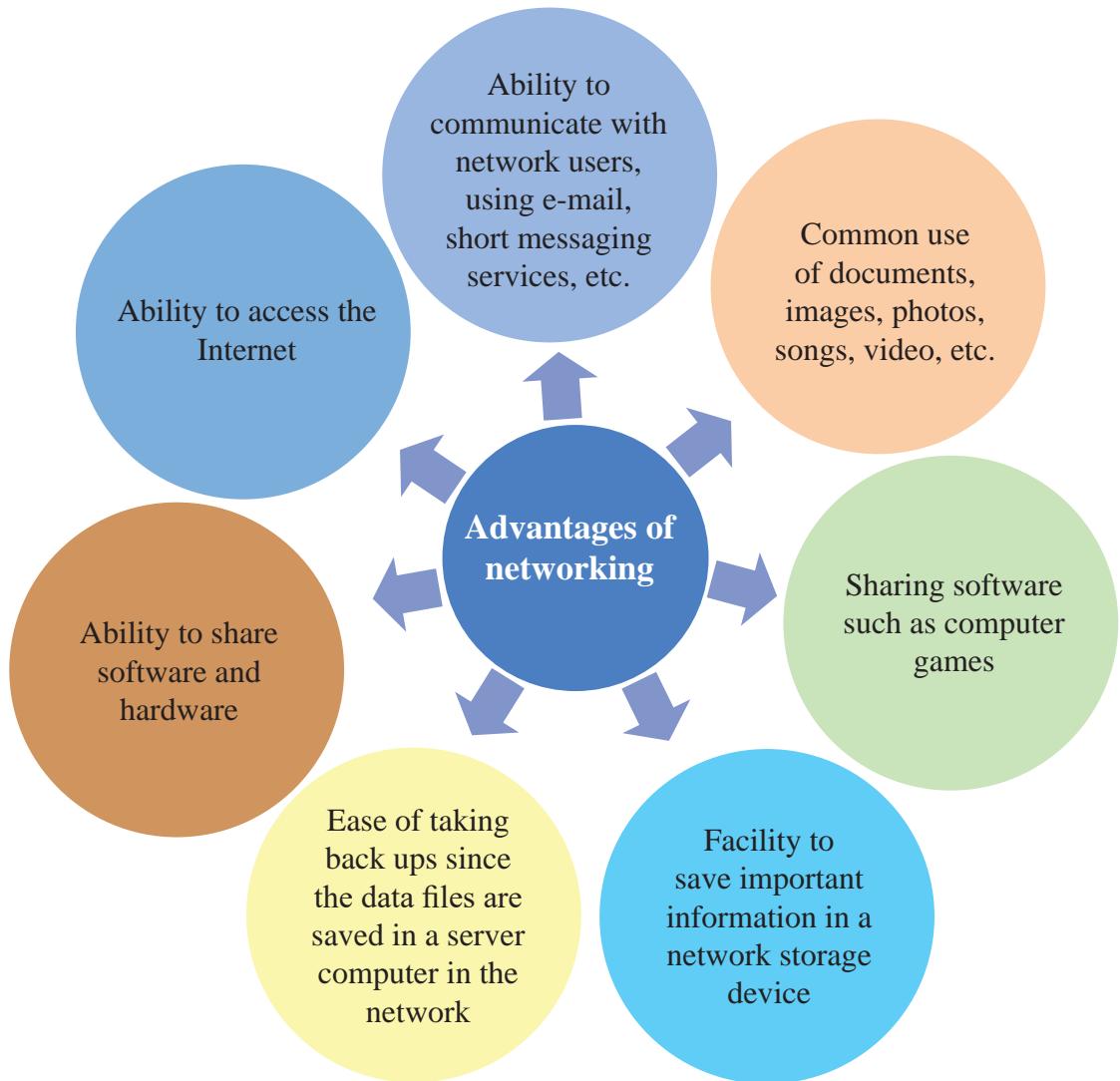


Figure 5.1 : Advantages of using computer networks

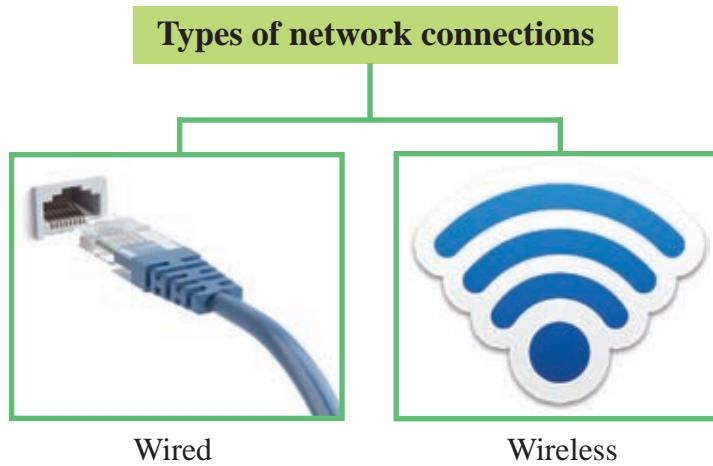


Figure 5.2 : Types of network connections

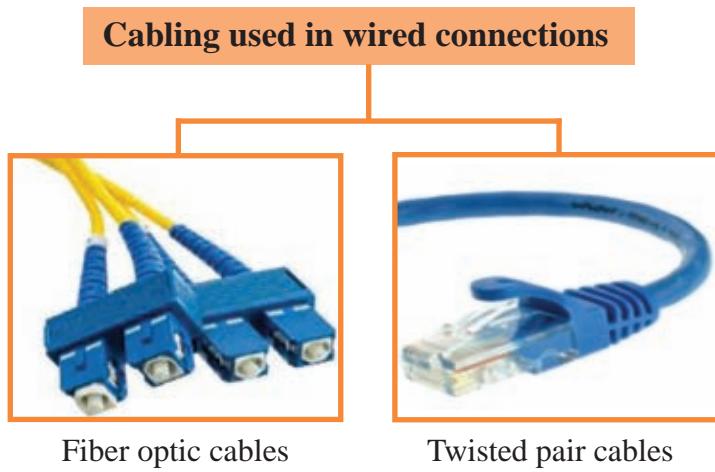


Figure 5.3 : Cabling examples

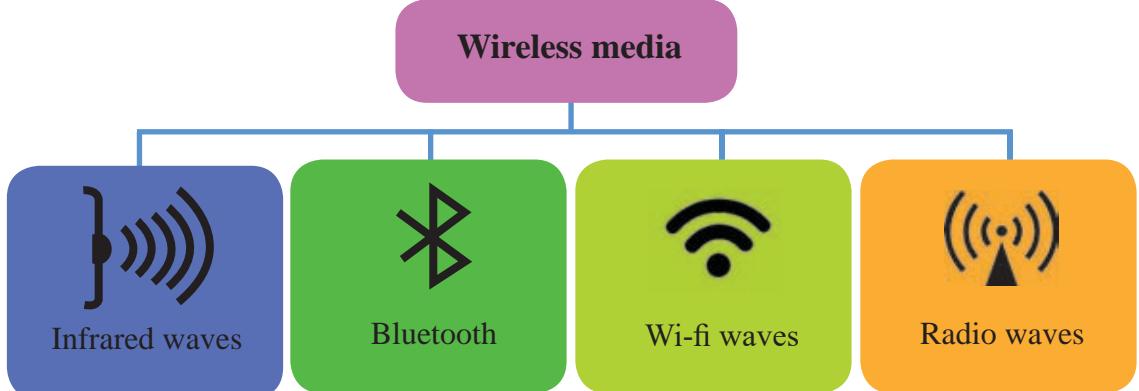


Figure 5.4 : Wireless media examples

Table 5.1 : Basic device requirements for computer networks

Basic devices of a Network	
The server manages the software, the hardware, the files and communication in the network. Any ordinary computer with the necessary software installed can be used as a server.	 Server
The switch acts as the mediator between two or more computers. The switch recognizes the destination computer or the device when messages are sent from one computer to another in the network.  e.g.- when printing command is given from one computer that message is sent to the relevant device i.e. the printer via switch.	 Switch
Network Interface Card connects a computer to a computer network.	 Network Interface Card
RJ45 connector cables	 RJ45 cables



Note: The **router** is used to connect one network to another network or to the Internet.

The router connects your computer or the network to the Internet easily.



The following example shows a network between two computers using the devices discussed above;

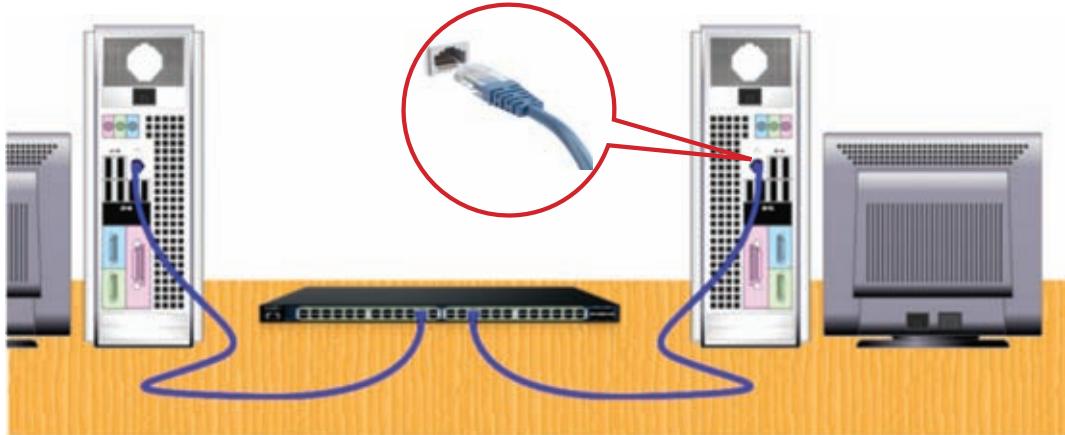


Figure 5.5 : A network involving two computers

### An example of a computer network

As shown in Figure 5.6 the computers are connected to the server computer via the switch.

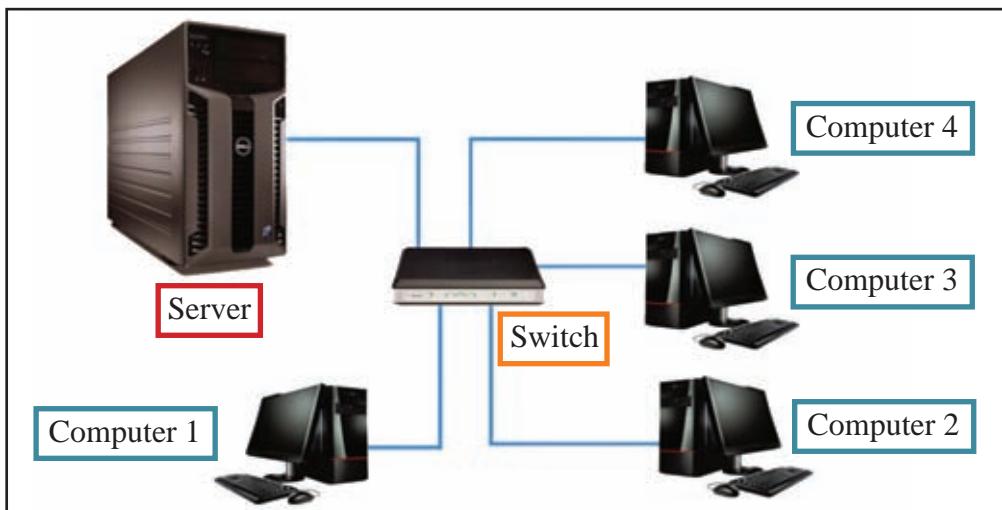


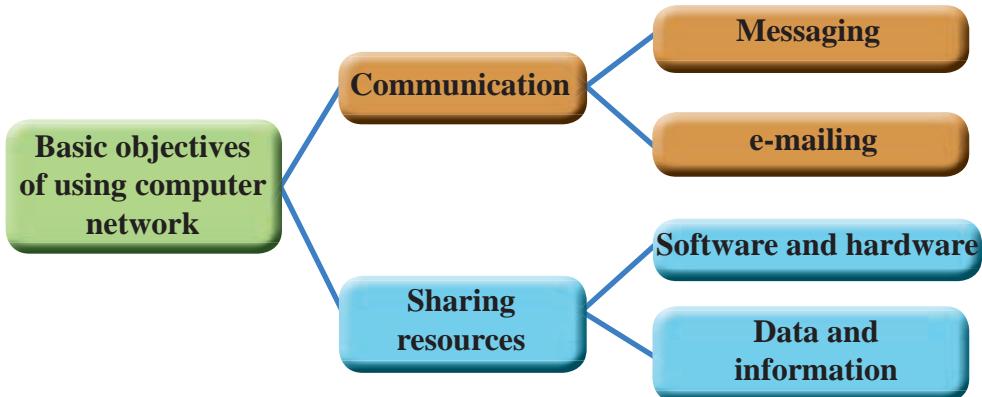
Figure 5.6 : An example of a computer network



Refer to workbook for Activities 5.1 and 5.2

## 5.2 Use of a computer network to share resources and for communication

Let us consider the basic objectives of computer networks.



### 5.2.1 Communication using a computer network

A computer network helps with easy communication among friends by messaging.

A message can be directed to many friends in the network at one time.

The Command Line Interface (CLI) can be used for this purpose.



### 5.2.2 Sharing resources using a computer network

e.g. 1 - Sharing hardware

When a printer is connected to the network using cables or wireless, every one in the network can use it when arrangements are made as such.



Some other devices shared in a network.



Scanner

Fax machine

### Advantages of using peripherals in common

- Ability to use common hardware with several computers
- Saving money
- Saving time

e.g. 2 - Sharing software

Each stand-alone computer may need individual software licenses. This is very expensive. However, buying multiuser software licenses for a computer network is relatively low. This saves a lot of money.

e.g. 3 - Sharing data and information

Sharing data and information helps save time, money and storage capacity while increasing the efficiency and productivity.

File folder



When a folder is shared in a network, all the files in the folder can be accessed by the users in the network.

This provides an opportunity to share images, photos, songs and videos, etc. among friends.

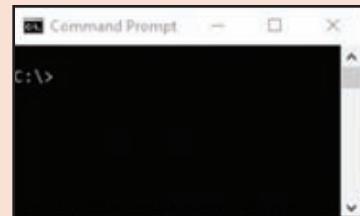


Refer to workbook for Activities 5.3 to 5.8



### Note - Command Line Interface (CLI)

The command Line Interface is an interface that could be used to give typed commands to computer sequentially in the form of texts. Before the introduction of the Graphical User Interface, the operating system of the computer, had the command line interface. This interface can be used to send messages to the network users.



In addition, the third party software such as LAN messages, Net send GUI, POP Messenger, also could be used for network user communications.

## Summary

### Computer networks

- A collection of two or more computers connected to share resources is a computer network.
- Computer networking has many advantages. The basic objectives of networking are to share resources and to communications.

### Computer connection types used in networking:

- Wired
- Wireless

### Wired media examples;

- Optical fiber
- Twisted pair cables

### Wireless media examples;

- Infrared waves
- Bluetooth
- Wi-Fi
- Radio waves

Basic device requirements for computer networking;

- Computers with Network Interface Card – NIC
- Switch
- Connection media

Server

- A computer network may have different servers to provide different services.
- The server controls management of software, hardware, files and messaging in a network.
- Any ordinary computer with relevant software installed can function as a server.

The switch

- The switch functions as a mediator to build up communication between two or more computers.
- Messages or data from one computer in the network are dispatched to the destination by the switch correctly.

Sharing resources and information

- Hardware, software, data and information can all be shared by users in a computer network.
- Messaging and e-mailing help with communication in a network.

Shared file folder

- All types of files in a file folder can be commonly used by the users in a network.

Sharing printer

- A printer connected to the network can be made available for common use by the users in the network.

Communication in a computer network

- Command Line Interface (CLI) can be used for communication among network users.

# 6

# ICT and Society

This chapter will cover the following:

- Changes to the society brought about by Information Communication Technology.

## 6.1 Impact of ICT on society

The methods of teaching in our class has changed a lot. Today we saw a video during the science lesson. We also saw some photos related to the History lesson on a computer. I remember the lesson very well. Now, I love learning.

Yes, that is e learning. It is teaching using ICT and the Internet

ICT has brought about great changes everywhere in every field. Use of ICT has helped complete tasks more efficient and quickly. Let's look at some such services we get.

- Clearer explanation with pictures and video clips
- Collecting information through the Internet
- Dialogue and messaging with other schools
- The facility to learn anytime from anywhere

### School e-learning



### Hospital e-health



- Use of computer based modern equipment to diagnose illnesses
- Facility to store patient information to be used when necessary

- Bill payment
- Specimen forms, loan information
- Government Information Centre
- Ability to apply to State universities through the Internet
- To obtain circulars, legal services
- Information in Gazette
- The map of Sri Lanka

### Public service - e-governance



### e-commerce



- Exchange of goods through the Internet
- Online shopping and purchasing



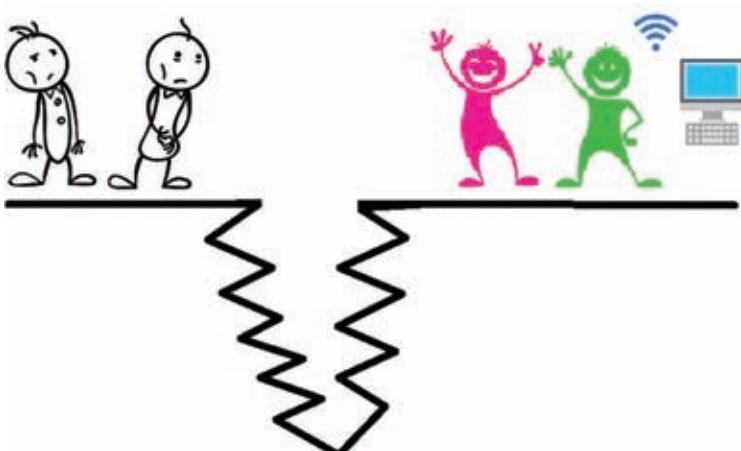
Refer to workbook for Activity 6.1.

Most countries in the world are fast developing, aren't they? Do you know the reasons for having two kinds of countries as the developed and developing

Our teacher explained us how a society can develop with Information Communication Technology. Yet, Information Communication Technology has not yet reached some countries. Some countries lag behind.



## Digital divide



Some societies in the world have ready access to computers and the Internet while some others do not. This gap between those who have and those who have not is known as the *digital divide*.



Refer to workbook for Activity 6.2.



Figure 6.1: e-waste

## Toxic poisons released from e-waste likely to harm humans

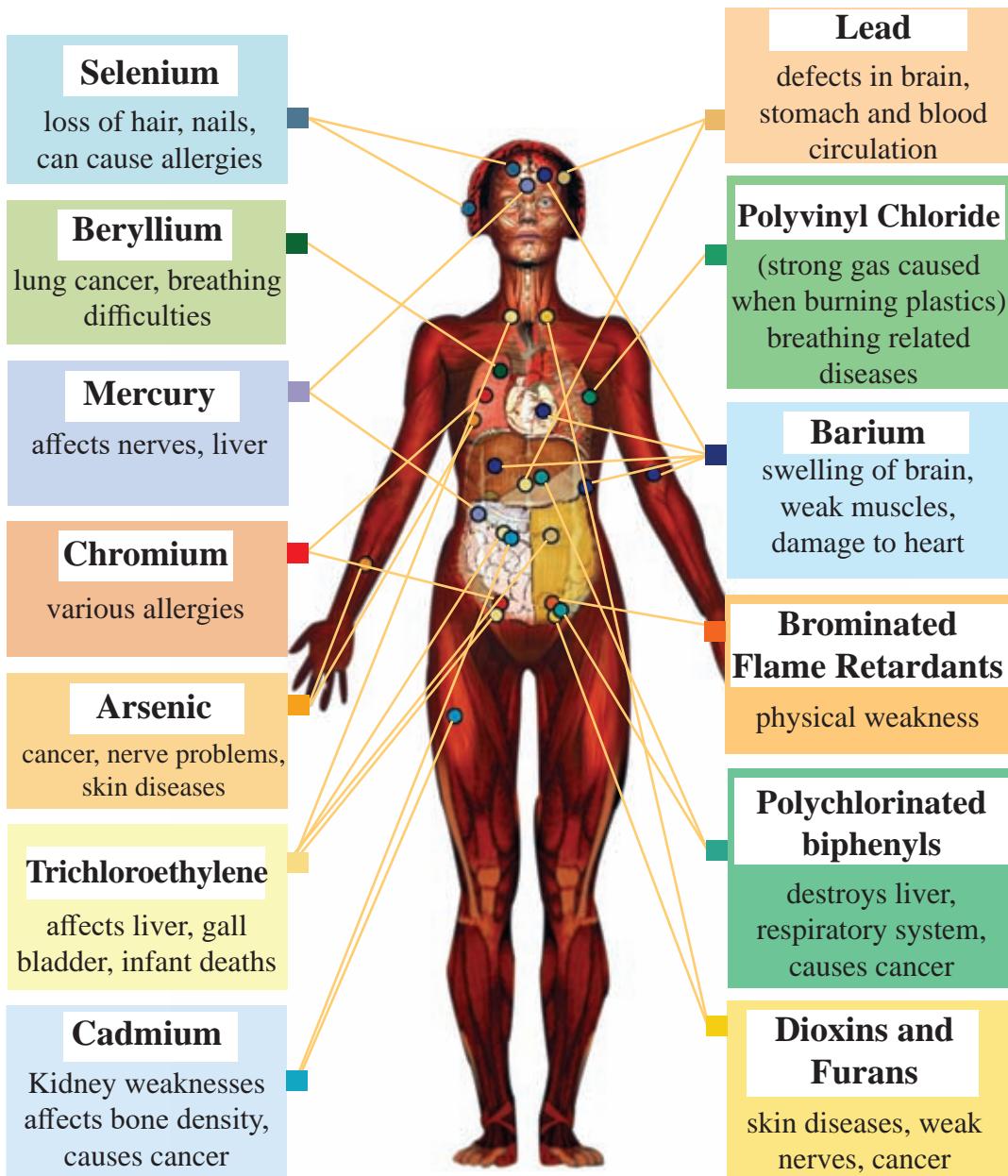


Figure 6.2 : Harmful effects of e-waste

Source: [ewise.co.nz/the impact of e-waste](http://ewise.co.nz/the-impact-of-e-waste)

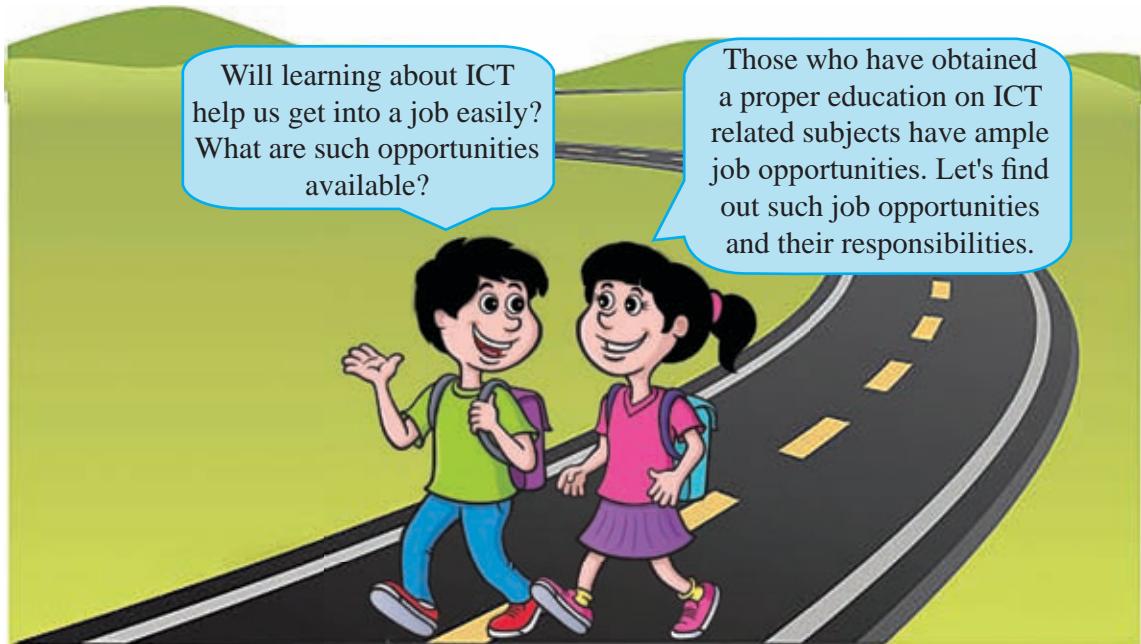
## Minimizing e-waste through the 3R technique

- Minimize purchase or collection of unnecessary goods - **Reduce**
- Use again and again after repairing it wherever possible - **Reuse**
- Handover to suitable agencies for recycling purposes - **Recycle**



Refer to workbook for Activities 6.3, 6.4 and 6.5.

## 6.2 Computer related job opportunities



### Software Quality Assurance Engineer

Carries out tasks to assure that the software functions properly

### Database Administrator

Plans, installs configures and maintains databases

### Software Engineer

Designs and develops software

### Web Application Developer

Designs, develops and maintains websites

### Software Architect

Designs the architecture of software, (Components and their interconnections)

### Graphic Designer

Develops web pages, advertisements, magazines, banners using software

### Programmer

Develops computer programs using programming languages

### System Analyst

Analyses organizational needs and designs computer systems, coordinates development of software

### Network Administrator

Installs, configures and maintains computer network

### IT Consultant

Advises organizations on the matters related to information technology



Refer to workbook for Activities 6.6 and 6.7.

## Summary

- The use of ICT in education, health services, commerce and the public service has resulted in increased efficiency.
- There is a "digital divide" between societies having and not having access to ICT sources.
- Improper disposal of e-waste is a threat to all living beings and environment.
- The 3R concept: Reduce, Reuse, Recycle can be used for proper disposal of e-waste.
- Many job opportunities are available in the field of ICT for qualified individuals.

## English-Sinhala-Tamil Glossary

No	English	Sinhala	Tamil
1.	abstract model	වියක්ත ආකෘතිය	கருத்தியல் மாதிரி
2.	acceptance testing	ප්‍රතිග්‍රහන පරීක්ෂාව	ஏற்புச் சோதனை
3.	access privilege	ප්‍රවේශෙශීමේ වරප්‍රසාදය	அணுகல் உரிமை
4.	agile model	සුවලු ආකෘතිය	சுறுசுறுப்பு மாதிரி
5.	alternate key	විකල්ප යතුර	மாற்றுச் சாவி
6.	American Standard Code for Information Interchange (ASCII)	තොරතුරු හුවමාරුව සඳහා වූ ඇමරිකානු සම්මත කේතය	தகவல் இடைமாற்றுக்கான அமெரிக்க நியம விதிக்கோவை
7.	amplitude	විස්තාරය	வිச்சம்
8.	amplitude modulation	විස්තාර මූල්‍යங்களில்	வිச்சப் பண்பேற்றம்
9.	analog	ප්‍රතිසම	ஒப்புமை
10.	anchor	ரැඳවුම	நிலை நிறுத்தி
11.	application layer	அனுபவෝග ස්ථිරය	பிரயෝக அடுக்கு
12.	architecture	தිරේමිතය	கட்டமைப்பு
13.	arithmetic and logical unit (ALU)	අංක செயல் கூடுதல் தொகை	எண்கணித மற்றும் தர்க்க அலகு
14.	array	අරාவ	அணி
15.	artificial intelligence	கணித இடைநிலை	செயற்கை நுண்ணறிவு
16.	Affective computing	இடைநிலை கூடுதல் வீத්‍யலேகි பரிசுநிய	நுண்ணறிவு உணர்திறந்மிக்க கணித்தல்
17.	associative law	සංகටන நியாய	கூட்டு விதி
18.	attenuation	වැශැරීම/கායநிய	நொய்மை
19.	attribute	ப්‍රபலකීය /ஒன்று/ ப්‍රபலக්ங்கள்	பண்புகள்
20.	authoring tool	සම්පාදන මෙවලම	படාප්பாக்கக் கருவி
21.	Automated Teller Machine (ATM)	ස්වයංකෘත මුදල් நுடைநு யந்துக	தானியங்கிப் பணம் கையாள் இயந்திரம்

22.	autonomous	ස්වයංපාලක / ස්වතන්තු/ස්වායත්ත	ස්‍යාත්තීන
23.	axiom	ස්වසිද්ධිය/ප්‍රත්‍යක්ෂය	වෙளිප්පතෙ ඉණුමෙ
24.	backups	ලපස්ට්	කාප්පෙගුත්තල්
25.	bandwidth	කළාප පළල/බඳස් පළල	පට්ටෙ අකලම්
26.	batch processing	කාණ්ඩ සැකසුම්	තොකුති මුහෙවුම්යාක්කම්
27.	big data	මහා දත්ත	පෙරිය තරව
28.	binary	දේශීලය	තුවිතම්, ඇරුම්
29.	binary coded decimal (BCD)	දේශීලය කේතික දෙකමය	இருமக் குறிமுறை தசமம்
30.	bio-inspired computing	පෙළව උෝරිත පරිගණනය/ පෙළව අනුෝරිත පරිගණනය	உயிரியல் உள்ளிரப்புக் கணிப்பு
31.	bit coin	බිටු කාසි	நுண்கடன் பணம் செலுத්තல்
32.	bitwise	බිටු அனுகாரித	பிட் வாரி
33.	bitwise logical operation	බිටු அனுகாரித கூர்க்கை மேஹெட்டுமி	பிட் வாரி தர்க்கச் செயற்பாடு
34.	black box testing	කාල மங்கூ பரீக்ஷை	கறுப்புப்பெட்டிச் சோதிப்பு
35.	blogging	வெஙி சுவகநய	வலைப்பதிவிடல்
36.	boot-up	பிலீகநய	தொடங்குதல்
37.	broadcasting	விகாங்கநய	தொலைபரப்பல்
38.	browsing	அதர்க்ஷீம	மேலோடல்
39.	bubble sort	இலුල நேர்ம/ யா-சைஸුமி நேர்ம	குமிழி வகைப்படுத்தல்
40.	built-in	ஒலுகැடி / திலுகி	உட்பொதிந்த
41.	business process re-engineering (BPR)	ஏஸාபාர் திறைவලியே ப්‍රதி ஒங்கேர்க்கர்ணாய	வணிக செயல்முறை மீன்கட்டமைப்பு
42.	candidate key	தිරුப்ப கணுர்	பிரதிநிதித்துவச் சாவி
43.	cardinality	கணுபீர்யதாலி	எண்ணளவை
44.	cathode ray tube (CRT)	காதநோவ්‌கි கිර்ண நலை	கதோட்டுக் கதிர் குழாய்

45.	central processing unit (CPU)	மெடின் சைக்கிள்மீ லீக்ககய	மத்திய செயற்பாட்டு அலகு
46.	characteristics	அதி குக்கண / கீவுக்குக்கண	சிறப்பியல்புகள்
47.	check box	சுலகங்கு கோருவ	சரிபார்ப்புப் பெட்டி
48.	client-server model	கேவு கேவுக்கு-கேவு மூன்று ஆகங்கிய	சேவைப் பயனர் மாதிரி
49.	clock	கீல்கீலகய	கடிகாரம்
50.	cloud computing	விலாகுல் பரிதானநய	மேகக் கணிமை
51.	coaxial cable	சுலக்குக் கேவுலய	ஒரச்சு வடம்
52.	code editor	கேவு சுங்கீரக	குறிமுறை தொகுப்பி
53.	comment	விவரங்கள்	விளக்கக் குறிப்பு
54.	commutative law	நண்டேஷன் நண்ட	பரிமாற்று விதி
55.	compact disc	ஸ்காங்கித சிக்ககய	ஒளியியல் வட்டு
56.	compatibility	கைப்புறம்	பொருந்துகை
57.	compiler	சுமிபாடுகய	தொகுப்பான்
58.	component	சுங்கங்கய	கூறு
59.	composite key	சுங்குக் கணுர்	கூட்டுச் சாவி
60.	constant	தீயதக	மாறிலி
61.	content management system (CMS)	அந்தர்க்கூட கலும்நாகர்ண பட்டிக்கிய	உள்ளடக்க முகாமைத்துவ முறைமை
62.	context switching	சுதீர்க்க ஸ்விவநக	சந்தர்ப்ப நிலைமாற்றல்
63.	contiguous allocation	யாலு வினாக்கனக	அடுத்தடுத்தான் ஒதுக்கீடு
64.	control structure	பாலன் விழுங்கய	கட்டுப்பாட்டுக் கட்டமைப்பு
65.	control unit (CU)	பாலன் லீக்ககய	கட்டுப்பாட்டலகு
66.	credit card	ஞாபத	கடன்டடை
67.	customization	அதிர்வீகர்ணங்க	தனிப்பயனாக்கல்
68.	data	டத்த	தரவு
69.	data and control bus	டத்த சு பாலன் பரி	தரவும் கட்டுப்பாட்டுப் பாட்டையும்

70.	database management system (DBMS)	டன்ன குறிலாய கலூக்காகர்ண பட்டினி	தரவுத்தள முகாமைத்துவ முறைமை
71.	data definition language (DDL)	டன்ன திரெவின ஹாக்குவ	தரவு வரையறை மொழி
72.	data dictionary	டன்ன கெடிட்கேஷன்	தரவு அகராதி
73.	data flow diagram	டன்ன கெல்லீ சுவகன	தரவு பாய்ச்சல் வரைபடம்
74.	data flow model (DFM)	டன்ன கெல்லீ ஆகாதிய	தரவு பாய்ச்சல் மாதிரி
75.	data link layer	டன்ன ஸ்டெக்ஸ் ஸ்பீரய	தரவு இணைப்பு அடுக்கு
76.	data manipulating language (DML)	டன்ன ஹக்ஸ்ரமி ஒக	தரவு கையாளல் மொழி
77.	data migration	டன்ன ஹரைவகந	தரவு பெயர்ச்சி
78.	debugging	நிலோக் கிரம	வழு நீக்கல்
79.	decision support system (DSS)	தீர்ண குறை பட்டினி	தீர்மான உதவு முறைமை
80.	declarative	பிரகாராதீமக	அறிவிப்பு
81.	default values	பேரநிதி அகய	இயல்புறிலை மதிப்பு
82.	defragmentation	பிரதிவிள்வகந	துணிக்கை நீக்கல்
83.	demodulation	லீலூர்ஜகந	பண்பிறக்கம்
84.	device	ரெபாங்க / ரெபாங்க	சாதனம்
85.	device driver	ரெபாங் கிவக மாட்காங்க	சாதனச் செலுத்தி
86.	digital	அங்கித	இலக்க முறை
87.	digital camera	அங்கித கைமராவ	இலக்கமுறைப் படக்கருவி
88.	digital economy	அங்கித ஆரீகந	இலக்கமுறைப் பொருளாதாரம்
89.	digitizer	கைவினாங்ககந	இலக்கமாக்கி
90.	direct implementation	கைஞ்சீப்பகந	நேரடி அமுலாக்கம்
91.	disk formatting	தை/கிஸக ஹவிகவி கைஞ்சீம்	வட்டு வடிவமைப்பு
92.	distortion	விகாதிய	திரிபு

93.	distributive law	විකටන න්‍යාය	පංක්‍රීතු විති
94.	document flow diagram	ලේඛන ගැලීම් සටහන	අුවණ්ප පාය්ස්සල් බැරපතම්
95.	domain	වසම	අුණකාම
96.	domain name server (DNS)	වසම් නාම සේවාදායකය	අුණකාප පෙයර් සොවයකම්
97.	domain name system (DNS)	වසම් නාම පද්ධතිය	අුණකාප පෙයර් මුහුරුමේ
98.	dynamic host configuration protocol (DHCP)	ගතික බාරක පාලන නියමාවලිය	මාරුම් විරුන්තොම්පි ඉණාමෙමු නෙත්‍රිමුහුර
99.	dynamic web page	ගතික වෙබ් පිටු	இயக்குநிலை வஸலப்பக்கம்
100.	e-commerce	இலங்கு வாதிப்பக்கம்	மின் வர்த்தகம்
101.	economical feasibility	அரசியல் கைந்துவ	பொருளாதாரச் சாத்தியப்பாடு
102.	elementary process description(EPD)	மூலிக குறைவிலி வිස්தரிய	அடிப்படைச் செய்மුහුර விபரிப்பு
103.	e-market place	ஒ-வெல்ல போக	இலத்திரனியல் சந்தை இடம்
104.	encryption	ஒத்த கேதனய	மුහුරகுறியாக்கம்
105.	enterprise resource planning system (ERPS)	ஒத்த கமிபன் கைவணி பட්ධதිය	நிறுவன மூலவள திட்டமிடல் மුහුரුமை
106.	entity	ஒத்தாரீய/அதிஒத்தனீவய/கன்றுவ	நிலைபொருள்
107.	entity identifier	ஒத்தாரீய/அதிஒத்தனீவய கட்டுநீர்வகை	நிலைபொருள் அடையாளங்காட்டி
108.	entity relationship(ER) diagram	ஒத்தாரீய கமிசன்தொ ரசப்பகுகා	நிலைபொருள் உறவுமුහුර அட்டவணை
109.	executable	குறைவுமிக கல හැකි	இயக்கத்தகு
110.	executive support system (ESS)	විධායக கාரை பட්ධதිය	நிறைவேற்று உதவு மුஹුரුமை
111.	expert system	විශේෂிய பட්ධதිය	நிபுணத்துவ மුஹුரුமை

112.	extended binary coded decimal interchange cod (EBCDIC)	විසේත්තත දේශීලුමය කේතක දැඟම	න්දිත්ත තුවිත කුත්‍රිමහෙර තසම මූල්‍යාර්ථක කුත්‍රි
113.	extended entity relationship (ER) diagram	විසේත්තත භූතාර්ථ සම්බන්ධතා රෘප සටහන	විරිවාක්කප්පාට් නිශ්චාපොරුණ් ඉංජුමුහෙර අංශ්‍යාවනෙන්
114.	feasibility study	ගෙකුතා අධිකාරිතය	සාත්තියප්පාට් කරුණක
115.	feedback loop	ප්‍රතිපෝෂණ ප්‍රජාතාන්ත්‍රික ප්‍රජාතාන්ත්‍රික ප්‍රජාතාන්ත්‍රික	පින්නුට්ටල බණ්ඩායම්
116.	fetch-execute cycle	අභරණ-ක්‍රියාකාරවලුම් ව්‍යුතය	තරුවිප්පු නිශ්චාපොරුණ් සුදුර්සි
117.	fiber optic	ප්‍රකාශ තන්තු	இழை ஒளியியல்
118.	file	தொநுவி	கோப்பு
119.	file hierarchy	தொநு இருவளிக	கோப்பு படிநிலை
120.	firewall	கිහි பவுர்	த්‍රේசவුර்
121.	normal form	ප්‍රථම ප්‍රමාණ අවස්ථාව	இயல்பாக்கல் வடிவம்
122.	fixed internal hard disk	அவிட அகங்கீநர் இல்லை தோரீ	நிலையான உள்ளக வண்டத்ட්
123.	flash memory	சிரு/ கீழ்க்கொண்ட மதகய	பளிச்சිட්�ு நினைவுகம்
124.	flash memory card	சிரு/ கீழ்க்கொண்ட மதக பத	பளிச்சිட්�ு நினைவுக அட்டை
125.	flat file system	லீக தொநு பட්‌பிளிக	சமதளக் கோப்பு முறைமை
126.	flip-flop	பிலි-போல	எழு-விழு
127.	float	ஓපුලිම/ஓපිලිම	மிதவை
128.	floppy disk	நம்ப தோரீ	நெகிழ் வட்ட්
129.	flow chart	கැලීම් கூடுதல்	பாய்ச்சற் கோட்டுப்படம்
130.	folder	தொநு கெல்லம்	கோப்புறை
131.	foreign key	அகங்கீநக யதුர்	அந்நியச்சாவி
132.	formatting	ஙைவிசுவி கென்வீம	வடிவமைத்தல்
133.	frame	ரාමுව	சட்டகம்
134.	frequency modulation	சுங்கங்க இர්ப்பகය	அந்திரவெண் பண்பேற்றல்

135.	full adder	ഇർത്തുകലകയ	മുമ്പുമുക്ക കൂട്ടി
136.	function	ക്രിയ / കാർഡ	സാർപ്പ
137.	functional dependency	കാർഡ ബിൽ പരായൻ തന്നുവ	ചെയല് സാർപ്പുനിലൈ
138.	functional requirement	കാർഡ ബിൽ അവക്ഷന്തുവ	ചെയല്പട്ട തേവൈ
139.	quantum computing	കോണോഫ്ലെ പരിഗത്തിന്റെ	ശൊട്ട് കൺപ്പി അടിപ്പത്തെ
140.	gateway	ഡോറ്റ് മുക / വാസ്ക്രേഡ് വാർക്ക് / വാഹല്ലേറ്റ്	നൃത്യഘാഷില്
141.	genetic algorithm	സഹജ ആൽഗോറിത്മം	മരപണ്ണ വധിമുന്നേ
142.	geographical information system(GIS)	ഭൂഗോളിയ നോർമൂൾ പാർഡ്വീൽഡ് / മിക്രോനേൻ നോർമൂൾ പാർഡ്വീൽഡ്	പുവിപിയല് തകവല് മുന്നേമെ
143.	graph plotter	പ്രസ്തുതാർ ലക്ഷ്യക്രമാന്തരം	പടവരൈയി
144.	graphic tablet	ശിൽക്കലീസ്	വരൈവിയല് വിവരമാക്കി
145.	grid computing	പാലക പരിഗത്തിന്റെ	കോട്ടുച്ചട്ടകക് കൺസിംഗ്
146.	guided media	തീയമു മാദിഷ	വഹിപുത്തപ്പട്ട ഉണ്ടകമ്
147.	half adder	അർബിക്കലകയ	അരൈ കൂട്ടി
148.	hand trace	ഹാൻഡ്രേബിന്റെ	കൈച് കവടുകൾ
149.	hard disk	ഡാക്ടി ടൈറ്റ / ഡാക്ടി ചീസ് ക്കയ	വൺതട്ടു
150.	hardware	ഡാക്ടിംഗ്	വൺപോറുൾ
151.	hexadecimal	ഒക്സി ഡിക്കിലു	പതിനെണ്ണുമും
152.	hierarchical model	ബുരാവലി ആക്ഷനിയ	പാത്രിലൈ മാതിരി
153.	host	സഹീക്കയ	വിരുന്തോമ്പി
154.	hub	നൂൽക്ക	കുവിയൻ
155.	human operator	മിനിസ്ക്രീനുകൾവോ	മനിത ഇയക്കുപവർ
156.	hybrid approach	ഡേമൂളുക്ക് പ്രവേശക	കലപ്പ അഞ്ചുകൾ
157.	hyperlink	അടിക്കമിഡിന്റെക്കയ	മീ ഇണ്ണപ്പി
158.	Integrated circuits ( IC)	അഞ്ചലിന പരിപരി	ഒരുംകിണ്ണേന്ത സർപ്പ
159.	icon	തിരഞ്ഞകയ	ചീരു പടമ്

160.	identity	සැරුවසාමන	අභේදයාලාම
161.	image	රෝපය	පෘෂ්ඨය
162.	imperative	විධානාත්මක	කට්ටණා
163.	incremental	වර්ධනාත්මක	ගුරුමාන, අතිකරිපු
164.	indexed allocation	අනුකූලීක විභාගනය	සුංඩි ඉතුක්ක්
165.	information	තොරතුරු	තකවල
166.	inkjet printer	තීන්ත විදුම් මුළුකය	ගෙෂත-තාරෙරාස්ස්ප්බොර්
167.	instant messaging	ක්ෂේත්‍ර පණිව්‍ය යැවීම	ඉන්ඩිස් සේය්ත්‍රියිල්
168.	integrated development environment(IDE)	සම්බාධික සංවර්ධන පරිසරය	ඉරුන්කිණෙන්ත විරුත්ති කුමළ
169.	integration test	අනුකළන පරීක්ෂණය	ඉරුන්කිණෙන්ත සොතිපු
170.	intelligent and emotional computing	ඛුද්දීමන් සහ වින්තලේඟී පරිගණනය	නුණුන්නරිවුම ඉණර්තිරුනුමික්ක කණිත්තල්
171.	interface	අතුරු මූහුණ	இடைமுகம்
172.	internet service provider( ISP)	අන්තර්ජාල දේව්‍ය සපයන්නා	இணையச் சேவை வழங்குனர்
173.	interpreter	අර්ථාන්තகය	மொழிமாற்றி
174.	interrupt	அතුරු விழும்	இடையூறு
175.	intranet	அන්ත:ජාලය/ அන්தோ:ජාல	அகவிணையம்
176.	internet of things (IoT)	සාරුව උව්‍ය அන්තර්ජාலය/ සඩැඳු උව්‍ය அන්තර්ජාலය	பொருட்களின் இணையம்
177.	iteration	ப්‍රතිකරණය	மீன் செயல்
178.	karnaugh map	கානෝ සිතියම	கானோ வரைபடம்
179.	knowledge management system( KMS)	දැනුම් කළමනාකරණ පද්ධතිය	அறிவு முகாமைத்துவ முறைமை
180.	large scale integration (LSI)	විශාල පරිමානයේ අනුකළනය	பாரிய அளவு இரුන්கිණைபු
181.	latency	ප්‍රமාව/ஒள්த்துவ	மறைநிலை

182.	least significant	அடிமேலேகேசீ	சிறும மதிப்பு
183.	legend	ஸ்தர சாரிய	குறி விளக்கம்
184.	life cycle of data	டுதீ தீவன விழய	தரவு வாழ்க்கை வட்டம்
185.	light emitting diode(LED) display	ஆலோக லீமோவக டியோடி சுந்தரைக்கை	ஒளிகாலும் இருவாயித் திரை / ஒளி உமிழும் இரு முனையம்
186.	linked allocation	சுடிகூடி வினாப்பகை	இணைப்பு ஒதுக்கீடு
187.	linker	சுந்தரைக்கை	இணைப்பி
188.	liquid crystal display( LCD)	டுவிக்ஸீக் சுந்தரைக்கை	திரவப்பளிங்குக் கணினித் திரை
189.	list	ஓர்கீல்கீலி	பட்டியல்
190.	liveware	பீவாங்க	உயிர் பொருள்
191.	local publishing	சீர்திகை பிஸ்டிக் கிரம	உள்ளக வெளியீடு
192.	local area network (LAN)	சீர்திகை பிஸ்டீக் கூலை	இடத்துறி வசையமைப்பு
193.	logic gate	தூர்கிக டீலாரகை	தர்க்கப் படலை
194.	Logical Data Modeling( LDM)	தூர்கிக டுதீ ஆகஸ்திகரன்கை	தர்க்கத் தரவு மாதிரியிருவாக்கல்
195.	logical data structure	தூர்கிக டுதீ விழுக்கை	தர்க்கத் தரவுக் கட்டமைப்பு
196.	logical design tools	தூர்கிக சுடலூட்டி மேவல்டி	தர்க்க வடிவமைப்புக் கருவி
197.	looping	இடப்பகை	வளைய வரல்
198.	machine code	யன்ன கேத்கை	இயந்திரக் குறியீடு
199.	machine-machine coexistence	யன்ன-யன்ன சுப்பாவைக்கீமே	இயந்திர- இயந்திர ஒருங்கிருத்தல்
200.	magnetic ink character reader( MICR)	மிதிகெட தீங்க கீகவுக்கை	காந்த மை எழுத்துரு வாசிப்பான்
201.	magnetic stripe reader	மிதிகெட தீர் கீகவுக்கை	காந்தப்பட்டி வாசிப்பான்
202.	magnetic tape	மிதிகெட பரீகை	காந்த நாடா
203.	malware	அதிக்க மாட்காங்கை	தீம்பொருள்

204.	management information system (MIS)	கலமனாகர்ண தோரஞ்சு பட்டினிய	முகாமைத்துவ தகவல் முறைமை
205.	man-machine coexistence	மிகிஸ்-யன்று சுப்பேவென்ம்	மனிதன் - இயந்திரம் ஒருங்கிருத்தல்
206.	media access control (MAC)	மாடிச பிலீச பாலக	ஊடக அணுகல் கட்டுப்பாடு
207.	memory management unit( MMU)	மதக கலமனாகர்ண லீக்கய	நினைவக முகாமைத்துவ அலகு
208.	mesh topology	வெட்டி சீலகய	கண்ணி இடத்தியல்
209.	microprocessor	கீழ்க் கூக்கிய	நுண்செயலி
210.	microwave	கீழ்க் கரங்க	நுண்ணலை
211.	mini disk	குபிச நைகீய	சிறு வட்டு
212.	mobile computing	பங்கம் பரிசுநாய	செல்லிடக் கணிமை
213.	mobile marketing	பங்கம் ஆலேகிரநாய	செல்லிடச் சந்தைப்படுத்தல்
214.	modularization	மோடி஗்ருகர்ணய	கூறு நிலையாக்கம்
215.	modulation	இருப்பநாய	பண்பேற்றம்
216.	most significant	வெடிம் வேஸேகி	அதியுயர் மதிப்பு
217.	mother board	மூடி புவர்வி	தாய்ப்பலகை
218.	multi agent systems	வினு கார்க பட்டினிய	பல்முகவர் முறைமை
219.	multi user-multi task	வினு பரிசீலக - வினு கார்கய	பற்பயனர்-பற்பணி
220.	multi-core processors	வினு கர சுகைக	பல்கரு செயலி
221.	multimedia objects	வினு மாடிச வசேஷ	பல்லுராடக போருள்
222.	multiplexer	வினு பரிகாரகய	பல்சேர்ப்பி
223.	multiplexing	வினு பரிகர்ணய	பல்சேர்ப்பு
224.	multiprocessing	வினு செக்கூம்	பன்முறைவழியாக்கி
225.	multitasking	வினுகார்க கிரிம்	பற்பணி
226.	multi-threading	வினு-அனுகியாயநய	பல் செயல்கூறு
227.	nature inspired	புகங்கி பேர்த பரிசுநாய/	இயற்கை உள்ளீர்ப்புக்

	computing	ප්‍රකෘති අනුප්‍රේරණ පරිගණකය	කණීපු
228.	nested loop	නිඩිත ඉපය	න්දිත්ත බණ්ඩයම්
229.	network addresses translating (NAT)	ජාල යොමු පරිවර්තනය	වලෙයමෙමපු මුක්වරි පෙයර්පු
230.	network architecture	ජාල තීර්ණය	වලෙයමෙමපුක් කට්ටමෙමපු
231.	network layer	ජාල ස්වර්ය	වලෙයමෙමපු අංක්‍රේස්
232.	network model	ජාල ආකෘතිය	වලෙයමෙමපු මාත්‍රි
233.	neural network	ස්නෑයුල් ජාලය	නුර්ම්පියල් වලෙයමෙමපු
234.	non-functional requirement	කාර්යඛල්දී නොවන අවශ්‍යතාව	සෙයල්සාරාත් තොවෙක්ස්
235.	normalization	ප්‍රමතකරණය	இயல்பாக்கல்
236.	null	අනිණුන්‍ය	வෙற්‍රු
237.	object code	වස්තු කේත/	பொருள் குறி
238.	object oriented	වස්තු நடிகூ / பாடக	பொருள் நோக்குடைய
239.	object- relational model	வස්තු-ஸම්බන්ධක ஆகாதிய	பொருள் உறவுநிலை மாதிரி
240.	octal	அஷ்டமய	எண்மம்
241.	office automation system (OAS)	கාර්යාල சீவகங்களின் பட්‌பதிய	அலுவலகத் தன்னியக்க முறையை
242.	offline	මාර්ග அபகத/ மාர්ගதை நොවන	தொடரறு நிலை
243.	one's compliment	විகை අනුප්‍රරகය	ஒன்றின் நிரப்பி
244.	online	මාර්ගதை	தொடரறா நிலை
245.	open source	விவசன இலாகு	திறந்த மூலம்
246.	operational feasibility	මෙහෙයුම් கைநතாவி	சෙයற்பாட்டுச் சாத்தியப்பாடு
247.	operator category	කාරක ப්‍රව්‍ಯகය	சෙයலி வகை
248.	operator precedence	කාරක ப්‍රமிக்க	சෙයலி முன்னுரிமை
249.	optical character reader (OCR)	ප්‍රකාශ අනු කෙනු කියවනය	ஓளිயியல் எழுத்துரு வாசிப்பான்

250.	optical mark reader (OMR)	பிரகார லைன் கீயவன்ய	காந்த மை எழுத்துரு வாசிப்பான்
251.	output	பிரிடுங்கல்	வெளியீடு
252.	packet switching	பொடி சூலமார்வல்	பொதி மடைமாற்றல்
253.	paging	பிழுகர்ணய	பக்கமிடல்
254.	paradigm	ஐசுமாட்டீகய்/ புதிமானய/புதிர்ஜபய	கோட்பாட்டுச் சட்டகம்
255.	parallel implementation	சம்மான்தர சீர்ப்பனய	சமாந்தர அமுலாக்கம்
256.	parameter passing	பருமிதி கேவீல்	பரமானக் கடத்தல்
257.	parity	சமதூவி	சமநிலை
258.	password	இரு படிய	கடவுச்சொல்
259.	payment gateway	கேவீல் வாக்ஸ் டீலார்ய	பணக் கொடுப்பனவு நுழைவாயில்
260.	periodic refreshing	அவற்ற பூர்வீகர்ணய	காலமுறை புதுப்பித்தல்
261.	peripheral device	பரையன்த கிளாங்கய / கிளகும்கய	புறச் சாதனம்
262.	phablet	யெல்லை	பெப்லட்
263.	phased implementation	அவடிசீர்ப்பனய / கீயவர் கியான்மக்கிரம்	கட்ட அமுலாக்கல்
264.	phase modulation	கலா மீரீஜனய	நிலை பண்பேற்றம்
265.	phishing	தநுகிழம்	வழிப்பறித்தல்
266.	physical layer	ஹெலிக் சீர்ப்பய	பெளதீக அடுக்கு
267.	physical memory	ஹெலிக் மதகய	பெளதீக நினைவுகம்
268.	pilot implementation	கியாமக் சீர்ப்பனய / கியாமக் கியான்மக்கிரம்	முன்னோடி அமுலாக்கல்
269.	piracy	வேங்கீலக்/ குஞ்சிதனய	களவு
270.	pirated software	வேங்/குஞ்சித மஸ்கூங்	திருட்டு மென்பொருள்
271.	plagiarism	ஞோலி/ரவ்னு வேங்கய	கருத்துத் திருட்டு
272.	point to point connection	சுற்று கேஷங் சம்பிள்கிதூவி	ஒன்றுடனொன்று இணைப்பு

273.	pointing device	ඩැක්ස්ට්‍රුම් උපාංගය	සුංචි සාතනම්
274.	port	කෙවෙනිය	වායිල්, තුරේ
275.	portable external hard disk	ජංගම/සුවහනීය බාහිර දූෂණී තැවෙය	කාවත්තකු පුර බණ්තැංු
276.	portal	දේවාරය/ ආමුඩ්වාරය	වෘෂ්‍යවාචල්
277.	Point of sale (POS) machine	විකුණුම් පොල යන්තු	විශ්‍යපණ මිට තිරිම්
278.	postulate	ලිපකල්පනය	ඝැකීස්
279.	power supply	විදුලි සැපයුම/ඡව සැපයුම	යින් වුණුකි
280.	presence check	තරිතතා පරික්ෂාව	இருத்தல் சரிபார்த்தல்
281.	presentation layer	සමර්පන/ஓදිරිපත් කිරීම් ස්ථිරය	முன්வෙப්පු அடுக்கு
282.	primary key	ප්‍රාථමික/මුළු යතුර	முதன්මைச் சාධී
283.	primitive data type	ප්‍රාථමික දත්ත වර්ගය	පුර්වීකත் தரவு வகை
284.	privacy	පොද්ගලිකත්වය	அந்தரங்கம்
285.	private key	පොද්ගලිக යතුර	பிரத்தியேகச் சාධී
286.	process	திறாவளிக/திறாயනය/ கூக்கும்	செயல்/ முறைவழியாக்கல
287.	process control block(PCB)	திறாயන பாலு விணிவிய	செயல் கட்டுப்பாட்டுத் தொகுதி
288.	process management	திறாயන கலமினாகர்ணம்	செயல் முகாமைத்துவம்
289.	process states	திறாயන தத්�வ	செயல் நிலை
290.	process transition	திறாயන கூங்கும்பு	செயல் நிலைமாறல்
291.	product commercialization	தித්பාදන வாணிபங்கரණம்	தயாரிப்பு வர்த்தகமயமாக்கல்
292.	product of sum (POS)	வෛක්‍යங்கේ ගණිතය	கூட்டுத்தொகையின் பெருக்கம்
293.	program translator	குமෙළේ පරිවර්තක	செய்நிரல் மொழிபெயர்ப்பான்
294.	proprietary	கிளිකම් සහිත	தனியுரிமை
295.	protocol	திறமාවලිය	நடப்பொழுங்கு

296.	prototyping	இலாகங்கிரந்து	மூலவகை மாதிரி
297.	proxy server	நியேஞ்சன சேவாடாயகை	பதிலாள் சேவையகம்
298.	pseudo code	வினாச கேதய	போலிக்குறி
299.	public switch telephone network (PSTN)	பொடு சீலிவ டிருக்ளின் பூலக	பொது ஆஸியிடப்பட்ட தொலைபோசி வலையமைப்பு
300.	public key	பொடு கடர்	பொதுச் சாவி
301.	pulse code modulation	சீப்ளீட் கேத இருப்ளன்டு	துடிப்புக்குறி பண்பேற்றம்
302.	pulse width modulation	சீப்ளீட் விதர இருப்ளன்டு	துடிப்பு அகலப் பண்பேற்றம்
303.	radio button	விகல்லீப் கேரிம்	ரேடியோ பொத்தான்
304.	random access memory (RAM)	சுசுமிஹாலி பிலேக் மதகை	தற்போக்கு அணுகல் நினைவகம்
305.	range check	பருச பரிக்காவி	வீச்சு சரிபார்த்தல்
306.	rapid application development (RAD)	கீழ் யெல்லாம் கங்களைப்படிக்கை	துரித பிரயோக விருத்தி
307.	read only memory (ROM)	பலின மாறு மதகை	வாசிப்பு மட்டும் நினைவகம்
308.	real time	தலை காலிக	நிகழ்நேரம்
309.	record	எப்லையை	பதிவு
310.	redo	நைவத கிரிம்	மீளச் செய்
311.	redundancy	சுமதிரக்கீத்துவி	மிகைமை
312.	reference model	யோழி ஆகங்கிய	வலையமைப்பின் கட்டமைப்பு
313.	refreshing	புதிட கிரிம்	புத்துயிர்ப்பித்தல்
314.	register memory	ரேஜிஸ்டர் மதகை	பதிவகம்
315.	relational	சுமின்஦ிக	தொடர்பு, உறவுநிலை
316.	relational model	சுமின்஦ிக ஆகங்கிய	உறவுநிலை மாதிரி
317.	relational database	சுமின்஦ிக டெந் சுமிடாய்	உறவுநிலை தரவுத்தளம்
318.	relational instance	சுமின்஦ிக தீடுக்கை	தொடர்பு முறை எடுத்துக்காட்டு

319.	relational schema	සම්බන්ධතා පරිජාරීක සටහන	தொடர்பு முறைத் திட்டம்
320.	relationship	සම්බන්ධතාවය	தொடர்புமுறை
321.	remote	දුරස්ථී	தொலை, தூர்
322.	render	விளை	வழங்கு
323.	repeater	ප්‍රහරිකරකය	மீனி, மீட்டி
324.	repetition	ප්‍රහරක්தිය	மீன் செயல்
325.	reset button	ප්‍රත්‍යාர්ථිக බොත්තම	மீளமைப்புப் பொத்தான்
326.	retrieve	සමුද්දரණ	மீளப்பெறு
327.	return value	ප්‍රත්‍යාගමන අගය	திரும்பல் பெறுமானம்
328.	reverse auction	ප්‍රතිවෙන්දේශிய	எதிர்மாற்று ஏலம்
329.	ring topology	මුදු ස්ථෑලகය	வளைய இடத்தியல்
330.	router	මං கண்டு	வழிப்படுத்தி, வழிச்செலுத்தி
331.	routing	මං கணிரலීම	வழிச்செலுத்தல்
332.	scanner	සුපිරික්සකය	நுணுகு நோக்கி
333.	scheduler	தியமகரණය	ஓழுங்குபடுத்தி
334.	scope of variable	விவෘତ පරාසය	மாறி செயற்பரப்பு
335.	query	வினாக்கள்	வினவல்
336.	selection	தேர்ம	தெரிவு
337.	selector	வரகය	தேர்வி, தேர்ந்தெடுப்பி
338.	sensor	சுல்லைகය	உணரி
339.	sequence	அனுகுமிய	தொடர்
340.	sequential circuit	அனுகுமிக පරිපථය	தொடர்ச் சுற்று
341.	sequential search	அனுகுமிக සெக்சுல	வரிசைமுறைத் தேடல்
342.	server	தேவාදාயகය / அனுகுமிககය	சேவையகம்
343.	session layer	සැසි ස්ථිරය	அமர்வு அடுக்கு
344.	sharable pool	ஒவ்வொரு ப්‍රதිபாදன	பகிரதகு பொது இடம்
345.	sign-magnitude	லக்னுவத් ப්‍රமාණය / சுங்கத்தின	குறியுடைய வீச்சளவு

		பரிமானங்கள் / அங்கில பரிமானங்கள்	
346.	single user-multi task	லீக் பரிசீலக-தினு காரையை	தனிப்பயனர்-பற்பணி
347.	single user-single task	லீக் பரிசீலக-லீக் காரையை	தனிப்பயனர்-தனிப்பணி
348.	smart card	சிறுரூ காரிசிதம்	சூட்டிகை அட்டை
349.	smart phone	சிறுரூ டிராக்டர்நாய்	சூட்டிகைத் தொலைபேசி
350.	smart system	சிறுரூ பட்டினிய	சூட்டிகை முறைமை
351.	social networking	ஸமாச் சுலகர்ணாய்	சமூக வலையமைப்பாக்கல்
352.	software	மாதிரிகாங்கள்	மென்பொருள்
353.	software agent	மாதிரிகாங்கள் கார்கள்	மென்பொருள் முகவர்
354.	sort	தேர்ம்	வரிசைப்படுத்து
355.	source	புகுவி	மூலம்
356.	spiral model	கூரிய அகாத்திய	சுருளி மாதிரி
357.	spooling	லதீம்	சுற்றுதல்
358.	Star topology	தூர்கா ஸ்டீலக்கை	விளம்பின் இடத்தியல்
359.	stepwise refinement	பிழவருகார் பிரிப்பட்டு	படிமுறை நீக்கல்
360.	storage	அவையங்கள்	சேமிப்பு
361.	storage allocation	அவையங்கள் விஹாரங்கள்	சேமிப்பு ஒதுக்கல்
362.	stored program concept	அவைத் துமலேஷ் சங்கல்லீப்பை	சேமிக்கப்பட்ட செய்நிரல் எண்ணக்கரு
363.	structure	வசூலங்கள்	கட்டமைப்பு
364.	structure chart	வசூலங்கள் கார்கள்	கட்டமைப்பு வரைபு
365.	structured	வசூலங்கள்	கட்டமைப்புதைய
366.	structured query language( SQL)	வசூலங்கள் வீல்கூட்டு செயல்கள்	கட்டமைப்பு வினவல் மொழி
367.	submit button	கோமு வோத்தும்	சமர்ப்பித்தல் பொத்தான்
368.	subnet mask	எப் சுலக அவர்ணாய்	உபவலை முறைமுகம்
369.	sub-netting	எப்-சுலகங்கள்	உபவலையமைப்பு

370.	sub-program	பிர-குமல்லேஷன்	துணைச் செய்நிரல்
371.	sum of products (SOP)	ஒன்றியங்கள் வீகங்கள்	பெருக்கங்களின் கூட்டுத்தொகை
372.	supply chain management	ஸ்டைமிள் டாம் கலமனாகர்ணம்	விநியோக சங்கிலித்தொடர் முகாமைத்துவம்
373.	swapping	பிரதிநிர்ணய	இடமாற்றல்
374.	switch	சீலிவக	ஆளி
375.	syntax	காரக ரதி	தொடரியல்
376.	system development life cycle(SDLC)	பட்டின கங்கை தீவன வகுக்கு	முறைமை விருத்தி வாழ்க்கை வட்டம்
377.	table	வகுவு	அட்டவணை
378.	table check constraint	வகு பரிக்கீ கங்கை கைய	அட்டவணை சரிபார்த்தல் கட்டுப்பாடு
379.	tag	ரெகிலங்க	ஒட்டு
380.	Technical feasibility	தொகீங்கிக் கைங்காவ	தொழினுட்பச் சாத்தியக் கற்கை
381.	telecommuting	டிரக்கீ கங்கை / டிர கீங்கிலீங்க	தொலைசெயல்
382.	testing strategy	பரிக்கீங்கு உபகுமா	பரிசீலித்தல் உபாயம்
383.	text and font	பாட கூற அக்கீர	வாசகமும் எழுத்துருவும்
384.	text formatting	பாட கைகூறு கைங்கீலம்	வாசக வடிவமைப்பு
385.	text input	பாட ஆடாக	வாசக உள்ளீடு
386.	normal form	புது அவச்சீலா	இயல்பாக்கல் வடிவம்
387.	thumbnail	கைகேலி ரை	குறும்படம்
388.	time division modulation (TDM)	கால பெட்டு இருப்பங்க	நேரப் பிரிவுப் பண்பாக்கம்
389.	time sharing	கால விஹாரங்க	நேரப்பகிர்வு
390.	timing	கால சுறுங்க	நேரக்கணிப்பு
391.	top down design	மூடின் வில் கைகூறும்	மேலிருந்து கீழான வடிவமைப்பு

392.	touch pad	ஸ்பර්කක උපධානය / පාදකය	தொடு அட்டை
393.	touch screen	ස්පර්කක තිරය	தொடுதிரை
394.	transaction processing system( TPS)	ගණුදෙනු සැකසුම් පද්ධතිය	பரිමාறුහ් සේයලාක්க මුණුමෙම
395.	transitive dependency	සංක්‍ாන්ති පරායන්තරාව	மாறும் சார்பு நிலை
396.	transport layer	ப්‍රවාහන ස්ටරය	போக்குவரத்து அடுக்கு
397.	transport protocol	ප්‍රවාහන නியமாවලිය	போக்குவரத்து நடப்பொழுங்கு
398.	tuple	උපලැකියාக/லේලිය	பதிவு/நிரை
399.	twisted pair	அட්‌கிர ශ්‍රීගල	முறුக்கிய சோடி
400.	two's compliment	දෙකෙනි අනුපූර்கය	இரண்டின் நிரப்பி
401.	type check	පුරුෂ பரிக்ணාவ	வகை சரிபார்த்தல்
402.	constraint	සංரேஷனகය	கட்டுப்பாடு வகை
403.	ubiquitous computing	சரුවච්‌பதி ஆගෙන்நகය	எங்கும் வியாபித்த கணிமை
404.	undo	அஹேசி கிரி‌ம	செயல்தவிர்
405.	unguided media	நியமு நோவன மாධிய	வழிபடுத்தப்படாத ஊடகம்
406.	uni-casting	சுற்ற சமிக்ரேஷனகය	தனிப்பரப்பல்
407.	unicode	ஷ்டிகேர்வி/ ஶீக்கேத	ஒற்றைக்குறி முறை
408.	unique constraint	அனந்த சுங்ரேஷனகය	தனித்துவக் கட்டுப்பாடு
409.	unit testing	ಶீக்க பரிக்ணාந	அலகுச் சோதனை
410.	universal	சාර්வனு	பொது
411.	updating	யாவத்காலீன கிரி‌ம	தற்காலப்படுத்தல்
412.	user	பரிசිலக	பயனர்
413.	user defined	பரிசිலக தිර්வாචித	பயனர் வரையறை
414.	validation	வளங கிரி‌ம	செல்லுபடியாக்கல்
415.	variable	வිවෘතங	மாறி
416.	very large scale integration (VLSI)	ஒது விகால பரிமாளுங்கே அනுகரித	மிகப் பெரியளவிலான ஒருங்கிணைப்பு

417.	video graphic adapter (VGA)	උජස විතුක අනුහුරණුරටව	කාණොඩි බරෙයි පොරුත්ති
418.	virtual community	අතරීෂ ප්‍රජාව	මෙය්තිකර් සමුකම්
419.	virtual memory	අතරීෂ මතකය	මෙය්තිකර් නිශේෂවකම්
420.	virtual storefront	අතරීෂ වෛලු පුද්ගලිකාගාරය	මෙය්තිකර් කැළමුකප්ප
421.	waterfall model	දියඇලි ආකෘතිය	න්ර් වීම්ස්සි මාතිරි
422.	wave length	තරංග ආයාමය	අලෙල න්සාම්
423.	web portal	වෙබ් දේවාරය	වෙළ බාසල්
424.	web server	වෙබ් සේවාදායකය	இணைய சேவையகம்
425.	web service provider	වෙබ් සේවා சுப்ரதிமிகர்	இணைய சேவை வழங்குனர்
426.	white box testing	ස්ටෝරෝ மாங்கா பரிசீலனை	வெண்பெட்டிச் சோதிப்பு
427.	world wide web (WWW)	லேங்க லீசிர் லீயமன	உலகளாவிய வෙළ
428.	uniform resource locator (URL)	லீகாகாரி சுமிபத் திண்வாயகය	சீர்மை வள இருப்பிடங்காட்டி
429.	uniform resource identifier(URI)	லீகாகாரி சுமிபத் திண்வாயக	சீர்மை வள <sup>1</sup> அடையாளங்காட்டி

This glossary is still being developed.