ICT FOR GENERAL EDUCATION

Senior 6

TEACHER'S BOOK

Experimental version

FOREWORD

Dear teacher,

Rwanda Basic Education Board is honored to present Senior Six Teacher's Book which serves as a guide to competence-based teaching and learning to ensure consistency and coherence in the learning of the ICT subject. The Rwandan educational philosophy is to ensure that students achieve full potential at every level of education which will prepare them to be well integrated in society and exploit employment opportunities.

In line with efforts to improve the quality of education, the government of Rwanda emphasizes the importance of aligning teaching and learning materials with the syllabus to facilitate their learning process. Many factors influence what they learn, how well they learn and the competences they acquire. Those factors include the relevance of the specific content, the quality of tutors' pedagogical approaches, the assessment strategies and the instructional materials available. Special attention was paid to the activity that facilitate the learning process in which students can develop ideas and make new discoveries during concrete activity carried out individually or with peers.

With the help of teachers, students will gain appropriate skills and be able to apply what they have learnt in real life situations. Hence, they will be able to develop certain values and attitudes allowing them to make a difference not only to their own lives but also to the nation.

This is in contrast to traditional learning theories which view learning mainly as a process of acquiring knowledge from the more knowledgeable who is mostly the teacher. In Competence-Based Curriculum, learning is considered as a process of active building and developing of knowledge and understanding, skills, values and attitudes by the learner, where concepts are mainly introduced by an activity, situation or scenario that helps the learner to construct knowledge, develop skills and acquire positive attitudes and values.

In addition, such active learning engages students in doing things and thinking about the things they are doing. They are encouraged to bring their own real experiences and knowledge into the learning processes. In view of this, your role is to:

- Plan your lessons and prepare appropriate teaching materials.
- Organize group discussions for students considering the importance of social constructivism suggesting that learning occurs more effectively when the learner works collaboratively with more knowledgeable and experienced people.
- Engage students through active learning methods such as inquiry methods, group discussions, research, investigative activity and individual work activity.
- Provide supervised opportunities for students to develop different competences by giving tasks which enhance critical thinking, problem solving, research, creativity and innovation, communication and cooperation.
- Support and facilitate the learning process by valuing learners' contributions in the class activity.

- Guide students towards the harmonization of their findings.
- Encourage individual, peer and group evaluation of the work done in the classroom and use appropriate competence-based assessment approaches and methods.

To facilitate you in your teaching activity, the content of this Teacher's Book is Self - explanatory so that you can easily use it. It is divided in 3 parts:

The part 1: Explains the structure of this book and gives you methodological guidance;

The part 2: Gives the sample lesson plans as reference for your lesson planning process;

The part 3: Provides details on the teaching guidance for each concept given in the student teacher's book.

Even though this Teacher's Book contains the answers for all activity given in the Student Book, you are requested to work through each question and activity before judging learner's findings.

I wish to sincerely appreciate all people who contributed towards the development of this book, particularly REB staff who organized the whole process from its inception. Special gratitude goes to the secondary schools which provided teachers who worked diligently for the successful completion of this book. Any comment or contribution would be welcome for the improvement of this Teacher's Book for the next edition.

Dr. MBARUSHIMANA Nelson

Director General of REB

ACKNOWLEDGMENT

Writing a Teacher's book is a team effort, and this one is no exception. I wish to express my appreciation to all the people who played a major role in development of this ICT Teacher's book. It would not have been successful without active participation of different education stakeholders.

I owe gratitude to different institutions namely that allowed their staff to work with REB in the production of this ICT Teacher's Guide book for Senior 6. I wish to extend my sincere gratitude to other stakeholders whose efforts in one way or the other contributed to the successful writing of this Teacher's Book.

Finally, my word of gratitude goes to the Rwanda Basic Education Board staff particularly those from the Curriculum, Teaching and Learning Resources Department (CTLRD) who were involved in the whole process of writing and adapting general education textbooks.

MURUNGI Joan,

Head of CTLR Department/REB

PART I. GENERAL INTRODUCTION

About the teacher's guide

This book is a teacher's guide for ICT subject, for Senior Six in General Education specifically for all combinations except Computer Science options. It is designed to accompany the student book and intends to help teachers in the implementation of the Competence Based Curriculum specifically the ICT syllabus.

As the name says, it is a guide that teachers can refer to when preparing their lessons. Teachers may prefer to adopt the guidance provided but they are also expected to be more creative and consider their specific classes' contexts and prepare accordingly.

I.0. The structure of the guide

This section presents the overall structure, the unit and sub-heading structure to help teachers to understand the different sections of this guide and what they will find in each section.

Overall structure

The whole guide has three main parts as follows:

- **Part I: General Introduction.**

This part provides general guidance on how to develop the generic competences, how to integrate cross cutting issues, how to cater for students with special educational needs, active methods and techniques of ICT and guidance on assessment.

- **Part II: Sample lesson plan**

This part provides a sample lesson plan, developed and designed to help the teacher develop their own lesson plans.

- **Part III: Unit development**

This is the core part of the guide. Each unit is developed following the structure below. The guide ends with references.
Each unit is made of the following sections:

- **Unit title:** from the syllabus
- **Key unit competence**: from the syllabus
- **Prerequisites (knowledge, skills, attitudes and values)**

This section indicates knowledge, skills and attitudes required for the success of the unit. The competence-based approach calls for connections between units/topics within a subject and interconnections between different subjects. The teacher will find an indication of those prerequisites and guidance on how to establish connections.

- **Cross-cutting issues to be addressed**

This section suggests cross cutting issues that can be addressed depending on the unit content. It provides guidance on how to come up with the integration of the issue. Note that the issue indicated

is a suggestion; teacher are free to take another cross-cutting issue taking into consideration the learning environment.

- **Guidance on the introductory activity**

Each unit starts with an introductory activity in the teacher's book. This section of the teacher's guide provides guidance on how to conduct this activity and related answers. Note that students may not be able to find the right solution but they are invited to predict possible solutions or answers. Solutions are provided by students gradually through discovery activities organized at the beginning of lessons or during the lesson.

- **List of lessons/sub-heading**

This section presents in a table suggestion on the list of lessons, lesson objectives copied or adapted from the syllabus and duration for each lesson. Each lesson /subheading is then developed.

- **End of each unit**

At the end of each unit the teacher provides the following sections:

- Summary of the unit which provides the key points of content developed in the teacher's book.
- Additional information which provides additional content compared to the student book for the teacher to have a deeper understanding of the topic.
- End unit assessment which provides answers to questions of the end unit assessment in the teacher's book and suggests additional questions and related answers to assess the key unit competence.
- Additional activities **:**(remedial, consolidation and extended activities)**.** The purpose of these activities is to accommodate each student (slow, average and gifted) based on the end of unit assessment results.

Structure of each sub heading

Each lesson/sub-heading is made of the following sections:

Lesson /Sub heading title 1:

- **Prerequisites/Revision/Introduction:**

This section gives a clear instruction to teacher on how to start the lesson.

- **Teaching resources**

This section suggests the teaching aids or other resources needed in line with the activities to achieve the learning objectives. Teachers are encouraged to replace the suggested teaching aids by the available ones in their respective schools and based on learning environment.

- **Learning activities**

This section provides a short description of the methodology and any important aspect to consider. It provides also answers to learning activities with cross reference to student's book.

- **Exercises/application activities**

This provides questions and answers for exercises/ application activities.

I.1. Methodological guidance

I.1.1. Developing competences

Since 2015 Rwanda shifted from a knowledge based to a competence based curriculum for pre-primary, primary and general secondary education. For TTCs, it is in 2019 that the competence based curriculum was embraced. This called for changing the way of learning by shifting from teacher centered to a learner centered approach. Teachers are not only responsible for knowledge transfer but also for fostering teacher's learning achievement, and creating safe and supportive learning environment. It implies also that a student has to demonstrate what he/she is able to do using the knowledge, skills, values and attitude acquired in a new or different or given situation.

The competence-based curriculum employs an approach of teaching and learning based on discrete skills rather than dwelling on only knowledge or the cognitive domain of learning. It focuses on what learner can do rather than what learners know. Students develop basic competences through specific subject unit competences with specific learning objectives broken down into knowledge, skills and attitudes. These competences are developed through learning activities disseminated in learner-centered rather than the traditional didactic approach. The students are evaluated against set standards to achieve before moving on.

In addition to specific subject competences, students also develop generic competences which are transferable throughout a range of learning areas and situations in life. Below are examples of how generic competences can be developed in ICT:

Generic competence	**Examples of activities that develop generic competences**
Critical thinking	- Describe the relationship and interdependence of sciences - Observe, record, interpret data recorded during experiments - Identify and use the applications of ICT concepts to solve problems of life and society
Research and Problem solving	- Research using internet or books from the library - Design a project for making bioplastics - Design a questionnaire for data collection during field visit

Innovation and creativity	- Create an experiment procedure to prove a point - Develop a graph to illustrate information - Design a data collection survey/questionnaire - Conduct experiments with objectives, methodology, observations, results, conclusions - Identify local problems and ways to resolve them
Cooperation, Personal and Interpersonal management and life skills	- Work in Pairs - Small group work - Large group work
Communication	- Organise and present in writing and verbally a complete and clear report of an experiment - Observe, record, interpret the results of a measurement accurately. - Select and use appropriate formats and presentations, such as tables, graphs and diagrams.
Lifelong learning	- Exploit all opportunities available to improve on knowledge and skills. Reading scientific journals to keep updated.

I.2.2. Addressing cross cutting issues

Among the changes in the competence based curriculum is the integration of cross cutting issues as an integral part of the teaching learning process-as they relate to and must be considered within all subjects to be appropriately addressed. The eight cross cutting issues identified in the national curriculum framework are: genocide studies, environment and sustainability, gender, Comprehensive Sexuality Education (CSE), Peace and Values Education, Financial Education, standardization Culture and Inclusive Education.

Some cross cutting issues may seem specific to particular learning areas or subjects but the teacher needs to address all of them whenever an opportunity arises. In addition, student should always be given an opportunity during the learning process to address these cross cutting issues both within and out of the classroom so as to progressively develop related attitudes and values.

Below are examples on how crosscutting issues can be addressed in ICT:

Cross-cutting issues	**Examples on how to integrate the cross-cutting issues**
Inclusive education	Involve all students in all activities without any bias. Eg: Allow a student with physical disability (using wheelchair) to take notes or lead the team during an experiment.

Gender	Involve both girls and boys in all activities: No activity is reserved only to girls or boys. Teacher should ensure equal participation of both girls and boys during experiments as well as during cleaning and tidying up related activities after experiments.
Peace and Values Education	During group activities, debates and presentations, the teacher will encourage studentsto help each other and to respect opinions of colleagues.
Standardization culture	- Most ICT in Accounting require the use of software. Students should always be aware to use standard software products and use standard software - In addition, when using the different software students have to record data accurately. - For tasks involving calculations, they have to always present accurate results.
Environment and sustainability	- In order to avoid the environment pollution, students avoid throwing ICT materials away anywhere; special places or appropriate containers should be used. - Students also have to be aware of the impacts of the use of some products like cartridges, plastic components of ICT tools on the environment.
Financial Education	As this subject is for future Accountants, students should be encouraged to appreciate the financial benefits of the different ICT tools they use school compared to the situation in which those tools are not present

I.2.3. Attention to special educational needs specific to each subject

In the classroom, studentslearn in different way depending to their learning pace, needs or any other special problem they might have. However, the teacher has the responsibility to know how to adopt his/her methodologies and approaches in order to meet the learning needs of each student in the classroom. Also teacher must understand that students with special needs need to be taught differently or need some accommodations to enhance the learning environment. This will be done depending on the subject and the nature of the lesson.

In order to create a well-rounded learning atmosphere, teacher needs to:

• Remember that students learn in different ways so they have to offer a variety of activities (e.g. role-play, music and singing, word games and quizzes, and outdoor activities).

• Maintain an organized classroom and limits distraction. This will help students with special needs to stay on track during lesson and follow instruction easily.

• Vary the pace of teaching to meet the needs of each student-teacher. Some students process information and learn more slowly than others.
• Break down instructions into smaller, manageable tasks. Students with special needs often have difficulty understanding long-winded or several instructions at once. It is better to use simple, concrete sentences in order to facilitate them understand what you are asking.
• Use clear consistent language to explain the meaning (and demonstrate or show pictures) if you introduce new words or concepts.
• Make full use of facial expressions, gestures and body language.
• Pair a student who has a disability with a friend. Let them do things together and learn from each other. Make sure the friend is not over protective and does not do everything for the student-teacher. Both students will benefit from this strategy
• Use multi-sensory strategies. As all students learn in different ways, it is important to make every lesson as multi-sensory as possible. Students with learning disabilities might have difficulty in one area, while they might excel in another. For example, use both visual and auditory cues.

Below are general strategies related to each main category of disabilities and how to deal with every situation that may arise in the classroom. However, the list is not exhaustive because each student is unique with different needs and that should be handled differently.

Strategy to help students with developmental impairment:

- Use simple words and sentences when giving instructions.
- Use real objects that the student can feel and handle, rather than just working abstractly with pen and paper.
- Break a task down into small steps or learning objectives. The student should start with an activity that s/he can do already before moving on to something that is more difficult.
- Gradually give the student less help.
- Let the student work in the same group with those without disability.

Strategy to help students with visual impairment:

- Help students to use their other senses (hearing, touch, smell and taste) to play and carry out activities that will promote their learning and development.
- Use simple, clear and consistent language.
- Use tactile objects to help explain a concept.
- If the students has some sight, ask them what they can see. Get information from parents/caregivers on how the student manages their remaining sight at home.
- Make sure the student has a group of friends who are helpful and who allow the students to be as independent as possible.
- Plan activities so that students work in pairs or groups whenever possible.

Strategy to help students with hearing impairment:

- Strategies to help students with hearing disabilities or communication difficulties
- Always get the students attention before you begin to speak.
- Encourage the student to look at your face.
- Use gestures, body language and facial expressions.
- Use pictures and objects as much as possible.
- Ask the parents/caregivers to show you the signs they use at home for communication use the same signs yourself and encourage other students to also use them.
- Keep background noise to a minimum.

Strategies to help children with physical disabilities or mobility difficulties:

- Adapt activities so that student who use wheelchairs or other mobility aids, or other students who have difficulty moving, can participate.
- Ask parents/caregivers to assist with adapting furniture e.g. The height of a table may need to be changed to make it easier for a student to reach it or fit their legs or wheelchair under.
- Encourage peer support friends can help friends.
- Get advice from parents or a health professional about assistive devices.

I.2.4. Guidance on assessment

Each unit in the teacher's guide provides additional activities to help students achieve the key unit competence. Results from assessment inform the teacher which student needs remedial, consolidation or extension activities. These activities are designed to cater for the needs of all categories of learners; slow, average and gifted learners respectively.
Assessment is an integral part of teaching and learning process. The main purpose of assessment is for improvement. Assessment for learning/ **Continuous/ formative assessment** intends to improve student-teachers' learning and teacher's teaching whereas assessment of learning/summative assessment intends to improve the entire school's performance and education system in general.

Continuous/ formative assessment

It is an ongoing process that arises out of interaction during teaching and learning process. It includes lesson evaluation and end of sub unit assessment. This formative assessment plays a big role in teaching and learning process. The teacher should encourage individual, peer and group evaluation of the work done in the classroom and uses appropriate competence-based assessment approaches and methods.

In Year two textbook, formative assessment principle is applied through application activities that are planned in each lesson to ensure that lesson objectives are achieved before moving on. At the end of each unit, the end unit assessment is formative when it is done to give information on the progress of students and from there decide what adjustments need to be done. Assessment standards are taken into consideration when setting tasks.

Summative assessment

The assessment done at the end of the term, end of year, is considered as summative. The teacher, school and parents are informed on the achievement of educational objectives and think of improvement strategies. There is also end of level/ cycle assessment in form of national examinations.

I.2.5. Student teachers' learning styles and strategies to conduct teaching and learning process

There are different teaching styles and techniques that should be catered for. The selection of teaching method should be done with the greatest care and some of the factors to be considered are: the uniqueness of subjects, the type of lessons, the particular learning objectives to be achieved, the allocated time to achieve the objective, instructional available materials, the physical/sitting arrangement of the classroom, individual student teachers' needs, abilities and learning styles.

There are mainly four different learning styles as explained below:

a) Active and reflective learners

Active learners tend to retain and understand information best by doing something active with it, discussing or applying it or explaining it to others. Reflective learners prefer to think about it quietly first.

b) Sensing and intuitive learners

Sensing learners tend to like learning facts while intuitive learners often prefer discovering possibilities and relationships. Sensors often like solving problems by well-established methods and dislike complications and surprises; intuitive learners like innovation and dislike repetition.

c) Visual and verbal learners

Visual learners remember best what they see (pictures, diagrams, flow charts, time lines, films, demonstrations, etc).; verbal learners get more out of words (written and spoken explanations).

d) Sequential and global learners

Sequential learners tend to gain understanding in linear steps, with each step following logically from the previous one. Global learners tend to learn in large jumps, absorbing material almost randomly without seeing connections, and then suddenly "getting it."

I.2.6. Teaching methods and techniques that promote the active learning

The different student learning styles mentioned above can be catered for, if the teacher uses active learning whereby students are really engaged in the learning process.

What is Active learning?

Active learning is a pedagogical approach that engages students in doing things and thinking about the things they are doing. In active learning, learners are encouraged to bring their own experience and knowledge into the learning process.

The role of the teacher in active learning

- The teacher engages students through active learning methods such as inquiry methods, group discussions, research, investigative activities and group and individual work activities.
- He/she encourages individual, peer and group evaluation of the work done in the classroom and uses appropriate competence-based assessment approaches and methods.
- He provides supervised opportunities for students to develop different competences by giving tasks which enhance critical thinking, problem solving, research, creativity and innovation, communication and cooperation.
- Teacher supports and facilitates the learning process by valuing student-teachers' contributions in the class activities.

The role of learners in active learning

Learners are key in the active learning process. They are not empty vessels to fill but people with ideas, capacity and skills to build on for effective learning. A learner engaged in active learning:

- Communicates and shares relevant information with other learners through presentations, discussions, group work and other learner-centred activities (role play, case studies, project work, research and investigation)
- Actively participates and takes responsibility for their own learning
- Develops knowledge and skills in active ways
- Carries out research/investigation by consulting print/online documents and resourceful people, and presents their findings
- Ensures the effective contribution of each group member in assigned tasks through clear explanation and arguments, critical thinking, responsibility and confidence in public speaking
- Draws conclusions based on the findings from the learning activities.

Some active techniques that can be used in ICT

The teaching methods strongly emphasised in the competence Based Curriculum (CBC) are active methods. Below are some active techniques that apply in sciences:

A. Practical work/ experiments:

Many of the activities suggested in ICT curriculum as well as in the teacher's book are practical works or experiments.

Practical work is vital in learning ICT; this method gives the student the opportunity to implement a series of activities and leads to the development of both cognitive and hands-on skills. The experiments and questions given should target the development of the following skills in student-teachers: observation, recording and report writing, manipulation, measuring, planning and designing.

A practical lesson/Experiment is done in three main stages:

- **Preparation of experiment:** Checking materials to ensure they are available and at good state; try the experiment before the lesson; think of safety rules and give instructions to lab technician if you have any.
- **Performance of experiment:** Sitting or standing arrangement of student-teachers; introduction of the experiment: aims and objectives; setting up the apparatus; performing the experiment; write and record the data.
- **Discussion:** Observations and interpreting data; make generalisations and assignment: writing out the experiment report and further practice and research.

In some cases, demonstration by the teacher is recommended when for example the experiment requires the use of sophisticated materials or very expensive materials or when safety is a major factor like dangerous experiments and it needs specific skills to be learnt first.

In case your school does not have enough laboratory materials and chemicals, experiments can be done in groups but make sure every student participates. You can also make arrangements with the neighbouring science school and take your students there for a number of experiments.

B. Research work

Each student or group of students is given a research topic. They have to gather information from internet, available books in the library or ask experienced people and then the results are presented in verbal or written form and discussed in class.

C. Project work

ICT teachers are encouraged to sample and prepare project works and engage their studentsin, as many as possible. Students in groups or individually, are engaged in a self-directed work for an extended period of time to investigate and respond to a complex question, problem, or challenge. The work can be presented to classmates or other people beyond the school. Projects are based on real-world problems that capture learners' interest. This technique develops higher order thinking as the students acquire and apply new knowledge in a problem-solving context.

D. Field trip

One of the main aims of teaching ICT in Rwanda is to apply its knowledge for development. To achieve this aim we need to show to students the relationship between classroom science lessons

and applied sciences. This helps them see the link between science principles and technological applications.

To be successful, the field visit should be well prepared and well exploited after the visit:

Before the visit, the teacher and student:

- agree on aims and objectives
- gather relevant information prior to visit
- brainstorm on key questions and share responsibilities
- discuss materials needed and other logistical and administrative issues
- discuss and agree on accepted behaviours during the visit
- Visit the area before the trip if possible to familiarise yourself with the place

After the visit

When students come back from trip, the teacher should plan for follow-up. The follow-up should allow studentsto share experiences and relate them to the prior science knowledge. This can be done in several ways; either: Students write a report individually or in groups and give to the teacher for marking. The teacher then arranges for discussion to explain possible misconceptions and fill gaps. Or students write reports in groups and display them on the class notice board for everyone to read.

Main steps for a lesson in active learning approach

All the principles and characteristics of the active learning process highlighted above are reflected in steps of a lesson as displayed below. Generally, the lesson is divided into three main parts whereby each one is divided into smaller steps to make sure that students are involved in the learning process. Below are those main parts and their small steps:

1) Introduction

Introduction is a part where the teacher makes connection between the current and previous lesson through appropriate technique. The teacher opens short discussions to encourage students to think about the previous learning experience and connect it with the current instructional objective. The teacher reviews the prior knowledge, skills and attitudes which have a link with the new concepts to create good foundation and logical sequencings.

2) Development of the new lesson

The development of a lesson that introduces a new concept will go through the following small steps: discovery activities, presentation of student-teachers' findings, exploitation, synthesis/summary and exercises/application activities, explained below:

❖ **Discovery activity**

Step 1

- The teacher discusses convincingly with students to take responsibility of their learning
- He/she distributes the task/activity and gives instructions related to the tasks (working in groups, pairs, or individual to instigate collaborative learning, to discover knowledge to be learned)

Step 2

- The teacher let the students work collaboratively on the task.
- During this period the teacher refrains to intervene directly on the knowledge
- He/she then monitors how the students are progressing towards the knowledge to be learned and boost those who are still behind (but without communicating to them the knowledge).

❖ **Presentation of student-teachers' productions**

- In this episode, the teacher invites representatives of groups to present the student-teachers' productions/findings.
- After three/four or an acceptable number of presentations, the teacher decides to engage the class into exploitation of the student-teachers' productions.

❖ **Exploitation of student-teachers's productions**

- The teacher asks the students to evaluate the productions: which ones are correct, incomplete or false
- Then the teacher judges the logic of the student-teachers' products, corrects those which are false, completes those which are incomplete, and confirms those which correct.

❖ **Institutionalization (summary/conclusion/ and examples)**

- The teacher summarises the learned knowledge and gives examples which illustrate the learned content.

❖ **Exercises/Application activities**

- Exercises of applying processes and products/objects related to learned unit/sub-unit
- Exercises in real life contexts
- Teacher guides students to make the connection of what they learnt to real life situations. At this level, the role of teacher is to monitor the fixation of process and product/object being learned.

3) Assessment

In this step the teacher asks some questions to assess achievement of instructional objective. During assessment activity, students work individually on the task/activity. The teacher avoids intervening directly. In fact, results from this assessment inform the teacher on next steps for the whole class and individuals. In some cases, the teacher can end with a homework assignment.

PART II. SAMPLE LESSON PLAN

Lesson plan

School name: X Teacher's name: X

Term	Date	Subject	Class	Unit N°	Lesson N°	Duration	Class size
2	X	ICT	S6	2	33 of 46 (in S6)	80 min	40 students

Type of Special Educational Needs to be catered for in this lesson and number of students in each category	None of students needs special educational needs
Unit title	INTRODUCTION TO WEB DESIGNING
Key Unit Competence:	Create a static website using HTML
Title of the lesson	Design a static web page using html tags and hyperlinks
Instructional objectives	After learning the lesson, students will be able to appreciate the use of different tags used to create a web page
Plan for this Class (location: in / outside)	This class will be held in computer lab connected to internet and Students will be organize in small groups
Learning Materials (for all learners)	Computers connected to internet, projector, ICT student text book S6.
References	ICT student text book S6 and internet website: *https://www. w3schools.com/html/html_links.asp*

Timing for each step	Teacher activities	Learner activities	Competences and cross cutting issues

			to be addressed + a short explanation
Introduction 5 minutes	*The teacher facilitates students to go in their respective groups *Teacher asks some questions which helps students to discover the topic of the lesson.	*Students respond appropriately to the questions asked by the teacher in review of the lesson. *Students discuss about hyperlinks using internet.	-Communication .Cooperation .Critical thinking. **Gender** through mixing boys and girls to do activity
Development of the lesson (Harmonization and summary) 10 minutes: Doing activity 5 minutes: Presentation 10 minutes Doing application activity	-Teacher provides activity questions to discuss in pair using internet. -Teacher guides students to do their activity - The teacher asks students to present their findings and give additional comments to the students 'work. -Teacher provides application Activity to students.	- In groups, using internet Students discuss on: The process of creating, saving and running HTML page HTML links -Students ask questions for clarifications while discussing in groups. - Students individually do application activity using shit of papers	**Communication** through presentations and discussing in groups. **Cooperation** when working together in groups **Cross cutting issues:** **Gender education:** Both boys and girls should participate in doing a research and discuss about how to design a static web page using html tags and hyperlinks.

	-Teacher comments on work of students		**Financial education :** Select an effective and efficient version of HTML which will help in designing a good and efficient website.
Conclusion (Assessment) 10 minutes	- The teacher concludes the lesson by asking questions to the learners, to know the achievement of the objective. - Provides a simple quiz - To be completed by the tutor after the lesson	- Students individually do application activity using shit of papers -Doing a quiz in using their draft books and pens	Critical thinking and interpersonal cooperation
Teacher self-evaluation			

PART III. UNIT DEVELOPMENT

UNIT 1. DATABASE DESIGN

1.1. Key unit competence:

Identify important entities and their attributes from a given real life situation and create a related database

1.2. Prerequisite (knowledge, skills, attitudes and values)

- Students have knowledge and skills related Microsoft Office programs namely Word, Excel and PowerPoint meaning that they are already familiar with the Office programs menu which are found both in these programs and in Access. These different Office programs were studied in Ordinary level and the acquired skills were reinforced also in Advanced level.
- Before starting this new unit in Senior Six, students first studied the Unit Database Basics. They are therefore familiar with the database concepts and this will facilitate their understanding of the new unit.
- In Excel, students studied how to format a cell contents so as to make it accept certain types of data like Currency, Text, …This will help to easily understand the concept of data types in Access

1.3. Cross-cutting issues to be addressed:

For every lesson crosscutting issues have to be integrated. Addressing cross cutting issues makes a lesson be integrated to real life issues in the society instead of being a standalone entity. Here is how cross cutting issues are addressed:

- **Standardization culture:** As students learn Access and when they learn how to export or import data from or to different programs, students must be aware that the importing and exporting of data is possible because programmers who created those different programs had in their minds that those programs will have to work together and should therefore fulfill a certain standard for this to be possible. Here they grasp the importance of standardizing different programs. On the other hand, when students are creating tables and queries they find out that there are standard data types that must be used to hold the data. For example, when creating a query involving more than one table, two tables columns cannot be linked if they are of different data types. and running queries

- **Financial Education:** By learning database design students discover that they can create a database that can solve a real life problem and that can bring economic gains to the institution having that database. Access database has the potential to better manage an institution's business.

- **Gender education: Students** must be aware that ICT is not a subject appropriate only for girls or boys. ICT topics especially those related to database design are appropriate for both sex not for only boys.

1.4. Introductory activity

- **Guidance:**

- The teacher organizes students in groups in order to do the unit's introductory activity.
- The teacher asks students to do the introductory activity in their respective groups.
- The teacher moves around to see how students are working and provides guidance where it is needed.
- The teacher invites some groups to presents their findings to the class
- The teacher asks students to evaluate the findings and do a summary of those findings.
- The teacher tells students that in the coming lessons they will have complete answers.

- **Answer of Introductory the Activity**

1)a) A paper based and a computerized database are different because a computerized database is structured, kept in a computer and use appropriate software to manage a database while a paper-based database is kept on a paper making it more difficult to manage it. The detailed difference is in the table below:

Computerized database	**Paper-based database**
Is used to keep much data	The storage space is small therefore the size of data kept is small.
It is very easy and fast to find a specific record meeting a specific criteria	To find a specific record required running through all the document which makes it difficult to find a specific record
It can be used to quickly data	Analysis of data is slow and done manually
Can be sorted by using different criteria (ascending, descending)	Difficult to sort especially when using many criteria
Data can be easily updated	Updating data is done manually by scribbling out
Data can be secured by using passwords	The kind of security provided to data is using physical locks

b) The problems faced by this university in using a paper-based database are related to the characteristics of this kind of database as stated in answer a) in the column on the right. Those problems are related to the lack of flexibility in performing different operation making this university database costly.

c) Once this university has a computerized database it will start to enjoy the benefits stated in the answer a) in the column on the left. The resulting benefits will be that this database is less costly.

2) Students give examples of computerized database in the institutions near them. It can be a database about student marks, student payments, school or institutions assets, etc

1.5. List of lessons

#	Lesson title	Learning objectives	Number of periods
1	Database models	Explain the different database model and make related diagrams	2
2	Database relational model	Explain the database relational model and differentiate it with other models	1
3	Database design steps: Investigation and identification of entities	Explain and carry out investigation and identification of entities as two steps in database design	2
4	Identification of relationships between entities	Identify relationships between database entities and represent them with an Entity Relationship Diagram	2
5	Database Optimization through Normalization	Convert a database to the third normal form	3
6	Data types in Access	Explain the different data types in Access and use them appropriately	1
7	Database creation	Create an Access database with tables in both Design view and SQL view	3
8	Manipulation of data in an Access table	Perform different operation on an Access database tables in datasheet view	3
9	Assessment		1

LESSON 1: Database models

a) Learning Objectives

Explain the different database model and make related diagrams

b) Teaching resources

For this lesson to be well conducted students will need to have the ICT student book, Computers with internet connectivity to facilitate research, projector.

c) Prerequisites

Students already learnt Access in the unit "Database basics". They are therefore familiar with some database concepts.

d) Learning Activities

- **Guidance:**
  - This lesson can be conducted in the classroom as because it does not have a practical activity
  - Teacher asks students to form groups to do the activity 1.1
  - The teacher facilitates students as they answer the questions by providing guidance where they have difficulties
  - Sample groups present their answers. At the end of the presentation a summary is done.
  - The teacher conducts the lesson by building on the students' findings

- **Answer of Activity 1.1**

1) The kind of database used by this bank is a relational model
2) Explanations related to a relational database model can be found in the student book in the section on "Database model
3) As provided in the student book, the other types of database models are: hierarchical model, network model, object oriented database model, etc.

e) Application activity 1.1

Answers:

1) A database model is a representation of the logical structure of a database including relationships and constraints that determines how data can be stored and accessed.
2) Two database models to be explained are Network model and Object Oriented database model. Related explanations on them can be found in the Student book
3) a) The diagram shown represent a network model.
   b) Explanations about a network model can be found in the Student book in the section "1.1.3. Network model"

LESSON 2: Database relational model

a) Learning Objectives

Explain the database relational model and differentiate it with other models

b) Teaching resources

For this lesson both the students and the teacher will need: computers with internet connectivity or textbooks to facilitate research, projector to present to the class the results of the research, posters showing different examples of a relational model.

c) Prerequisites

- Students are familiar with different database models including the relational model. This time they go deeper into this topic.
- In their everyday subjects they know a table and the parts of a table like columns and rows. This knowledge will be transferred to the new topic

d) Learning Activities

- **Guidance:**

- This lesson is started by doing the activity 1.2 which serves as an introductory activity to the lesson.
- Students present their findings and a summary on the relational model is done by emphasizing on the different concepts of this model as outlined in the student book
- Emphasize on the similarities between the following key terms: relations vs. object, records vs. row, value vs. cell and attribute vs. column
- As the lesson is concluded, give guidance on how the application activity 1.2 is to be done.

- **Answer of Activity 1.2**

1) The meaning of the terms Relation schema, cardinality, degree can be found in the student book in the section "1.2. Database relational model"

e) Application activity 1.2

Answers:

1) a) The table name is STUDENTS
   b) The table columns are: SNo, FirstName, LastName, Class, DateOfBirth, StudentID
   c) The primary key column is the one that contains values that uniquely identifies each row in a table. This column does not allow null values. In the diagram shown, the primary key column is SNo.
   d) The FirstName column cannot store numbers because names are not numbers but text.

LESSON 3: Database design steps: Investigation and identification of entities

a) Learning Objectives

Explain and carry out investigation and identification of entities as two steps in database design

b) Teaching resources

To conduct this lesson, the following resources are needed:

- Textbooks and computers with internet connectivity to facilitate research
- Projector to be used in presenting the results of the research

c) Prerequisites

Students have basic knowledge on database, database concepts, tables, database models. This will serve as a basis in better understanding the new lesson.

d) Learning Activities

- **Guidance:**

- The lesson starts by doing the activity 1.3 and brainstorming on the current database at school and emphasize on its strong and weak points. This can be done in the classroom or students can be allowed to go to the school administration and do a small investigation depending on the available time
- Under the guidance of the teacher students state the results of their investigation which will be like sentences about the business process of the school.
- From the sentences of the investigation, students identify the tables of the future database

- **Answer of Activity 1.3**

1) a) Students do an investigation to discover the kind of database used at the school if it is a paper-based or a computerized database. If it is computerized they provide more explanations on the kind of software used and the features of that database.
   b) Students identify the weak points of the current system. If it is a paper-based database, the main disadvantage is that it is less efficient and difficult to manipulate and manage. If it is a computerized database, it can have weak points related to how it is built.

c) The purpose of investigation as one step in database creation is to identify the existing system of data management, identify its weakness, identify the business process of an institution and later derive database tables from the findings.

e) Application activity 1.3

Answers:

1) Students visit one institution in their environment, they do an investigation and from their findings identify the tables that the new database would have.
2) If an investigation, as one step of database creation is not well done, the database resulting from that investigation will not solve the real existing problem at that institution.

LESSON 4: Identification of relationships between entities

a) Learning Objectives

Identify relationships between database entities and represent them with an Entity Relationship Diagram

b) Teaching resources

c) Prerequisites

- This lesson is a continuation of the previous lesson "Database design steps: Investigation and identification of entities" therefore students have the required knowledge to start this lesson
- Students were introduced to database models by which database tables are interconnected using lines, this knowledge will be transferred to this new lesson

d) Learning Activities

- **Guidance:**

- **Answer of Activity 1.4**

1) Tables that are more likely to be related are: Student and Teacher, Student and Mark, Student and Subject, Student and Class, Parent and Student
2) The possible columns for each of the tables are:

STUDENT (RegNo, FirstName, LastName, DateOfBirth, Sex), TEACHER (IDNo, FirstName, LastName, DateOfBirth, Sex, Qualification, SubjectsTought), MARK (RegNo, SubjectNo, Marks), PARENT (IDNo, FirstName, LastName, DateOfBirth, Sex, StudentRegNo), SUBJECT (SubjectNo, SubjectName, Comments), CLASS (ClassNo, Level)

3) Students identify other tables that may be included in a school database. Those tables may store data about: students school fees payments, tables about the finance of the school, etc

e) Application activity 1.4

Answers:

1) Using their imaginations students created Entity Relationship Diagrams for the databases of different institutions namely a School library, a Car rental company, and a Shopping mall.
2) The importance of ERD for a database is to provide a visual starting point to be used by database designers while they are building the database. It also make the database structure be more understandable to people who did not participate in its creation.

LESSON 5: Database Optimization through Normalization

a) Learning Objectives

Convert a database to the third normal form

b) Teaching resources

For this lesson to be conducted effectively the materials needed are: Computers with internet connectivity, projector, posters on which there is a database in the 1NF, 2NF and 3NF

c) Prerequisites

Students are familiar with database tables and how a database is built from an investigation and other steps in database design.

d) Learning Activities

- **Guidance:**

- The lesson is introduced by doing the activity 1.5. By doing that activity students discover the anomalies presented by a database which is not normalized
- The teacher puts students in groups and instructs them to do the activity 1.5
- Students presents their answers to the questions of the activity 1.5
- The teacher tells students that during the lesson they are going to see how the anomalies presented by the shown table can be solved through normalization
- By questions and answers the teacher go through the lesson by explaining the different normal forms and doing practical examples
- The teacher tells students how to do the application activity 1.5

- **Answer of Activity 1.5**

1)a) The table that contains information about doctors are StaffNo and DoctorName, for patients it is patientNo and patientName while for appointments it is appointment and surgeryNo

b) When a new doctor is hired and needs to be entered, the new doctor's name and staff number are registered but other cells lack information and stay therefore empty.
c) When a new patient is admitted, his/her details are entered but doctor details are not available. In the same way as above some cells stay with empty data
d) If a doctor has quit the hospital and must be deleted when those records are deleted some of the records about patients and appointments will remain or all the records that needed to be kept will be deleted if this deletion is not done manually.

e) The new resulting is not appropriate in a database as some cells are filled while some others are not filled.

StaffNo	DoctorName	patientNo	patientName	appointment	surgeryNo
RS001	KABAYIZA Emmanuel	P100	RUKUNDO Clement	12/09/2022	S10
RS001	KABAYIZA Emmanuel	P105	KAMANZI Adolph	13/09/2022	S15
		P108	ILIZA Christine	12/09/2022	S10
RS002	IRIBAGIZA Alliane	P108	ILIZA Christine	14/09/2022	S10
RS003	KEZA Kelly	P105	KAMANZI Adolph	14/09/2022	S15
RS003	KEZA Kelly	P110	HABINSHUTI Aaron	15/09/2022	S13
RS004	RWIBASIRA Felecian				
		P111	UWIMANA Laurent	17/09/2022	S16

f) The problems stated in e) can be solved by normalizing the tables in a database.

e) Application activity 1.5

Answers:

1) When the table is converted to the first normal form it becomes:

FirstName	LastName	Course
Louis	KARASIRA	Chemistry
Louis	KARASIRA	Biology
Louis	KARASIRA	Geography
Leon	NTAGANDA	Entrepreneurship
Leon	NTAGANDA	Physics
Helen	KALIZA	History

2) The conversion of the table to the 3NF will generate the following tables:

STUDENTS

IDSt	LastName
1	CYUBAHIRO
2	MANZI
3	KALISA

PROFESSORS

IDProf	Professor
1	INGABIRE
2	MUNYEMANA
3	KARENZI

GRADES

IDgrade	Grade
1	4
2	5
3	6

LESSON 6: Data types in Access

a) Learning Objectives

Explain the different data types in Access and use them appropriately

b) Teaching resources

For teaching this lesson both the teacher and students will need:

- Textbooks or Computer with internet connectivity to facilitate research
- Some posters showing error messages displayed when wrong data types are chosen when entering data
- A computer with Access to show the different data types

c) Prerequisites

Students have a basic notion of data types that they got while they were studying Excel. In Excel learners understood that every column is designated to receive a certain type of data. They also know from different subjects that there exist numbers, text, dates.

d) Learning Activities

- **Guidance:**

- The lesson is introduced by the questions in the activity 1.6. The teacher can write the data in question 1), display that data using a projector or display a poster with that data and ask questions about it. The answers to be given must be related to data types
- The teacher moves to the second question of the activity 1.6 and ask questions which will make students better understand what data types and their importance
- By the guidance of the teacher, students move deeper in the content of the lesson and discover the different data types.
- As the lesson is completed, the teacher gives guidance on how to do the questions in the application activity 1.6

- **Answer of Activity 1.6**

1) The data types represented are: Text, Date, Number and Currency (students many say money)
2) a) The error message is being displayed because the student is attempting to enter a wrong data type because She/he is entering a number instead of a date.
   b) The problem of the error message can be solved by entering the right data type which is a date. The date can be entered using the date picker which is shown next to the cell.

c) Other columns are not displaying error messages because they have entered the right data type acceptable in the table.

e) Application activity 1.6

Answers:

1) For questions a) to d) Students suggest the columns names for the different tables by making sure that every table has a primary key and suggest the data types. The data types for most of the columns will be Short text.

LESSON 7: Database creation

a) Learning Objectives

Create an Access database with tables in both Design view and SQL view

b) Teaching resources

For teaching and learning this lesson the materials needed are:

- Computers with internet connectivity to facilitate research or with Ms Office package which include Ms. Access. The latter will be used in different practical activities involving the creation of an Access database with tables
- Projector to show how to create a database
- Textbooks including the student book to facilitate research

c) Prerequisites

From the previous lessons, students have a knowledge in these topics will facilitate the learning of other topics:

- Different parts of a table like column, row
- The data types to be used on different columns depending on the kind of data to be stored
- The criteria for a normalized database
- Students are also familiar with different office programs menu which will make it easy when they start using Ms. Access menu

d) Learning Activities

- **Guidance:**

- This lesson starts by doing the activity 1.7. Students observe the screenshot in this activity and answer the related questions.
- Under the guidance of the teacher students open Ms. Access and create the table whose structure is shown in the activity.
- The teacher demonstrates how different steps shown in the student book section "1.7. Database creation are done" are done
- The teacher gives instruction on how to do the application activity 1.7

- **Answer of Activity 1.7**

1) a) The columns of this database are: IDNumber, FirstName, LastName, DoB, Sex, Country, City

b) The primary key column is IDNumber
c) The data type for the DoB column is Date/Time

2) The students create the database and create the table with the data structure shown

e) Application activity 1.7

Answers:

1) From a to d) Students create the tables with the columns shown. Most of the tables' columns are text.

LESSON 8: Manipulation of data in an Access table

a) Learning Objectives

Perform different operation on an Access database tables in datasheet view

b) Teaching resources

For this lesson to be conducted effectively the following resources are needed:

- Computers with Ms. Access to facilitate practice on data manipulation and computers with internet connectivity or textbooks to facilitate research
- Projector to be used in showing demonstrations about data manipulations in Access
- Textbooks especially the student book ICT S6

c) Prerequisites

Students learnt different lessons about Access namely database creation. They can open Access and are familiar with its menu. This prerequisite will facilitate the acquisition of new skills related to this lesson

d) Learning Activities

- **Guidance:**

- This lesson starts by doing the activity 1.8. Students observe the screenshot in this activity and answer the related questions.
- Under the guidance of the teacher students open Ms. Access and create the table whose structure is shown in the activity.
- The teacher demonstrates how different steps shown in the student book section "1.8. Database creation are done" are done
- The teacher gives instruction on how to do the application activity 1.8.

- **Answer of Activity 1.8**

1) To know if a given student paid all the due fees the table to be used are: STUDENTS, PROMOTIONS and SCHOOLFEES. From the STUDENTS table we will get information related to students names, from PROMOTIONS we get information related to different levels (S1 to S6) while from the SCHOOLFEES table we get information related to the amount of money paid.

2) The column TermName will keep information about the term of the year like Term I, Term II and Term II. However, because this table will keep information about for years (promotions) the term can be combined with a year to avoid confusion. Example Term I 2023
3) a) The tables with StuID columns are: STUDENTS, PROMOTIONS, SCHOOLFEES
b) Having one column which appear in many tables establishes a link between those tables therefore making possible the querying of those tables as one entity. Those columns act as a foreign key.
4) To display names and dates of birth of students who study in S5 the tables which will be used in querying the tables to be involved will be: STUDENTS, PROMOTIONS, SCHOOLFEES

e) Application activity 1.8

Answers:

1) Students create the database with the tables STUDENTS, PROMOTIONS, SCHOOLFEES
2) Students take a list of students in their class and enter those data in the tables they have created.
3) a&b) With the tables they have created, students run different queries as requested. The queries may return nothing if there is no record in those tables that meet the stated criteria.
4) How to use the filter option is explained in the student book under the section "1.8.2.Sorting and filtering data"

1.6. Summary of the unit

This unit on Database Design focused on the different steps leading to the creation and use of a database system where it is not existent. Those steps have been developed by showing what is done at every step. With the practical side which involves the use of Access as a database management system, the related lessons use the Design view though where possible, considering students' level, the SQL view can be used.

Database design focuses on conceptual, logical and physical levels. Knowing the logical organization of a relational database, entity relationship model and relationships among entities and data optimisation technique is required to design a database that overcomes update, insertion and delete anomalies.

1.7. Additional information for teachers

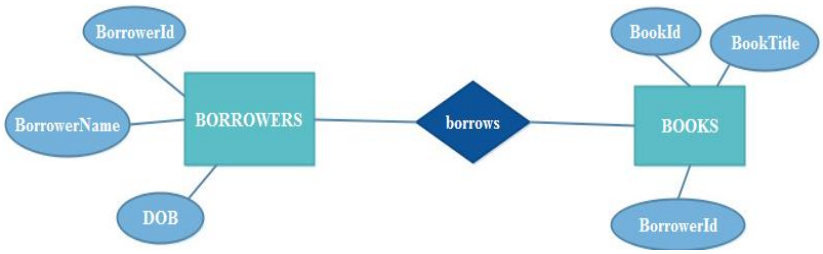
The teaching of this unit is done theoretically by using active methods. However, some of the lessons at the end of the unit are done by involving practical activities and using the most recent Ms Access. For quick learners the teacher can allow the use of other database management system like MySQL, Oracle, etc.

1.8. End unit assessment answers

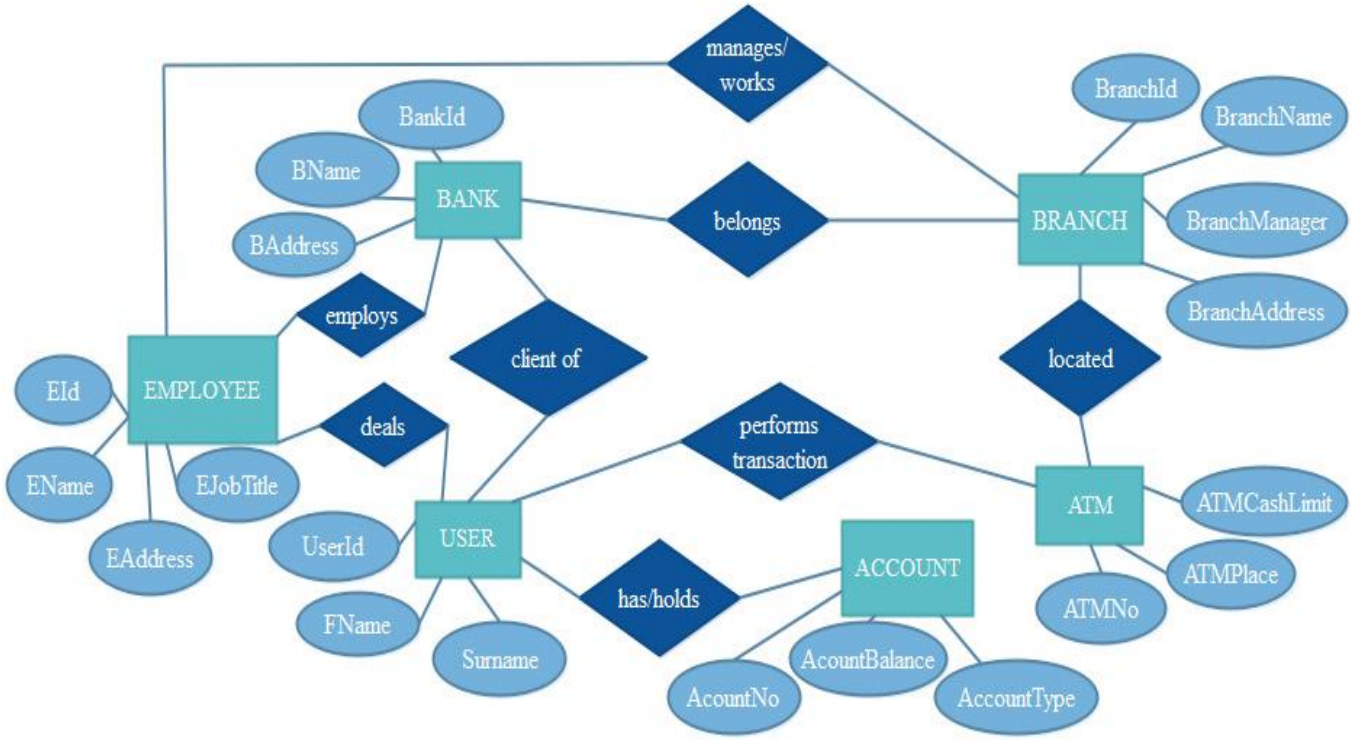
Question 1.

The primary keys are

i) Borrowerid for BORROWRES table and BookId for BOOKS table because they are the only columns that are unique
ii) The foreign key for the BOOKS table is BorrowerId
iii) Relationship between BORROWERS and BOOKS is the Entity Relationship Diagram below:



Question 2. An Entity Relationship Diagram for a banking system with 6 entities is shown below:



Question 3.
(i) The data type for each field:
PicNo: number, PicTitle: Short Text, PicArtist: Short Text, PicDescription: Short Text, PicSize: Number (integer), PicPrice: Currency, ArrivedDate: Date/Time, Status: Short text. The PicPrice column can also be of number data type

(ii) The primary key is CatNo
(iii) Complete the query-by-example grid below to select and show the CatNo, PicTitle and PicPrice of all unsold pictures by the artist 'GATOTO'.

Field:	CatalogueNumber	PictureTitle	PictureArtist	PicturePrice	Status
Table:	PICTURE	PICTURE		PICTURE	PICTURE
Sort:					
Show:	☑	☑		☑	
Criteria:			="GATOTO"		="Unsold"
or:					

1.9. Additional Activities

1.9.1.Remedial activities

1) Fill in the blanks using these terms: Repeating groups, Normalization, Physical
a) ……. produces a lower normal form.
b) A relational table must not contain.....
c) .....refers to the level of database design which is concerned on how data will be encoded and stored. This level consists of practical applications.

Answer: a) Normalization, b) Repeating groups, c) Physical

2) State the database design steps.

Answer:

Investigation the information, Identification of Important Entities and their Attributes, Identification of relationship among entities, Database creation, data entry and manipulation

3) Differentiate entity and relationship.

Answer:

An Entity is a table/object that holds specific information while a relation is defined as the associations or interactions between entities. For example, Student is taught by Teacher

1.9.2.Consolidation activities

1) Based on the cardinality, explain the different types of relationships that can exist between entities.

Answer:

- **One-to one (1:1)**: A single instance of an entity can relate to only one instance of the other entity. It is the relationship of one entity to only one other entity, and vice versa. **Example:** President-Country, Person-Passport
- **One-to-many (1: M)**: An instance of one entity can relate to multiple instance of another instance. The relationship that associates one record of entity A to more than one record of entity B is called one-to-many relationship. **Example:** 1 country can have many states.
- **Many-to-One Relationship Type (M: 1):** The relationship between EMPLOYEE and DEPARTMENT is an example of many-to-one relationship. Many employees can work in one department
- **Many-to-many (M: M):** Multiple instances of an entity can relate to multiple instances of another entity. **Example:** Many teachers can teach many students.

2) Which of the following data types is more commonly called Boolean?
a) Yes/No
b) Date/Time
c) Hyperlink

d) Attachment

Answer: A

1.9.3.Extended activities

1) Suppose a student called UWIMANA work on his personal computer with Microsoft Office 2016 installed on it. She has created a database named SCHOOL using Microsoft Office Access 2016. This database contains three Access objects named Student, AllStudentsQuery, and StudentAddress. She wants to view these objects in the navigation pane. Which of the following options will you choose to accomplish the task?

a) All Access Objects
b) Navigate To Category
c) Filter By Group
d) Custom

Answer: a)

2) What is the cardinality and existence of each of the following relationships in just the direction given? State any assumptions you have to make.

a) Husband to Wife
b) Car and Steering wheel
c) Student to Degree
d) Child to Parent
e) Player to Team
f) Student to Course

Answer:

a) Husband to Wife: 1:1
b) Car and Steering wheel: 1:1
c) Student to Degree: 1:1
d) Child to Parent: 1:1, M:1
e) Player to Team: 1:1, M:1
f) Student to Course: M:M, 1:M

1) What are the database models that are used at conceptual level and logical level?

Answer:

At Conceptual level we use Entity-Relationship model (ERM) to represent all the data elements. At the logical level we use the RELATIONAL model.

2) Consider the following table. Answer corresponding questions

EMPLOYEE

EmpId	**FullName**	**Designation**	**Salary**	**Doj**	**Dob**	**Country**	**City**
101	KAREKEZI Ange	Accountant	240000	3/23/2003	1/13/1980	RWANDA	HUYE
102	GANZA Kevin	Head-IT	320000	12/2/2010	7/22/1987	UGANDA	KAMPALA

103	MUTONI Rehma	Customer Care	200000	6/24/2009	2/24/1983	BURUNDI	BUJUMBURA
105	NKUSI Anicet	Marketing Officer	310000	11/8/2006	3/3/1984	BURUNDI	BUJUMBURA
108	KARENZI Abdul	CEO	560000	12/29/2004	1/19/1982	RWANDA	KIGALI

i) Identify the composite attribute and give reason

ii) Identify the primary key

iii) Which attribute could have a NULL value? Why?

Answer

i) FullName: One Employee can have Firstname, Surname, MiddleName, NickName, etc.
ii) EmpId is primary key because it is stable attribute and unique.
iii) City, Country and Doj can be null because they are optional and they are not candidate keys

2. Consider the following table which holds information about employees and projects. One employee can work on one or many projects and each project has a budget (in FRW) and time limit (in months) to be accomplished.

Assume EmpID and ProjectID are a composite PK.

EMPLOYEE_PROJECT			
EmpID	Budget	ProjectID	Period
E11	32,000,000	PR01	3
E11	40,000,00	PR02	5
E21	32,000,000	PR01	7
E21	27,000,000	PR03	8
E39	40,000,000	PR02	6
	17,000,000	PR04	

i) Which normal form does the table above belong to? and Why?

ii) With examples, identify the problems that table contains

iii)Explain the function dependency that exist in the table above

Answer

i) 1NF because it does not have repeating groups

ii) Anomalies are: Insertion anomaly, Dummy value, Deletion anomaly, Update anomaly, Data redundancy

3) The following database stores information about a bank, its customers and their loans. Use it to answer the asked questions.

LOAN:

LoanNumber	LoanType	BankBranch	Amount
C100001	Consumer loan	Musanze	1,000,000
AF100001	Asset Finance loan	Rubavu	54,000,000
MB120001	Microbusiness loan	Huye	3,000,000
AF100002	Asset Finance loan	Huye	124,000,000
MB120011	Microbusiness loan	Ngoma	800,000
MB120031	Microbusiness loan	Nyabihu	110,000
C100002	Consumer loan	Musanze	290,000

CUSTOMER

CustomerID	CustomerName	LoanNumber	Address
10002	KAYIHURA	C100001	Musanze
10003	KAMALI	AF100001	Kicukiro
10004	UWAMALIYA	MB120001	Huye
10006	KUBWIMANA	AF100002	Ngoma
11006	MUKAMUSONI	MB120011	Rubavu
12006	AYINKAMIYE	C100002	Kicukiro
11016	MUKAMANA	MB120031	Musanze

i) Find the names and address of all customers who have a loan from Musanze branch.

ii) Find and show all customers who live in the same district as KAMALI.

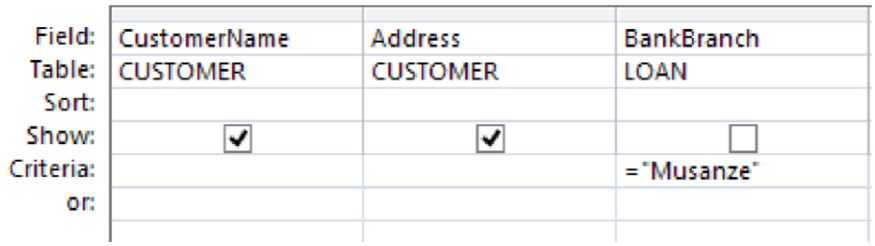
iii) Find and show customer id, names, Address, loan type and amount of customers who have loan type of "Asset Finance loan.

iv)Consider the following query by example grid:

What will be displayed?

Answers

i) Query by example grid

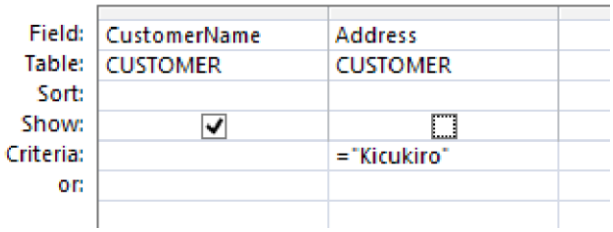


Field:	CustomerName	Address	BankBranch
Table:	CUSTOMER	CUSTOMER	LOAN
Sort:			
Show:	☑	☑	☐
Criteria:			="Musanze"
or:			

Output:

CustomerName
KAYIHURA
AYINKAMIYE

ii) The QBE grid for customers who live in the same District as Kamali:



Field:	CustomerName	Address
Table:	CUSTOMER	CUSTOMER
Sort:		
Show:	☑	☐
Criteria:		="Kicukiro"
or:		

Output:

CustomerName	Address
KAMALI	Kicukiro
AYINKAMIYE	Kicukiro

iii) The result of the shown Query By Example grid will be the following:

CustomerID	CustomerName	Address	BankBranch	Amount
10002	KAYIHURA	Musanze	Musanze	1,000,000
11006	MUKAMUSONI	Rubavu	Ngoma	800,000
12006	AYINKAMIYE	Kicukiro	Musanze	290,000
11016	MUKAMANA	Musanze	Nyabihu	110,000

UNIT 2: SQL AND DATABASE PROJECT

2.1. Key Unit competence

To be able to apply Structured Query Language in RDBMS and create a short database project

2.2. Prerequisites

Students have learnt some database concepts and database design in the previous Units. They ideally have some knowledge and skills related to database design. This concept will be applied by students in manipulating the database using SQL statements in MS Access.

2.3. Cross-cutting issues to be addressed

Throughout every lesson, cross cutting issues must be addressed. Addressing cross cutting issues makes a lesson not to be an isolated entity but relate the lesson with the issues in real world. Here below are some cross-cutting issues to be addressed:

Inclusive Education: Students with and without disabilities participate together in the same classes during teaching and learning process.

Standardization Culture: to be covered when explaining the standards required during installation of system software and application software and factors that need to be considered in order to minimize health risks such as RSI (Repetitive Strain Injuries) and eye strain while using computer. Students must be familiar with the standards of computer hardware devices and software by making sure that they always have to use devices and software from known manufactures

Gender education: All students must get involved in class activities regardless of gender

2.4. Guidance on introductory activity

Through the guidance of the teacher, referring to the provided instructions in the student book, the teacher guides students to create the Farmer Ltd database using MS Access.

Then students create a customer table using SQL statements. the teacher can allow students to use MS Access using the skills learned in S5 to create a table and add records to the customer table without using appropriate SQL statements.

2.5. List of lessons

#	Lesson title	Learning objectives	Periods
1	Introduction to SQL	Explain the purpose of SQL statements in MS Access.	2
2	SQL Language Data Definition Language	Explain the use of Data Definition Language statements on MS tables	2
3	SQL Constraints application to MS Access table	Applying SQL constraints on MS Access tables	2
4	SQL Language Data Manipulation Language	Explain the use of INSERT statement to insert data and SELECT statement to query data into MS Access tables	3
5	Operators in the WHERE Clause	Apply condition in a SELECT statement by using the where clause	3
5	SQL Aggregate function	Explain the use various SQL Aggregate function to query data into MS tables	2
6	String Expressions in SQL	Explain the use of String Expressions to query data into MS tables	2
7	SQL Language Data Control Language	Explain SQL Language Data Control Language	1
8	End unit assessment		1

Lesson 1: Introduction to SQL

a) Learning objectives

To explain the purpose of SQL statements in MS Access.

b) Teaching resources:

This lesson requires equipment such as a projector and computers with MS Office Access as RDBMS installed and connected to the Internet in order to conduct further research.

c) Prerequisites:

Students have basic knowledge and skills about database concepts and database design in the previous Units. They are also familiar with the MS access interface and tools.

d) Learning activities

- **Guidance**

- This topic introduces the students into SQL environment using MS access as a RDBMS software.
- Students will do the activity 2.1 in pair,
- Students search on the internet reasons MS Access is used as RDMS software.
- Teacher walk around the pair to guide the pairs and to make sure every member is participating
- Teacher gives guidance on how to do application activity 2.1

- **Answers to Activity 2.1**

MS Access is a fully functional RDBMS because It provides all the data definition, data manipulation, and data control features.

e) Application activity

• Answers to application activity 2.1

1. The role played by SQL language into Database management
   - Data definition: SQL allows a database administrator to define the organization and structure of stored data and the relationships amongst different stored data items.
   - Data retrieval: SQL helps an application or user program to fetch stored data from a computer database and make use of it.
   - Data manipulation: SQL helps an application or user program to update the computer database by removing old data, modifying hitherto stored data, and adding new data.
   - Access control: SQL can also be deployed for restricting user permission for adding, retrieving or modifying stored data, thence protecting data from unauthorized access.
   - Data sharing: SQL is used by concurrent users to coordinate data sharing to ensure the users don't interfere with one another.

- Data integrity: SQL is also used in a database to define integrity constraints to prevent data corruption by system failure or inconsistent update.

2. The differences between the DDL and DML are:
   - DDL is Data Definition Language which is used to define data structures. For example: create table, alter table are instructions in SQL.
   - DML is Data Manipulation Language which is used to manipulate data itself. For example: insert, update, delete are instructions in SQL.

The below table detailed the difference between DDL and DML:

DDL	DML
It stands for Data Definition Language.	It stands for Data Manipulation Language.
It is used to create database schema and can be used to define some constraints as well.	It is used to add, retrieve or update the data.
It basically defines the column (Attributes) of the table.	It adds or update the row of the table. These rows are called as tuple.
It doesn't have any further classification.	It is further classified into Procedural and Non-Procedural DML.
Basic command present in DDL are CREATE, DROP, RENAME, ALTER etc.	BASIC command present in DML are UPDATE, INSERT, MERGE etc.
DDL does not use WHERE clause in its statement.	While DML uses WHERE clause in its statement.

Lesson 2: SQL Data Definition Language

a) Learning objectives

To Explain the use of Data Definition Language statements on MS tables

b) Teaching resources:

This lesson requires equipment such as a projector and computers with MS Office Access as RDBMS installed and connected to the Internet in order to conduct further research.

c) Prerequisites

Students have learned basic database concepts such as relations and attributes such concepts are going to be crucial for this lesson, students are going to see where these concepts are applied.

d) Learning activities

- **Guidance**

- Teacher groups students into small groups so that they share ideas on the next step to follow after the creation of a database
- Teacher walk around the group to guide the groups and to make sure every member is participating
- Group representative to present their finding to the rest of the class
- With the guidance of the teacher students will share the list of SQL command they think fall under DML commands.
- Teacher gives guidance on how to do Application Activity 2.2

- **Answers to Activity 2.2**

The answer of this activity are provided in the student book.

e) Application activity

Answer application activity 2.2

1) The DDL command to create the customer table are provided in Students Book.
2) The SQL command to add ProductName column is: ALTER TABLE customer ADD ProductName varchar (15));
3) The SQL command to delete address column is: ALTER TABLE customer DROP COLUMN address;

Lesson 3: SQL Constraints Application to MS Access Table

a) Learning objectives

Applying SQL constraints on MS access tables

b) Teaching resources:

This lesson requires equipment such as a projector and computers with MS Office Access as RDBMS installed and connected to the Internet in order to conduct further research.

c) Prerequisites:

Students have applied basic database concepts such as relations and attributes such concepts by creating a database table in the previous lesson. Now they are going to apply constraints to the created table.

d) Learning activities

- **Guidance**

- Teacher groups students into pair
- Students share ideas on the syntax of adding a constraint on the database table
- Teacher walk around the group to guide the pairs and to make sure every member is participating
- Pair representative to present their finding to the rest of the class
- Teacher gives guidance on how to do Application Activity 3.1

- **Answers to Activity 2.3**

Instruction to use in order to do activity 3.1 is already provided in Students Book.

- **Answers to exercise 3.1**

The instruction needed to do the Application 3.1 is given in the Students book.

e) Application activity 2.3

- **Answers to application activity 2.3**

The instruction needed to do the Application Activity 3.1 is given in the Students book.

Lesson 4: DATA MANIPULATION LANGUAGE

a) Learning objectives

Explain the use of INSERT statement to insert data and SELECT statement to query data into MS Access tables

b) Teaching resources

This lesson requires equipment such as a projector and computers with MS Office Access as RDBMS installed and connected to the Internet in order to conduct further research.

c) Prerequisites

Students have learned basic database concepts such as relations and attributes. These concepts are going to be crucial for this lesson, students are going to apply learned concepts into practice.

d) Learning activities

- **Guidance**

- The teacher makes sure all students have created a database in MS Access and the created database has at least one table.
- Teacher show students how to use the INSERT INTO statement
- Teacher show student how to query a table using SELECT statement.
- Teacher walk around the group to guide students and to make sure every member is participating
- Teacher gives guidance on how to do Application Activity 2.4

- **Answers to Activity 2.4**

Instruction to use in order to resolve the activity 2.4 are already provided into Students Book.

INSERT INTO saleperson (sale_id, Fname, Lname ,Sale_Age, District, Province, Product_Name, Quantity_Sold, Store_Location) VALUES (2, "Rurangayire"," Ariane","25"," Kamonyi" "Eastern", "Milk", "40", "Kamonyi");

- **Answers to Exercises**

Instruction and skills to use in order to do the different exercise of lesson 4 are available in the student book in the related section.

e) Application activity

Answers to application activity 2.4

Instruction to use in order to do Application activity 2.4 is available in the Students Book.

Lesson 5: Operations in the Where clause

a) Learning objectives

To Apply condition in a SELECT statement by using the where clause

b) Teaching resources:

This lesson requires equipment such as a projector and computers with MS Office Access as RDBMS installed and connected to the Internet in order to conduct further research.

c) Prerequisites

Students have used SELECT statement to query data into the table

d) Learning activities

- **Guidance**

- The teacher makes sure all students have created a database in MS Access and the created database has at least one table.
- Teacher show student how to query a table using SELECT statement accompanied by the WHERE, ORDERED by clause.
- Teacher show student how to use Delete statement
- Teacher show student how to query a table using SELECT statement accompanied by the AND, OR and NOT operator.
- Teacher walk around the group to guide students and to make sure every member is participating
- Teacher gives guidance on how to do application activity 5.1

- **Answers to Activity 5.1**

Instruction to do Activity 5.1 is already provided in the Students' book.

- **Answers to different exercises**

Instruction, knowledge and skills to do the different exercises of lesson 5 are available in the students' book.

e) Application activity

- **Answers to Application Activity 5.1**

Instruction to do Application Activity 5.1 is already provided in the Students' book.

Lesson 6: SQL Aggregate functions

a) Learning objectives

To explain the use various SQL Aggregate function to query data into MS tables

b) Teaching resources:

This lesson requires equipment such as a projector and computers with MS Office Access as RDBMS installed and connected to the Internet in order to conduct further research.

c) Prerequisites

Students have knowledge and skills on computer the use of SELECT statement learnt in the previous lesson.

d) Learning activities

- **Guidance**

- The teacher makes sure all students have created a database in MS Access and the created database has at least one table.
- Teacher show student how to query a table using SELECT statement accompanied by the COUNT, MAX, MIN, AVG, SUM function.
- Teacher walk around the group to guide students and to make sure every member is participating
- Teacher gives guidance on how to do Application Activity 2.6

- **Answers to Activity 2.6**

Answer for the activity 2.6 are provided in the students' book.

e) Application activity

Answers to application activity 2.6

Knowledge and skills enabling the student to answer the questions of the application activity 2.6 are provided in the students' book.

Lesson 7: STRING EXPRESSIONS in SQL

a) Learning objectives

Identify operating system issues and software issues and fix them

b) Prerequisites:

Students have knowledge and skills on computer the use of SELECT statement learnt in the previous lesson.

c) Teaching resources

This lesson requires equipment such as a projector and computers with MS Office Access as RDBMS installed and connected to the Internet in order to conduct further research.

d) Learning activities

- **Guidance**

- The teacher makes sure all students have created a database in MS Access and the created database has at least one table.

- Teacher show student how to query a table using strings functions
- Teacher walk around the group to guide students and to make sure every member is participating
- Teacher gives guidance on how to do Application Activity 2.7

- **Answers to Activity 2.7**

Answer for the activity 2.7 can be found in the students' book in the section related to "String expressions in SQL"

e) Application activity

Answers to application activity 2.7

1. Find the length of the title of the song called" Imenagitero" is 11
2. Reverse the name of the book "Imigenzo n'imiziriizo ya Kinyarwanda" is "adnawrayniK ay oziriizimi'n oznegimI"
3. Comparison of the names "Nyamasheke" and "Nyagatare" is 1.
4. Change "Ndi umunyarwanda" in upper case is "NDI UMUNYARWANDA"
5. Change "RWANDA GIHUGU CYANJYE" in lower case is "rwanda gihugu cyanjye"

Lesson 8: Data Control Language (DCL)

a) Learning objectives

Explain and apply different steps to install an operating system

b) Teaching resources

Students have knowledge and skills on computers and the use of SELECT statement learnt in the previous lesson.

c) Teaching resources

This lesson requires equipment such as a projector and computers with MS Office Access as RDBMS installed and connected to the Internet in order to conduct further research.

d) Learning activities

- **Guidance**

- The teacher makes sure all students have created a database in MS Access and the created database has at least one table.
- Teacher show student how to query a table using strings functions
- Teacher walk around the group to guide students and to make sure every member is participating

- Teacher gives guidance on how to do Application Activity 2.8

- **Answers to Activity 2.8**

The Answer for the activity 2.8 are provided in the students' book.

e) Application activity

Answers to application activity 2.8

The Answer for the activity 8.1 are provided in the students' book.

2.6. Summary of the unit

Data is stored in entities which are referred to as tables in MS Access and this ability to store data provides us with an opportunity to read, update, insert and delete data any time at a later date.

The design of a database goes through a number of steps which have to be respected in order to arrive at a better final result. Once the database is in place data can be entered in it or queries can be run on the database. In order to work with the stored data, we need to be able to communicate with the database. For this we need to use Structured Query Language (SQL) as one of the means to query a database.

SQL provides us with the opportunity to read data from single or even multiple tables. We can use SQL to run different queries on the data stored by using the Design view or SQL view. SQL can also be used to insert new records, update existing ones and delete unwanted ones.

2.7. Additional information for teachers

Most lessons in the unit "Database Design" can be taught in theory and don't need the use of computers. However, at a later stage in the unit, lessons become practical and therefore requiring the use of computers. Students must be participative in the different lessons for a better understanding and present their findings which will be used in building the lesson summary.

Where the conduction of the lesson requires long introductory activities (activity starting every lesson), it may be necessary for these activities to be done the previous day so as to save time during the current lesson.

The use of modern technology such as projector and internet is crucial because this enhance the quick lesson delivery and make students be more attracted during the lesson delivery.

2.8. End Unit assessment

All instructions to do the end unit assessment are provided in the students' book. The SQL statements for creating a teacher table and inserting records into the table, as well as different SQL statements used to query the table, are available in the students' book.

2.9. Additional activities

2.9.1. Remedial activities

Consider the following database for a banking enterprise

1. BRANCH (BranchNo, BranchName, BranchCity, Assets)
2. ACCOUNT (AccNo, BranchName, Balance)

i. Create the above tables by properly specifying the primary keys

ii. Enter at least five records for each relation

2.9.2. Consolidation activities

Consider “Customers” relation with the attribute CustomerID, Name, ProductName, Age.

Perform the following tasks:

1. Add new column “sex”
2. Add “Not null” constraint to age field (column)
3. Remove the column “sex”
4. Drop “not null” constraint from age field.

2.9.3. Extended activities

You are given a database named “Library”, with a relation Book (ISBN (Text, primary key), title (text), author (text), pages (number), and price (currency))

1. Create this database and relation and insert at least five records.
2. Retrieve the amount to get when all books are sold.
3. Retrieve the most expensive book.
4. Select the least expensive book
5. Show the total number of the books in book relation.
6. Find the average price of the books

UNIT 3. INTRODUCTION TO VISUAL BASIC

3.1 Key unit competence:

To be able to describe a Visual Basic Integrated Development (VB-IDE) and connect a simple form to a database.

3.2 Prerequisite (knowledge, skills, attitudes and values)

- Students have knowledge and skills related to HTML, database and Microsoft Office programs namely Word, Excel and PowerPoint meaning that they are already familiar with the Office programs menu which are found both in these programs and in Access. These different Office programs were studied in Ordinary level, previous years and the acquired skills were reinforced also in s6 level.
- Before starting this new unit in Senior Six, students first studied the Unit Database Basics. They are therefore familiar with the database table creation and this will facilitate their understanding of the new unit.
- In database, students studied how to create and manipulate the data recorded in database ,This will help to easily understand the concept of database project creation

3.3 Cross-cutting issues to be addressed:

Financial Education:

To be covered when explaining to students cost related to the technical requirements for creating Visual basic project.

Standardization Culture: To be covered when explaining to students that there are standards required in selecting devices to be used to make a VB project.

Inclusive Education: Students with and without disabilities participate and learn together in the same class. Teacher should avail and install appropriate software for vision impairment learners such as Non-Vision Desktop Access (NVDA), Job Access with Speech (JAWS) etc., This will facilitate them to listen what is being done. Keyboard should have some buttons with bumps or nipples for facilitating vision impairment learners to touch easily

Peace and Values Education:

Learners have to work together in harmony even sharing a computer and each has to respect other's project work

3.4 Introductory activity

- **Guidance:**

Instruction to do the introductory activity Guide learners how to plan and gather information for the chosen VB project

Guide learners to computer lab and make sure that VB6.0 is installed in all computers and let them manipulate computers by creating frontend interface as shown in student content s' guide. Guide learners to create a backend with Ms Access as BDMS. Guide learners to open ODBC for database connectivity with VB front end. Facilitate learners to use DAO, Data controls and properties for connecting Database to VB forms. Guide learners to evaluate created front end interface basing on ergonomic rules.

3.5 List of lessons

No	Lesson title	Learning objectives	Number of periods
1	Event Oriented Programming using visual basic	Explain the different Event Oriented Programming in visual	3
2	The Features of Visual Basic	Explain *the Features* of Visual Basic and their usage	3
3	Visual Basic Standard EXE Integrated Development Environment (VB-IDE)	Explain and discover how Visual Basic Standard EXE Integrated Development Environment (VB-IDE) work.	3
4	Controls in Visual Basic: Form, Label, Textbox and Radio Button	Explain and understand Form, Label, Textbox and Radio Button usage	3
5	Controls in Visual Basic: Check box, Command button, image, timer calendar	Explain and understand Check box, Command button, image, timer calendar usage	3
6	Cntrols in Visual Basic: ComboBox, ListBox and Drive	Explain and understand ComboBox, ListBox, ListBox and Drive usage	3
7	Controls in Visual Basic: Frame, Picture Box, File system and director list box	Explain and understand frame, PictureBox, Filesystem and Directory usage	3
8	Planning and Developing a Visual Basic program.	Explain and understand Planning and Developing a Visual Basic program	3
9	VB Project Planning	Explain and understand Planning and Developing a Visual Basic program	3
10	Connecting a visual basic 6.0 project to a database by using ADO	Explain how to connect Visual Basic to database using ADO	3
11	Connect ADODC control to the tables within Access database	Explain how to connect Visual Basic to database using ADO	3
12	Building the interface and accessing the database	Explain how to design friendly and ergonomic user interface	1
	End Unit Assessment		2

LESSON 1: Event Oriented Programming using visual basic

a) Learning Objectives

Explain the different Event Oriented Programming in visual basic

b) Teaching resources

For this lesson to be well conducted students will need to have the ICT student book, Computers with internet connectivity to facilitate research, projector.

c) Prerequisites

Students already learnt Access in the unit "Database basics". they can therefore apply the same reasoning on Event Oriented Programming now to be learned.

d) Learning Activities

- **Guidance:**

- This lesson can be conducted in the computer lab or smart classroom because it have a practical activity
- Teacher asks students to form groups to do the activity 3.1
- The teacher facilitates students as they answer the questions by providing guidance where they have difficulties
- Sample groups present their answers. At the end of the presentation a summary is done.
- The teacher conducts the lesson by building on the students' findings

- **Answer of Activity 3.1**

1) Visual basic
2) User can interact with electronic devices by using graphical user interface (GUI)

e) Application activity 3.1

Answers:

1) a. shutdown = allow proper local or remote shutdown of computer
   b. vol= Display a disk volume label and serial number
   c. ver = Display the windows version
   d. task list = Display all currently task running

2) A web application is any computer program that performs a specific function by using a web browser while They must be developed for and installed on a particular operating system.
3) Click, double click, …
4) Multitasking, Attractiveness, Shortcuts, Easy use, Easy understanding

LESSON 2: The Features of Visual Basic

a) Learning Objective

Explain ***the Features*** **of Visual Basic** and their usage

b) Teaching resources

For this lesson both the students and the teacher will need: Visual Basic setup installed in the computers, internet connectivity or textbooks to facilitate research, projector to present to the class the results of the research, posters showing different examples visual basic features

c) Prerequisites

Students have basic knowledge on Database, this will serve as a basis in better understanding the new lesson.

d) Learning Activities

- **Guidance:**

- This lesson is started by doing the activity 3.2 which serves as an introductory activity to the lesson.
- Students present their findings and a summary on the relational model is done by emphasizing on the different visual basic features outlined in the student book
- As the lesson is concluded, give guidance on how the application activity 3.2 is to be done.

- **Answer of Activity 3.2**

1) Refer to the student book in the topic "the features of visual basic
2) New, Existing, Recent

e) Application activity 3.2

Answers:

1) Interfaces allow you to define features as small groups of closely related properties, methods, and events
2) Standard EXE
3) ActiveX is a set of object-oriented programming technologies and tools that Microsoft developed for Internet Explorer to facilitate rich media playback
4) You receive the all current project opened

LESSON 3: Visual Basic Standard EXE Integrated Development Environment (VB-IDE)

a) Learning Objectives

Explain and discover how **Visual Basic Standard EXE Integrated Development Environment (VB-IDE) work.**

b) Teaching resources

To conduct this lesson, the following resources are needed:

- Textbooks and computers with internet connectivity to facilitate research
- Projector to be used in presenting the results of the research
- Visual Basic setup installed in the computer

c) Prerequisites

Students have basic knowledge on HTML, Database, this will serve as a basis in better understanding the new lesson.

d) Learning Activities

- **Guidance:**

By the guidance of the teacher, students explain the term **VB IDE and** brainstorm on it.

- Students give examples of **Visual basic IDE Elements**

- Individually and under the guidance of the teacher; students discuss the different types of Visual basic IDE Elements and observe them through their computer
- Using visual basic interface Students do questions in the activity 3.3
- The teacher gives guidance on how to do the application activity 3.3

- **Answer of Activity 3.3**

1) A. Title ball, B. Tools ball, C. Form, D. Source code Window, E. Properties Window, F. Project Explorer Window

2) Is container for all the controls that make up the user interface and Use the Code window to write, display, and edit Visual Basic code.

e) Application activity 3.3

Answers:

1) Refer to the student book in the contents of VB IDE
2) a)Check box, you can select multiple options. In Option Button (Radio button) you can select one option
   b)A horizontal scroll bar enables the user to scroll the content of a window to the left or right. A vertical scroll bar enables the user to scroll the content up or down
3) Properties Window is used to change the state of each control using particular properties associated with each control.

LESSON 4: Common controls used in Visual Basic: using: Form, Label, Textbox and Radio Button

a) Learning Objectives

Explain and understand **Form, Label, Textbox and Radio Button** usage

b) Teaching resources

To conduct this lesson, the following resources are needed:

- Textbooks and computers with internet connectivity to facilitate research
- Projector to be used in presenting the results of the research
- Visual Basic setup installed in the computer

c) Prerequisites

Students have basic knowledge on HTML, Database, this will serve as a basis in better understanding the new lesson.

d) Learning Activities

- **Guidance:**

- The lesson starts by doing the activity 3.4 and brainstorming on the current database interface at school and emphasize on its strong and weak points. This can be done in the classroom or students can be allowed to go to the school administration and do a small investigation depending on the available time
- Under the guidance of the teacher students state the results of their investigation which will be like sentences about the database interface of the school, (or from the internet).

- From the sentences of the investigation, students identify how they can design a good interface of the future database interface usage.

- **Answer of Activity 3.4**

1) A. Designed by using Label tools
   B. Designed by using Textbox
   C. Designed by sing option button
2) Activate the textbox of district or sector, in properties click on Forecolour with double click, click on palette and select a color
3) Refer to the contents of student book in the lesson 3.4
4) Refer to the contents of student book in the lesson 3.4

e) Application activity 3.4

Answers:

1) Option button used for selecting one of many answers
2) Cfr note
3) Refer to the contents of student book in the lesson 3.4

LESSON 5: Controls in Visual Basic: Check box, Command button, image, timer calendar

a) Learning Objectives

Explain and understand **Check box, Command button, image, timer calendar** usage

b) Teaching resources

To conduct this lesson, the following resources are needed:

- Textbooks and computers with internet connectivity to facilitate research
- Projector to be used in presenting the results of the research
- Visual Basic setup installed in the computer

c) Prerequisites

Students have basic knowledge on HTML, Database, this will serve as a basis in better understanding the new lesson.

d) Learning Activities

- **Guidance:**

- The lesson starts by doing the activity 3.5 and brainstorming on the current interface command at school and emphasize on its strong and weak points. This can be done in the classroom or students can be allowed to go to the school administration and do a small investigation depending on the available time or use the database interface from internet
- Under the guidance of the teacher, students state the results of their investigation which will be like sentences about the command, check button of the school database interface

- From the sentences of the investigation, students identify how they can design command and check button for future use

- **Answer of Activity 3.5**

a. Command Button
b. Check box button
c. Picture button

e) Application activity 3.5

Answers:

1) Refer to the contents of student book in the lesson 3.5
2) a.
3) a.
4) d.
5) d.

LESSON 6: Controls in Visual Basic ComboBox, ListBox, ListBox and Drive

a) Learning Objectives

Explain and understand **ComboBox, ListBox, ListBox and Drive** usage

b) Teaching resources

To conduct this lesson, the following resources are needed:

- Textbooks and computers with internet connectivity to facilitate research
- Projector to be used in presenting the results of the research
- Visual Basic setup installed in the computer

c) Prerequisites

Students have basic knowledge on HTML, Database, this will serve as a basis in better understanding the new lesson.

d) Learning Activities

- **Guidance:**

- The lesson starts by doing the activity 3.6 and brainstorming on the current interface list (combo box format) at school and emphasize on its strong and weak points. This can be done in the classroom or students can be allowed to go to the school administration and do a small investigation depending on the available time or use the database interface from internet
- Under the guidance of the teacher, students state the results of their investigation which will be like sentences about the command, check button of the school database interface
- From the sentences of the investigation, students identify how they can design combobox list button for future use

- **Answer of Activity 3.6**

1. List, Option button

e) Application activity 3.6

Answers:

Refer to the contents of student's book lesson 3.6

LESSON 7: Common controls used in Visual Basic: using Frame, Picture Box, File system and director list box

a) Learning Objectives

Explain and understand frame, PictureBox, Filesystem **and Directory** usage

b) Teaching resources

To conduct this lesson, the following resources are needed:

- Textbooks and computers with internet connectivity to facilitate research
- Projector to be used in presenting the results of the research
- Visual Basic setup installed in the computer

c) Prerequisites

Students have basic knowledge on HTML, Database, this will serve as a basis in better understanding the new lesson.

d) Learning Activities

- **Guidance:**
  - The lesson starts by doing the activity 3.7 and brainstorming on how file and directory are accessed.
  - Under the guidance of the teacher, students study how data can be uploaded and use in visual basic
  - From the skills observed, students identify how they can upload file, directory as well as using Frame button for future use
- **Answer of Activity 3.7**

1. Refer to the contents of student book in the lesson 3.7
2. A. you can add a picture in your documents by copying and pasting it in your document
   B. In visual basic you can add a picture in visual basic form by using
   Picture1.Picture = Load Picture("C:\test.bmp")

e) Application activity 3.7

Answers:

1st and 2nd question can be answered by referring to the contents of student's book

LESSON 8: Planning and Developing a Visual Basic program.

a) Learning Objectives

Explain and understand **Planning and Developing a Visual Basic program**

b) Teaching resources

To conduct this lesson, the following resources are needed:

- Textbooks and computers with internet connectivity to facilitate research
- Projector to be used in presenting the results of the research
- Visual Basic setup installed in the computer

c) Prerequisites

Students have basic knowledge on HTML, Database, this will serve as a basis in better understanding the new lesson.

d) Learning Activities

- **Guidance:**

The lesson starts by doing the activity 3.8 and run a simple program in any programming language.

- This can be done in the smart classroom and run the program
- individually students explain the output and steps used for having the output.
- By the guidance of the teacher, students run a program will display a text in visual basic
- Using visual basic interface Students do questions in the activity 3.8
- The teacher gives guidance on how to do the application activity 3.8

- **Answer of Activity 3.8**

Activity 3.8

1. A. Label is used to provide information to the user
   b. Text Box is used to receive and display input and output from and to the use
   c. Command button is used to cause an event to happen.
2. Instructions (code) inside command1 code window.
3. The instructions contain errors
4. write instructions or code correctly.

e) Application activity 3.8

Answers:

1. to design a form refer to the student book contents
2. Design a form like above using all possible control and its proportional properties.

Coding a program.

```
Private Sub cmdadd_Click()
txtnames.Text = “”
txtage.Text = “”
Cmbgender.Text = “”
Cmbcombination.Text = “”
Cmbclass.Text = “”
txtamount.Text = “”
lblreturn.Caption = “”
End Sub
Private Sub cmdcal_Click()
lblreturn.Caption = Val(txtamount.Text) * 3 / 100 + txtamount
End Sub
```

```
Private Sub cmdexit_Click()
 Unload Me
End Sub
Private Sub cmdsave_Click()
lstborrowers.AddItem txtnames & " " & txtage & " " & Cmbgender & " " &
Cmbcombination & " " & Cmbclass & " " & txtamount & " " & lblreturn
End Sub
Private Sub Form_Load()
Cmbclass.AddItem "S1"
Cmbclass.AddItem "S2"
Cmbclass.AddItem "S3"
Cmbclass.AddItem "S4"
Cmbclass.AddItem "s5"
Cmbclass.AddItem "S6"
Cmbgender.AddItem "MALE"
Cmbgender.AddItem "FEMELE"
Cmbcombination.AddItem "O level"
Cmbcombination.AddItem "EKK"
Cmbcombination.AddItem "MCE"
Cmbcombination.AddItem "PCM"
Cmbcombination.AddItem "MEG"
Cmbcombination.AddItem "MPG"
End Sub
```

LESSON 9: VB Project Planning

a) Learning Objectives

Explain how to connect Visual Basic to database using ADO

b) Teaching resources

To conduct this lesson, the following resources are needed:

- Textbooks and computers with internet connectivity to facilitate research
- Projector to be used in presenting the results of the research
- Visual Basic setup installed in the computer

c) Prerequisites

Students have basic knowledge on HTML, Database, this will serve as a basis in better understanding the new lesson.

d) Learning Activities

- **Guidance:**

- The teacher organizes learners into pairs and instructs them to answer questions in the activity 3.9
- The teacher gives guidance wherever learners want one.
- The teacher invites pair to present their findings by using a projector
- The teacher asks students to evaluate findings and decide whether the form designed sufficient

- **Answer of Activity 3.9**

1. Is for helping him to manager client's information
2. A. Add new is used for adding a new record
   B. Display is used for displaying client's information
   C.EXIT is used for closing the window

e) Application activity 3.9

Answers:

1. a. User Interfaces

Describe the logical characteristics of each interface between the software product and the users.

b. Hardware Interfaces

Describe the logical and physical characteristics of each interface between the software product and the hardware components of the system.

c. Software Interfaces

Describe the connections between this product and other specific software components (name and version), including databases, operating systems, tools, libraries, and integrated commercial components.

2. Question number 2 and 3 refer to the contents of student book

LESSON 10: Connecting a VB 6.0 project to a database by using ADO

a) Learning Objectives

Explain how to connect Visual Basic to database using ADO

b) Teaching resources

To conduct this lesson, the following resources are needed:

- Textbooks and computers with internet connectivity to facilitate research
- Projector to be used in presenting the results of the research
- Visual Basic setup installed in the computer

c) Prerequisites

Students have basic knowledge on HTML, Database, this will serve as a basis in better understanding the new lesson.

d) Learning Activities

- **Guidance:**

- The teacher organizes learners in group of 4 and instructs them to answer questions in the activity 3.10
- The teacher gives guidance wherever learners want one.
- The teacher invites pair to present their findings related to the steps of connecting VB TO adodc by using a projector
- The teacher asks students to run the steps for founding the results

- **Answer of Activity 3.10**

1. Front End
2. It can be possible by using ADO and DataGrid

e) Application activity 3.10

Answers:

1. Move next used for accessing the next record
   Move previous used for return back to the previously
2. Question number 2 and 3 Refer to the contents of student book

LESSON 11: Connect ADODC control to the tables within Access database

a) Learning Objectives

Explain how to connect Visual Basic to database using ADO

b) Teaching resources

To conduct this lesson, the following resources are needed:

- Textbooks and computers with internet connectivity to facilitate research
- Projector to be used in presenting the results of the research
- Visual Basic setup installed in the computer

c) Prerequisites

Students have basic knowledge on HTML, Database, this will serve as a basis in better understanding the new lesson.

d) Learning Activities

- **Guidance:**

- The teacher organizes learners in group of 4 and instructs them to answer questions in the activity 3.11
- The teacher gives guidance wherever learners want one.
- The teacher invites pair to present their findings related to the steps of connecting adodc to table by using a projector
- The teacher asks students to run the steps for founding the results

- **Answer of Activity 3.11**

1) Connect adodc to databse
2) Connect datagrid to the databse
3) Connect text box to the table
4) Write the commands in command buttons

e) Application activity 3.11

Answers:

Refer to the contents of student's book for question 1,2 and 3

LESSON 12: Building the interface and accessing the database

a) Learning Objectives

Explain how to design friendly and ergonomic user interface

b) Teaching resources

To conduct this lesson, the following resources are needed:

- Textbooks and computers with internet connectivity to facilitate research
- Projector to be used in presenting the results of the research
- Visual Basic setup installed in the computer

c) Prerequisites

Students have basic knowledge on HTML, Database, this will serve as a basis in better understanding the new lesson.

d) Learning Activities

- **Guidance:**

- The teacher organizes learners in group of 4 and instructs them to answer questions in the activity 3.12
- The teacher gives guidance wherever learners want one.
- The teacher invites pair to present their form
- The teacher asks students to select the one designed with all condition

- **Answer of Activity 3.12**

1) Clear, Concise, Familiar, Responsive, Consistent, Attractive, Efficient
2) Refer to the contents of students book

e) Application activity 3.12

Answers:

1. What ergon and nomoi means
   a. ergon, meaning work
   b. nomoi, meaning natural laws,.
2. Describe

1. Ergonomics reduces costs.

By systematically reducing ergonomic risk factors, you can prevent costly
2. Ergonomics improves productivity.

The best ergonomic solutions will often improve productivity. By designing a job to allow for good posture, less exertion, fewer motions and better heights and reaches, the workstation becomes more efficient.

3. Ergonomics improves quality.

Poor ergonomics leads to frustrated and fatigued workers that don't do their best work. When the job task is too physically taxing on the worker, they may not perform their job like they were trained. For example, an employee might not fasten a screw tight enough due to a high force requirement which could create a product quality issue.

3. Question number 3 and 4 Refer to the contents of student book lesson 3.12

3.6. Unit summary

In this unit we have seen all steps to Describe Requirement Analysis and Project Planning as well as creating and connecting both frontend and backend. At the end of this unit teacher has to make sure if all learners are able to connect Visual Basic Interface to Database and create a simple Visual Basic standard desktop application for a real-life situation using appropriate tools, objects and properties.

3.7. Additional information

To teach lessons of this unit, teacher has to make computer lab ready and download at least one shareware for visually impaired learners such as Non-Vision Desktop Access (NVDA) if they are in his classroom. Teachers has to give enough homework about a taught lesson to help learners to improve their understanding. For more details about this unit teacher can do an internet research and reading textbook concerning this unit as it is referred to the appendix of this book.

3.8. End Unit assessment

This part provides the answers of end unit assessment activities designed in integrative approach to assess the key unit competence with cross reference to the textbook. The teacher's guide suggests additional questions and answers to assess the key unit competence.

Lab activity:

As a student of S6 in general Education, you get a chance to do an internship at your sector's health centre and the Director of health center asks you to create a program for health centre that will help them register patients by recording patient and administer drugs.

How do you think you will fulfil your task using VB?

Answers: in this project follow the same steps to create frontend and backend then you connect them (Unity 3 in student book)

3.9.Additional activities

3.9.1. Remedial activities

Remedial Activities: Suggestion of Questions and Answers for remedial activities for slow learners.

1. Suppose you have connected your VB project to Ms Access database, give the syntax and example of:

a) to add a record into your database

b) to delete a record by preventing the blank record Answer:

a) Add record into a database To add a record into a database we use the method AddNew. Syntax :Controlname.RecordSet.AddNew Ex. Adodc1.RecordSet.AddNew
b) Delete a record To delete a record, we use delete method: Private Sub CmdDelete_Click() Adodc1.RecordSet.Delete End Sub NOTE: To prevent the display of blank record, we move the record: Private Sub CmdDelete_Click() Adodc1.Recordset.Delete

3.9.2. Consolidation activities

1) What is a list control in visual basics 6.0? what is its default setting for name property?

Answer:

A list control in Visual Basics 6.0 is a control which helps to displays data on vertical list of items. The list default setting for name property is list1

2) What is a ComboBox control in VB 6.0?

Answer:

A ComboBox control is a combination of textbox control and a ListBox control on only one entity. It allows to add entries or to select from a list of predefined values.

3) What is the use of a DriveListBox?

Answer:

A DriveListBox is used to display a list of drives available in your computer.

4) Respond that questions using True or False:

a) A directory list box is used to display the list of files in a selected drive. Answer: FALSE
b) A ComboBox is used to display the list of files in a selected directory or folder. **Answer: FALSE**
c) A menu is an on-screen list of available functions or operations that can be performed currently. **Answer: TRUE**
d) ADO (Activex Data Object) is a control which helps us to access a data grid offering the possibility of working on different data sources such as text files, relational data base etc. **Answer: FALSE**
e) Which modes that VB6 operates in?

Answer:

- **Design mode:** Used to build application
- **Run mode:** Used to run the application
- **Break mode:** Application halted and debugger is available

3.9.3. Extended activities.

1. Write a program which contain Fist Name, Last Name, Age and Gender in label and its written in textbox and when make save it display in Listbox.

UNIT 4: INTRODUCTION TO WEB DESIGNING

4.1. Key unit competence:

Create static websites using HTML

4.2. Prerequisite knowledge and skills:

Students should have knowledge and skills related to Internet concept, Search engines learnt in Senior 1, Unit 8: Network and internet fundamentals; URL and its parts (protocol, host name, domain name, sub domain) and Search on the internet learnt in Senior 4, Unit 3: Social media and Online Services learnt in Senior 5.

4.3. Cross-cutting issues to be addressed:

Throughout every lesson, cross cutting issues must be addressed. Addressing cross cutting issues makes a lesson not to be an isolated entity but relate the lesson with the issues in real world. Here below are some cross-cutting issues to be addressed:

Inclusive Education: All students (those with and with no disabilities) are involved in the same class during teaching and learning process.

Gender education: To be covered when both (girls and boys) are involved in all learning and application Activity in a class.

Financial Education: Students must be aware of cost related to website design and implementation while choosing web server to host a web site.

Peace and value education: Students must be aware of internet-based crimes like hacking and prevent accessing people's data without permission committed using computer on different websites. They must also use the photo of others with their permissions, if not this can cause conflict.

Standardization culture: Students must have the culture of not taking from and keeping pictures on their website that are against Rwandan culture.

4.4 Guidance on the introductory activity

- This activity take place in the computer lab (where students can access the Internet) and each student must have a computer connected to the Internet where it is possible.
- The teacher instructs students to go to page where the introductory activity is in the textbook.
- The teacher organizes students into groups.
- Teacher lets students discuss about the photo observed
- The teacher asks students to do the introductory activity in their respective groups.
- Teacher lets the students work independently on the activity.
- The teacher moves around to see how students are working and provides guidance to needy groups
- The teacher invites representatives of groups to presents their findings
- The teacher asks students to evaluate findings.
- The teacher tells the students that in the fourteen coming lessons they will have complete answers.

Answer of introductory activity

1. Students observe the figure in their book and answers vary because they will respond according their experience. Students are browsing the Internet in the school computer lab or in cybercafé.
2. Students may give various names such as: www.umuravahighschool.ac.rw, www.umuravaschool.ac.rw
3. In order to delete information on the website it depends on your user privilege if you are an administrator you will be able to delete the content because you have full privilege (Read, delete, update and other) and if you are a user (Naïve User) you cannot delete the anything from the website. Note that the content cannot be deleted in the normal way by writing the website address in the browser.
4. Advantage of a website

• Reaching a wider audience
• Easy access to business information
• Publicity & advertising

5. Disadvantage of a website

- Crashes & uptime
- Difficultly reaching the right people
- Spam

1. Here are the five elements to web design: content, usability, aesthetics, visibility, interaction.

1.5. List of lesson

#	**Lesson title**	**Learning objectives**	**Number of periods**
1	Understanding of basic concepts	Explain the difference between website, web page, web application	1
2	Introduction and evolution of HTML	Explain what is HTML and its evolution.	1
3	HTML tags and syntax	Explain HML tag and syntax	1
4	HTML syntax and html page structure	Use HTML tags to create a static web page	1
5	Design a static web page using HTML tags and hyperlinks	Appreciate the use of different tags used to create a web page	1
6	Tags that identify and name documents	Identify and describe tags that identify and name documents	1
7	HTML lists: ordered and unordered list	Appreciate the use of and html tags which create ordered and unordered list pages.	2
8	HTML lists: definition and nested lists	Appreciate the use of <dl> , and html tags which create definition and nested lists web pages	1
9	HTML frame and table tags	Identify and describe HTML tags that create frames and tables	2
10	HTML forms	Identify and describe different form elements that create a form page	2
11	Particularities of HTML 5	Explain specifications of HTML5	1

12	Creation of links	Appreciate the use of <a> tag that creates an hyperlink	1
13	Back end vs Front end	Explain what is Front end and Back end in website design and development	1
14	**End Unit assessment**		2

LESSON 1: Understanding of basic concepts

a) Learning objectives

Explain the difference between website, web page, web application

b) Teaching resources

Computer lab, internet, textbooks to facilitate the research

c) Prerequisites

Students are now familiar with using different search engines and internet programs like web browsers which they learnt in Senior 4. They can therefore apply the same reasoning in this lesson.

d) Learning activities:

- **Guidance on activity 4.1**
  - Teacher organizes Students in groups in order to do activity.
  - Students elect the group leader and secretary.
  - Teacher lets the students in groups work independently on the activity.
  - Teacher walks around and sees if students are doing activity in their respective groups.
  - Students react on the finding/ answers from other groups.
  - Teacher corrects false answers and continue the lesson
- **Answers of activity 4.1**

1. Find the answer in student text book, first lesson (Definitions of basic concepts)
2. For the difference between statistic and dynamic web pages refer to student book, first lesson (understanding of basic concepts)
3. Advantages of a static web page and dynamic web page

Advantages of a static website

- **Saves Time:** Development of static websites saves time, because static websites are easy to develop.

- **Money saving approach**: Static websites are money saving, because such websites are cheaper to develop as compared to dynamic websites.
- **Hosting:** Static websites are easier to host, because static websites have fixed data.
- **Indexing:** Search engines such as Google, Bing etc., can easily index a static website.
- **Fast Transfer:** Static websites can be quickly transferred from server to client without much processing time.

Advantages of a Dynamic Website

- **Simple to update:** Dynamic websites are simpler to update. You don't need expert knowledge to make changes to a dynamic website.
- **User-focused design:** Dynamic websites are built by keeping users in minds. Users can make preferred changes to such websites.
- **Highly responsive:** Dynamic websites can be quickly updated to become responsive to different screen sizes.
- **Highly functional:** Dynamic websites are highly functional. Users can make many changes to dynamic websites.
- **SEO (Search Engine Optimization) friendly Design:** Dynamic websites are SEO-friendly.

e) Answers of application activity 4.1

By guidance of the teacher, students answer the question of application activity 4.1

1. Website and web application characteristics refers to student textbook.
2. Definition of web application (refers to textbook)

Example: Irembo application

3. Web application is more advantageous comparing to website.

Web application involves application program which performs various operation.

4. Difference between static web pages and dynamic page refers to student text book
5. It is easier to update dynamic web site comparing to static website because it is convenient for dynamic website to use a CMS (content Management System) web interface for managing content which will allow you to make changes easily.
6. It is very cheap to host static website in comparison with dynamic website as it does not require a lot of parts and more maintenance.

LESSON 2: Introduction and evolution of HTML

a) Learning objectives

Explain what is HTML and its evolution.

b) Teaching resources

Computer lab with internet, textbooks to facilitate the research

c) Prerequisites

Students have already knowledge and skills about URL and its parts (protocol, host name, domain name, sub domain and search on the internet learnt in Senior 4, Unit 4: Searching the internet. They have also knowledge about website, web page, web application and static web page learnt in lesson 4.1.

d) Learning activity:

- **Guidance** The teacher instructs students to go to page where the activity 4.2 is in the textbook.
    - The teacher organizes students into groups.
    - Teacher let students discuss questions of activity.
    - The teacher moves around to see how students are working and provides guidance to needy groups
    - Teacher invites 2 or 3 group representatives to present their findings to the rest of class.
    - Teacher reacts on answers given by students.
    - Based on the answers from students, teacher introduces the lesson.

- **Answers of activity 4.2**

1. a. WWW stands for World Wide Web

   b. HTML stands for Hypertext Markup Language

2. The World Wide Web is an internet-based system or platform that allows *hypertext documents* to be interconnected by *hyperlinks.*

3. HTML elements tell the browser how to display the content. Detailed accounts on the importance of HTML can be got by doing a research

4. HTML evolution is discussed in student text book

e) Answers of application activity 4.2

By guidance of the teacher, students answer the question of application activity 4.2

1. **HTML** is not a programming language but can be thought of as a presentation language. Because it is used to instruct the browser on how to present text and multimedia content on the Web.

2. **Hypertext** is text displayed on a computer display or other electronic devices with references (hyperlinks) to other text that the reader can immediately access.

Hypertext can be defined as text that links to other information. By clicking on a link in a hypertext document, a user can quickly jump to different content.

While **hyperlink** is a text, phrase or image that you click to go to another web page or a section within the current page or to another website.

3.**The particularities of XHTML over HTML4.01**

- XHTML support mobile web application
- The browser will make no assumptions and will allow you, your mistakes.
- XHML allows you to create your own self-descriptive tags, or language, that suits your application.

4. Discuss the advantages of HTML 5 comparing to the previous HTML versions.

HTML5 is the fifth revised and newest version of HTML standard offering new features that support multimedia content more effectively than the previous versions.

- **HTML5** supports majority of browsers.
- **HTML5** doctype is a short statement
- **HTML5** comes with Media elements and new input elements

LESSON 3: HTML tags and syntax

a) Learning objectives

- Explain HTML tag and its syntax
- Appreciate the use of HTML tags to create a static web page

b) Teaching resources

Computer lab with internet, textbooks to facilitate the research

c) Prerequisites

Students have now knowledge and skills about HTML. As they learnt in lesson3: Introduction and evolution of HTML, they can therefore apply the same reasoning on understanding HTML tag and its role.

d) Learning activity

- **Guidance**
  - Teacher organizes students in groups in order to do activity.
  - Teacher walks around and sees if students are doing activity in their respective groups
  - Teacher lets students discuss the syntax and the role of HTML tag.
  - Teacher invites 2 or 3 group representatives to present their findings to the rest of class.
  - Teacher reacts on answers given by students.
  - Based on the answers from Students, teacher introduces the lesson.

- **Answer of activity 4.3**

1. HTML tag is an element name surrounded by angle brackets that has following usage:
   - The <html> tag tells the browser that this is an HTML document.
   - The <html> tag represents the root of an HTML document.
   - The <html> tag is the container for all other HTML elements (except for the <!DOCTYPE> tag)
2. The syntax of an HTML tag is: <tag_name>content goes here...</tag_name>
3. The role of an HTML attribute
   - An ***attribute*** is used to define the property or characteristics of an element inside the element's opening tag.
   - Attributes provide additional information about HTML elements

• An attribute either modifies the default functionality of an element type or provides functionality to certain element types unable to function correctly without them.

e) Answers of application activity 4.3

1. HTML tag has this syntax:<tag_name>content goes here...</tag_name>
   - <tag_name> is the first tag
   - </tag_name> is the end tag
   - The content is written inside between the two tags
2. Attributes define additional characteristics or properties of the element such as width and height of an image. Attributes are always specified in the start tag (or opening tag) and usually consists of name/value pairs like name=”value”. Attribute values should always be enclosed in quotation marks.
3. Given this HTML statement: <font color=” green “> Hello Rwanda Color is an attribute name Green is an attribute value

There Hello Rwanda will be displayed in green font color into a browser.

LESSON 4: HTML syntax and HTML page structure

a) Learning objectives

Appreciate the use HTML tags to create a static web page
Explain the HTML page structure

b) Teaching resources

Computer lab with internet, textbooks to facilitate the research

c) Prerequisites

Students have now enough knowledge on HTML tags. With this, they can apply the same reasoning on explaining each HTML tag of HTML page syntax.

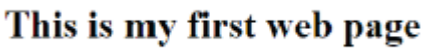
d) Learning activity:

- **Guidance**

- Teacher groups students into small groups so that they share ideas on questions asked in activity 4.4
- Teacher walks around the group to guide the groups and to make sure every member is participating
- In their respective groups, the students discuss also about every element of HTML page syntax.
- Group representative has to present their finding on the asked questions to the rest of the class
- With answers from students, a teacher introduces a lesson.

- **Answers of activity 4.4**

By guidance of the teacher, students answer the question of activity 4.4. students write down code in HTML editor and then save as .html. The result is displayed as below:



e) Answers of application activity 4.4

1. <DOCTYPE html> start every web page because it is a declaration line, it tells to the browser a type of html version is used.
2. Give HTML tags found between <head>……</head> tags
   a. <title…</title>
   b. <style>…</style>
   c. <meta>
3. Here below is html code that displays the name of my school:

```
<! DOCTYPE html>
<html>
<head>
<title> my school </title>
</head>
<body>
<h1> UMURERWA FRANCINE <h1>
<h1> Ecole Secondaire UMURAVA<h1>
</body>
</html>
```

LESSON 5: Design a static web page using html tags and hyperlinks

a) Learning objectives

- Identify and describe the html tags that create a static web page
- Appreciate the use of different tags used to create a web page

b) Teaching resources

Computer lab with internet, textbooks to facilitate the research

c) Prerequisites

Students are now familiar with HTML tags. Hence they can apply their skills on design a static web page.

d) Learning activity

- **Guidance**
  - Teacher groups students into small groups so that they share ideas on questions asked in activity 4.5
  - Teacher walks around the group to guide the groups and to make sure every member is participating
  - In their respective groups, the students, using internet they discuss on different steps followed when you create and execute a web page.

- Group representative has to present their finding on the asked questions to the rest of the class
- With answers from students, a teacher introduces a lesson.

Answers of activity 4.5

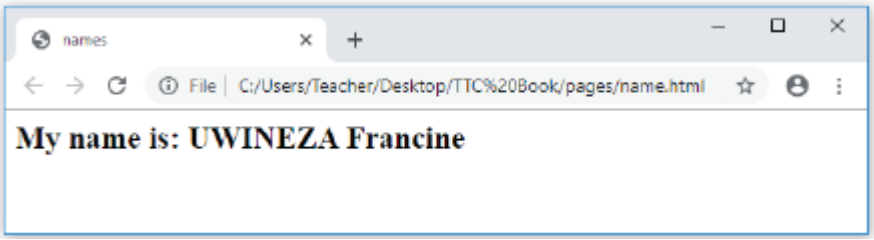
By guidance of the teacher, Students try to create and save the web page and run it in HTML editor. The result is displayed as below:

e) Answers of application activity 4.5

1. HTML code that displays a name:

```
<! DOCTYPE html>
<html>
<head>
<title>names</title>
</head>
<body>
<p><h2>My name is: UWINEZA Francine</h2> <p>
</body>
</html>
```

2. The output of the above html document:



LESSON 6: Tags that identify and name documents

a) Learning objectives

- Identify and describe the html tags that identify and name documents
- Appreciate the use of different tags that identify and name documents to create an html document

b) Teaching resources

Computer lab with internet, textbooks to facilitate the research

c) Prerequisites

Students are now familiar with HTML tags and page structures learnt in previous lessons. Therefore, they can apply the same reasoning to create a web page with tags that identify and name a document.

d) Learning activity:

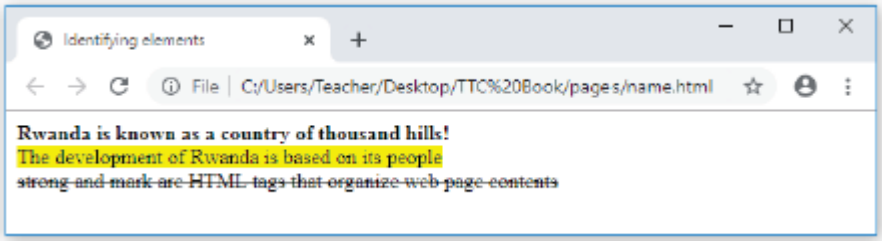
- **Guidance**
  - Teacher groups Students into small groups so that they share ideas on questions asked in activity 4.6

- Teacher walks around the group to guide the groups and to make sure every member is participating
- In their respective groups, the Students, using internet they discuss on different steps followed when you create and execute a web page.
- Group representative has to present their finding on the asked questions to the rest of the class
- With answers from students, a teacher introduces a lesson.

- **Answers of Activity 4.6**

By guidance of the teacher, Students try to create and save the given HTML code and run it.

1. The output of given html code:



- The tag is used to separate the text from the rest of the content. Browsers traditionally bold the text found within the tag.
- The <**mark**> **tag** is one of the HTML5 elements. It marks a part of the text **which** has relevance. It can be used to highlight text for showing emphasis.
- The <del> tag is used to identify text that has been deleted from a document but retained to show the history of modifications made to the document.

2. HTML tags for changing text color is <font> and the HTML tag for inserting a picture is <img>

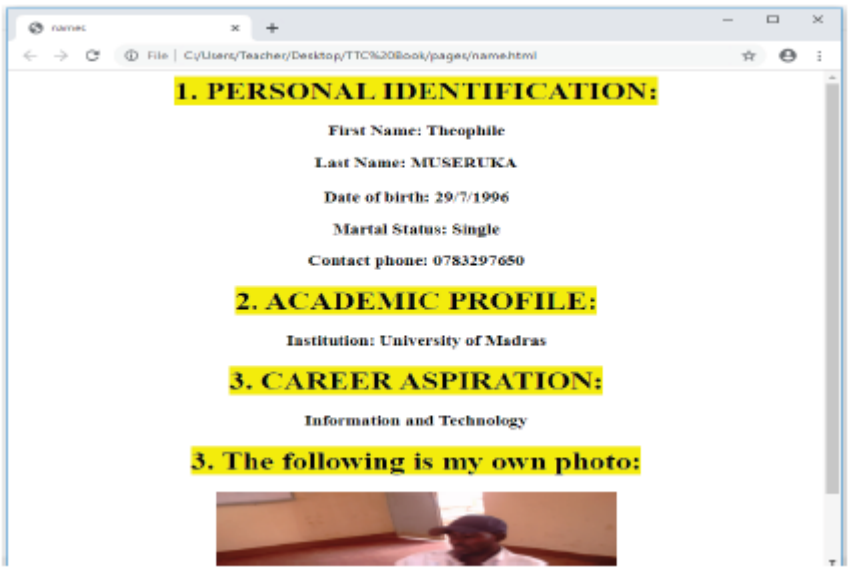
e) Answers of application activity 4.6

1. a,b,c,d) Html document which displays your description, academic profile, career aspiration and your photo:

```
<! DOCTYPE html>
<html>
<head>
<title>names</title>
</head>
<body>
<center>
<p><h1><font color=”Red”><mark>1. PERSONAL
  IDENTIFICATION:</mark></ font></font></h1></p>
<p> <h3> First Name: Theophile </h3></p>
```

```
    <p> <h3> Last Name: MUSERUKA </h3></p>
    <p> <h3> Date of birth: 29/7/1996 </h3></p>
    <p> <h3> Martal Status: Single </h3></p>
    <p> <h3> Contact phone: 0783297650 </h3></p>
    <p><h1><font color="Red"><mark>2. ACADEMIC
       PROFILE:</mark></font></ font></h1></p>
    <p> <h3> Institution: University of Madras </h3></p>
    <p><h1><font color="Red"><mark>3. CAREER
       ASPIRATION:</mark></font></ font></h1></p>
<p> <h3> Information and Technology</h3></p>
<p><h1><font color="Red"><mark>3. The following is my own
   photo:</mark></ font></font></h1></p>
    <img src="pic.jpg" width =30% height=30% alt="My own photo">
    </center>
    </body>
</html>
```

The output:



2. a. **Color attribute** sets a font color of a text
   b. **Size attribute** sets a font size of a text

3. The **src** in the < img> tag is an important attribute that specifies the location (source) or URL of the image you want to insert onto the page.

- The **alt** attribute specifies alternate text for an image, if the browser cannot display or locate the image.

- The **align** attribute is used to align an image on top, bottom, left or right of the browser window.

LESSON 7: HTML lists: Ordered and Unordered list

a) Learning objectives

- Identify and describe the html tags that organize web page contents.
- Appreciate the use of different tags that organize web page contents in website creation.

b) Teaching resources

Computer lab with internet, projector, textbooks to facilitate the research

c) Prerequisites

Students are now familiar with HTML tags that identify and name documents learnt in lesson 7. Therefore, they can apply the same reasoning to create a web page with tags that organize web page contents especially creation of ordered and unordered list pages

d) Learning activity

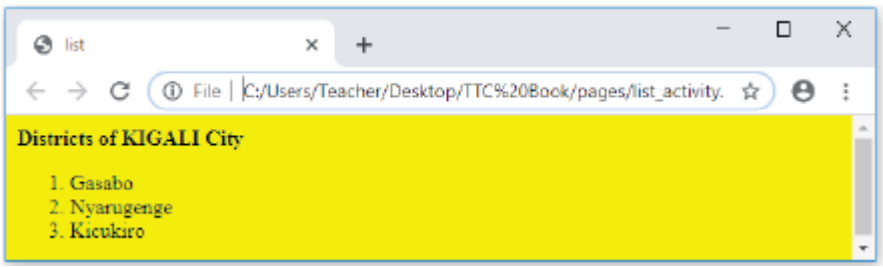
●Guidance:

- Teacher groups students into small groups so that they share ideas on questions asked in activity 4.7
- Teacher walks around the group to guide the groups and to make sure every member is participating.
- In their respective groups, the students, using internet they discuss on different ways used while organizing an HTML web page contents.
- Group representative has to present their finding on the asked questions to the rest of the class
- With answers from students, a teacher introduces a lesson.

Answers of activity 4.7

1. Students write code in HTML editor and save the given HTML code and run it.

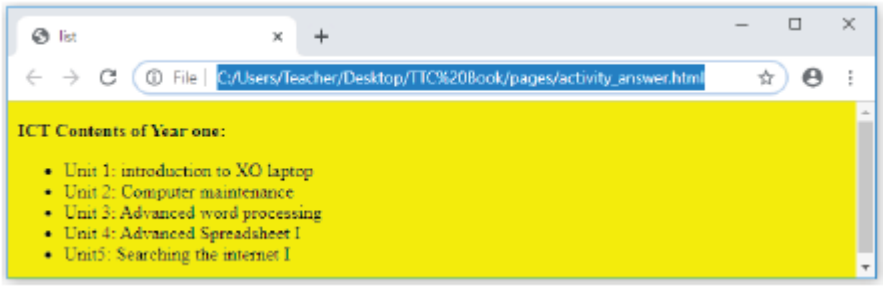
Output of a given html code:



The web page content is organized in ordered list.

e) Answers of application activity 4.7

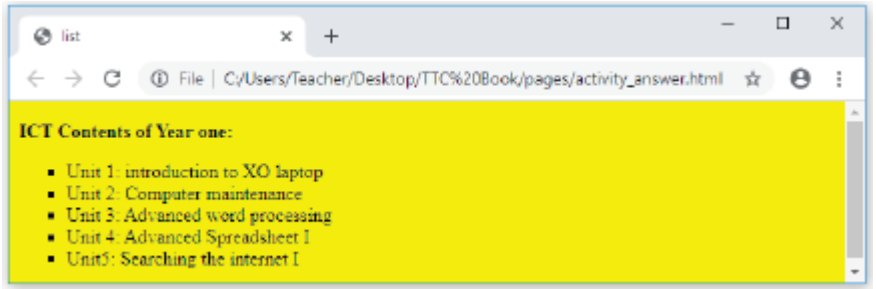
1. The given HTML code displays unordered list of 5 items as shown on the following figure.



2. The HTML document below, displays unordered list of 5 items using square bullet types.

```
<! DOCTYPE html>
<html>
<head>
<title>list</title>
</head>
<body bgcolor=”yellow”>
<p><Strong> ICT Contents of Year one:</strong></p>
<ul type=”square”>
<li>Unit 1: introduction to XO laptop </li>
<li>Unit 2: Computer maintenance </li>
  <li>Unit 3: Advanced word processing </li>
    <li>Unit 4: Advanced spreadsheet I </li>
    <li>Unit5: Searching the internet I </li>
    </ul>
    </body>
    </html>
```

This HTML code displays the following in a browser:



LESSON 8: HTML lists: Definition and Nested lists

a) Learning objectives

Appreciate the use of <dl> , and <ul> html tags which create definition and nested lists web pages.

b) Teaching resources:

Computer lab with internet, textbooks to facilitate the research

c) Prerequisites

Students are now familiar with HTML tags that organize web page content into ordered and unordered lists learnt in previous lesson 7. Therefore, they can apply the same reasoning on creating a definition list page.

d) Learning activity:

- **Guidance**

  - Teacher groups students into small groups so that they share ideas on questions asked in activity 2.8
  - Teacher walks around the group to guide the groups and to make sure every member is participating.
  - In their respective groups, the students discuss on answers of activity.
  - Group representative has to present their finding on the asked questions to the rest of the class
  - With answers from students, a teacher introduces a lesson.

- **Answers of activity 4.8**

1. The list is defined as a definition list. A definition list is a list which present a glossary of terms, or other lists like dictionary and encyclopedia.
2. Below are codes to display the definition list

```
<!DOCTYPE html>
<html>
<head>
<title>Definition list </title>
</head>
<body>
<dl>
<dt><b>RDB </b></dt>
<dd>RDB stands for Rwanda Development Board </dd>
<dt><b>RURA </b></dt>
<dd> RURA stands for Rwanda Utilities Regulatory Authority </dd>
<dt><b>RGB </b></dt>
<dd>RGB stands for Rwanda Governance Board</dd>
<dt><b>RSB</b></dt>
<dd>RSB stands for Rwanda Standards Board</dd>
</dl>
</body>
```

</html>

e) Answer of application activity 4.8

1) Students differentiate Definition and Nested list by referring themselves to the student book or doing additional research using internet or textbooks
2) Students create a HTML code that displays a page like the one shown in the student book

LESSON 9: HTML frame and table tags

a) Learning objectives

Identify and describe HTML tags that create frames and tables.

b) Teaching resources:

Computer lab with internet, textbooks to facilitate the research

c) Prerequisites

Students are now familiar with HTML tags that organize web page content the knowledge and skills about frames and table creation using HTML.

d) Learning activity:

- **Guidance:**
  - Teacher groups students into small groups so that they share ideas on questions of activity
  - Teacher walks around the group to guide the groups and to make sure every member is participating. - In their respective groups, the Students discuss on answers of activity.
  - Group representative has to present their finding on the asked questions to the rest of the class
  - With answers from students, a teacher introduces the lesson.

- **Answers of activity 4.9**

With teacher guidance, students find out answers of the activity:

1. Parts of a web page or a browser that display the content independent of its container are called **frames.**
2. HTML tags that create a table:

<!DOCTYPE html>
<html>
<head>
<title> Table in HTML </title>
</head>

```
<body>
<table border="1">
<tr>
<th>Nothern Province</th>
<th>East Province </th>
<th>West Province</th>
<th>South Province</th>
</tr>
<tr>
<td>Musanze</td>
<td>Bugesera</td>
<td>Rubavu</td>
<td>Nyanza</td>
</tr>
<tr>
<td>Gicumbi</td>
<td>Kirehe</td>
<td>Karongi</td>
<td>Ruhango</td>
</tr>
</table>
</body>
</html>
```

e) Answers of application activity 4.9

1. **a) <Frameset> tag** creates a group of frames to which web pages and media can be directed.

   b) <caption>…</caption> used to create the table caption

   c) Colspan attribute specifies the number of columns a cell should span.

d) <th> tag is used to create the table heading

2. Here below is an html document that creates web page with three frames:

```
<!DOCTYPE html>
<html>
<head>
<title>HTML Frames</title>
</head>
<frameset rows="30%,40%,30%">
<frame name="top" src="TOP.html" />
<frame name="main" src="MAIN.html" />
<frame name="bottom" src="BOTTOM.html" />
<noframes>
<body>
Your browser does not support frames. </body>
</noframes>
</frameset>
```

</html>

Its output is:

3. This html table page:

SAVE PARENTS'SCHOOL ADMINISTRATION STAFF

Employee's information						
RegNo	**Firstname**	**Lastname**	**Phone**	**Age**	**Position**	**Salary**
11	Jean Claude	UWIHANGANYE	0783297650	45	Head Teacher	400000Rwf
19	Diedonne	KAYIBANDA	0784298651	55	Head of Studies	300000Rwf
7	Pelagie	MUKANDORI	0784228661	51	Head of Discipline	250000Rwf
12	Dhalie	NIZEYIMANA	0780615775	35	Accountant	200000Rwf

Is created by the following HTML document:

```
<! DOCTYPE html>
<html>
<head>
<title>Table attributes </title>
</head>
<body>
<table border=”2” cellpadding=”2” cellspacing=”2”
width=”600”height=”100”>
<Caption><b> SAVE PARENTS’SCHOOL ADMINISTRATION STAFF</b></
caption><BR>
<tr>
<th colspan=7> Employee’s information</th>
</tr>
<tr>
<th>RegNo</th>
<th>Firstname</th>
<th>Lastname</th>
<th>Phone</th>
```

<th>Age</th>
<th>Position</th>
<th>Salary</th>
<tr>
<td>11</td>
<td>Jean Claude</td>
<td>UWIHANGANYE</td>
<td>0783297650</td>
<td>45</td>
<td>Head Teacher</td>
<td>400000Rwf</td></tr>
<tr>
<td>19</td>
<td>Diedonne</td>
<td>KAYIBANDA</td>
<td>0784298651</td>
<td>55</td>
<td>Head of Studies</td>
<td>300000Rwf</td></tr>
*<tr>***65**
<td>7</td>
<td>Pelagie</td>
<td>MUKANDORI</td>
<td>0784228661</td>
<td>51</td>
<td>Head of Discipline</td>
<td>250000Rwf</td></tr>
<tr>
<td>12</td>
<td>Dhalie</td>
<td>NIZEYIMANA</td>
<td>0780615775</td>
<td>35</td>
<td>Accountant</td>
<td>200000Rwf</td></tr>
</table>
</body>
</html>

LESSON 10: HTML Forms

a) Learning objectives

Identify and describe HTML tags that create form web pages
Appreciate the use of HTML form tags to create form web pages

b) Teaching resources:

Computer lab with internet, textbooks to facilitate the research

c) Prerequisites

Students are now familiar with HTML tags that organize web page content into any type of a list as learnt in lesson 7 and 5. Therefore, they can develop quickly the knowledge and skills about form creation using HTML.

d) Learning activity:

- **Guidance**
  - Teacher groups students into small groups so that they share ideas on questions of activity
  - Teacher walks around the group to guide the groups and to make sure every member is participating.
  - In their respective groups, the students discuss on answers of activity 4.10
  - Group representative has to present their finding on the asked questions to the rest of the class
  - With answers from students, the teacher introduces the lesson.
- **Answers of activity 4.10**

With guidance from the teacher, students answer the questions of the activity:

The given page is a form web page

1. An HTML form is a section of a document containing normal content, markup, special elements called controls (checkboxes, radio buttons, menus, etc.), and labels on those controls
2. Form, web form or HTML form on a web page allows a user to enter data that is sent to a server for processing. Forms can resemble paper or database forms because web users fill out the forms using checkboxes, radio buttons, or text fields.
3. Code used to do the form are available in student book.

e) Answers of application activity 4.10

1. a. **Action attribute:** The action attribute is used to specify the file on the server that receives data from the form for processing.

b. **Method attribute:** The Method attribute specifies how the data is to be sent to the web server. The method attribute specifies the HTTP method (GET or POST) to be used when submitting the forms

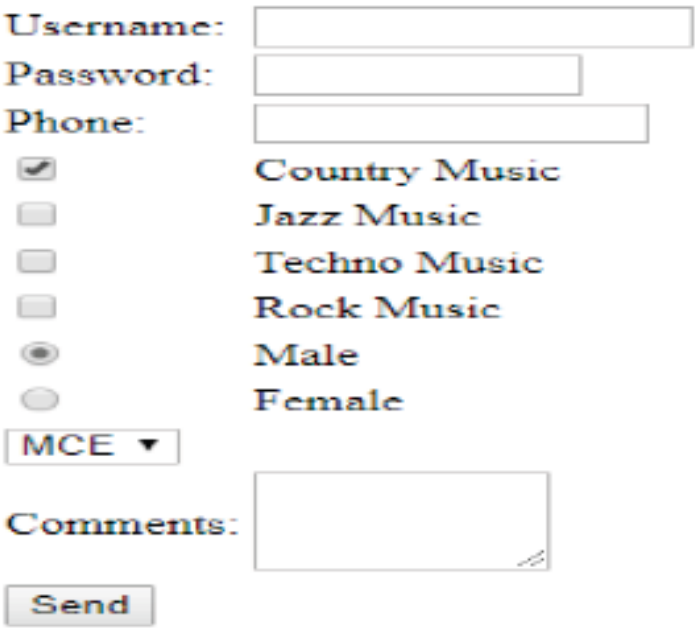
c. **Textarea tag:** Textarea control is a multi-line text input used when the user is required to give details that may be longer than a single sentence.

2. The syntax of Select or (Drop-Down List) form element

<select name=" ">
<option value1=" " >…</option>
….
<option value=" ">…</option>
</select>

3. Given the following form web page:

3. Given the following form web page:



This web page is displayed by the following html document:

```
</head>
<body >
<center>
<table><form Action= "login.php" Method= "get" >
<tr><td>Username:</td> <td><input type= "text" name= "FName" size="15"></
td></tr>
<tr><td>Password:</td> <td><input type= "password" name= "pass"size="10"></
td></tr>
<tr><td>Phone:</td> <td> <input type= "text" name= "phone" size="13"></ td></tr>
<tr><td><input type="checkbox" name="music" checked="checked"></td> <td>
Country Music</td></tr>
<tr><td><input type="checkbox" name="music" ></td> <td> Jazz Music</td></ tr>
<tr><td><input type="checkbox" name="music" ></td> <td> Techno Music</ td></tr>
<tr><td><input type="checkbox" name="music" ></td> <td> Rock Music</td></ tr>
<tr><td><input type="radio"name="sex" value="male"checked="checked" ></ td>
<td> Male</td></tr>
<tr><td><input type="radio"name="sex" value="female"</td> <td> Female</ td>
<tr><td><select name=" dropdown"> <option value="MCE" selected>MCE</ option>
<option value="MPG">MPG</option>
<option value="PCB">PCB</option> </select> </td></tr>
<tr><td>Comments:</td><td> <textarea rows="3"cols="10"name="comment">

</textarea></td></tr>
<tr><td><input type="submit" name="submit" value="Send"></td></tr> </
form></table>
</center>
```

```
    </body>
</html>
```

LESSON 11: Particularities of HTML 5

a) Learning objectives

Explain specifications of HTML5
Appreciate the use of HTML5 new input types to create form web pages

b) Teaching resources:

Computer lab with internet, textbooks to facilitate research

c) Prerequisites

Students have knowledge about Introduction to html and its evolution. They are also familiar with html form controls. Therefore, they can apply the same reasoning to create form web pages with new inputs types.

d) Learning activity

- **Guidance**
  - Teacher groups student into small groups so that they share ideas on questions of activity
  - Teacher walks around the group to guide the groups and to make sure every member is participating.
  - In their respective groups, the Students discuss on answers of activity.
  - Group representative has to present their finding on the asked questions to the rest of the class
  - With answers from students, a teacher introduces a lesson.
- **Answers of activity 4.11**
  1. HTML 5 came with new features that support multimedia content more effectively than previous versions.
  2. HTML5 has taken over other versions because:
     - It supports multimedia content
     - HTML5 is supported by majority of browsers.
     - HTML5 doctype is short comparing to doctypes of previous versions.
     - New elements such as <header>, <footer>, <section >have been added.
     - User can easily drag and drop elements from one location to another on the same webpage.
  3. Examples of new input types of HTML5

Refers to student text book (lesson11: **Particularities of HTML 5**)

e) Answers of application activity 4.11

1. HTML5 DOCTYPE is <! DOCTYPE html>
2. The basic idea behind HTML5 validation is, that you tell the browser which fields you want validated but don't actually do the tedious implementation yourself. As you define what state your input field is in your form also asks the browser to validate the field client-side based on the type of input field

3. a. **Email type:** Accepts only valid email addresses. If you try to submit a simple text, it forces to enter only email address is momo@gmail.com format

   b. **Datetime type:** Date and time (year, month, day, hour, minute, second, fractions of a second) encoded according to ISO 8601 with the time zone set to UTC.

   c. **URL type:** Accepts only valid URL address values. If you try to submit a simple text, it forces you to provide valid URL address in http:// www.example.com format.

4. Migration from HTML4 to HTML 5 is a brave decision that should not be held back due to few people who are resistant to change because of the following:

- **Deprecated elements and attribute**

Deprecated elements are features that have been rendered obsolete but that browsers may continue supporting them. Examples of deprecated features are border attribute used with <img/> element and name attribute in the anchor <a> element.

- **Bowser support**

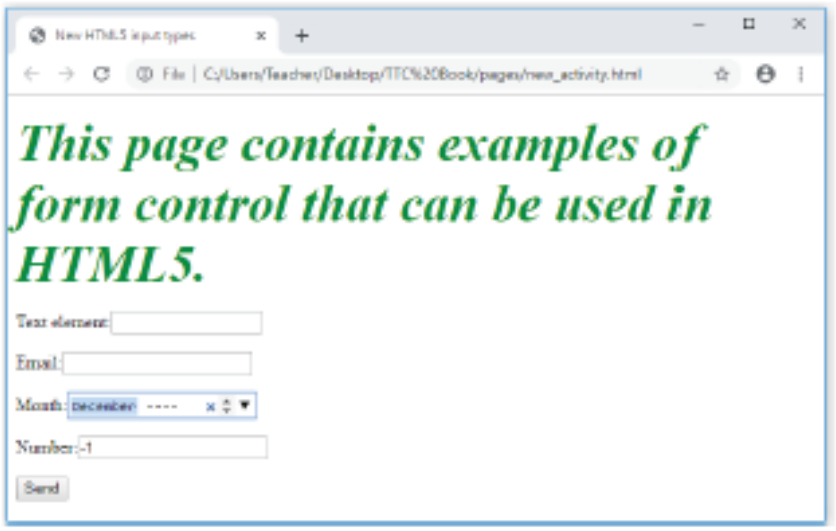
Browser support is one of the key factors to consider when migrating from HTML4 to HTML5. Fortunately, since HTML5 became a W3C recommendation in October, 2014, major browsers like Safari, Chrome, Firefox, Opera and Internet Explorer 9.0 have started supporting to HTML5 features.

5) The HTML code to create a page with the inputs: Text, Email, Month, Number is here below:

```
<!DOCTYPE html>
   <html>
   <head>
<title> New HTML5 input types</title>

   </head>
   <body>
   <p><em><strong><font size=36 color="green">This page contains examples of form
      control that can be used in HTML5.
   </font></strong></em></p>
   <form action="new_input.php" method ="post">
   <p> Text element:<input type="text"name="user"size=15></p>
   <p> Email:<input type="email"name="mail"size=20></p>
   <p> Month:<input type="month"name="month"> </p>
   <p> Number:<input type="number"name="number"> </p>
   <input type="submit"value="Send"name="button"><br/>
   </form>
   </body>
   </html>
```

This html code displays the following:



LESSON 12: Creation of links

a) Learning objective

Appreciate the use of<a>tag that creates a hyperlink

b) Teaching resources:

Computer lab with internet, textbooks to facilitate the research

c) Prerequisites

Students are now familiar with html tags that can create any web page Therefore, they can apply the same reasoning on creating linked web pages.

d) Learning activity:

- **Guidance**

- Students in groups discuss the questions of the lesson's activity
- In their respective groups, students discuss the answers of the activity.
- The group representative has to present their finding on the asked questions to the rest of the class
- Basing on the answers from students, the teacher introduces the lesson.

- **Answers of activity 4.12**

1. **A link** is A hyperlink is a text, phrase or image that you click to go to another web page or a section within the current page or to another website.
2. **Internal link**

   A local(i**nternal**) link (link to the same web site) is specified with a relative URL (without http://www....). While external links a web site to another ane.IT is specified with a relative URL.

e) Answers of application activity 4.12

1. Definitions of terms: hyperlink, hypertext and HREF attribute are found in a student text book lesson 12(Creation of links).
2. Refers student book to answer this question

3. The “ image link” code means that word “image link” is a hyperlink and when it is clicked on the user is directed to the page photo.html
4. First.html page below is linked to second.html page:

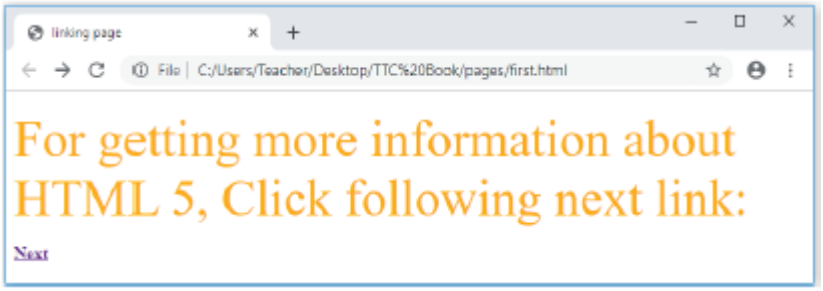
First.html page

```
<! DOCTYPE html>
<html>
<head>
<title>linking page</title>
</head>
<body>
<p><font color=”orange” size=”20”> For getting more information about HTML 5, Click following next link:
</font></p>
<a href=”second.html”><b>Next</b></a>
</body>
</html>
```

Second.html page

```
<! DOCTYPE html>
<html>
<head>
<title>linking page</title>
</head>
<body>
<p><font color=”orange” size=”20”> INTRODUCTION TO HTML 5
</font></p>
<center><h4>HTML5 is the fifth revised and newest version of HTML standard offering new features that support multimedia content more effectively than the previous versions.
To be supported by majority of browsers, HTML5 has been developed in collaboration with browser makers.
This explains why most browsers are supporting the new HTML5 specification.
<h4></center>
</body>
</html>
```

Output:



LESSON 13: Back end vs Front end

a) Learning objectives

Explain what is Front end and Back end in website design and development

b) Teaching resources:

Computer lab with internet, textbooks to facilitate the research

c) Prerequisites

Students are now familiar with basic html tags that can organize and create form elements found in Front end and students already have knowledge and skills about database (Back end) creation and management using MS Access. As they learnt Unit 4 in Senior 4 on; they can therefore apply the same reasoning in coming lessons.

d) Learning Activity:

- **Guidance**

Teacher groups students into small groups in order to do the activity 4.13
Teacher walks around in the groups and guide the groups and to make sure every member is participating.
In their respective groups, the Students discuss on answers of activity 4.13.
Group representative has to present their finding on the asked questions to the rest of the class
With answers from students, a teacher introduces a lesson.

- **Answers of activity 4.13**

The difference between Front end and Back end in the web site design and development process can be found in the student text book.

e) Answers of application 4.13

For the answers related to different questions of this application activity, refers to the student book

4.6 Summary of the unit

Today, large corporations, medium-sized, small -scale business, organizations and individuals are using websites and web applications to communicate company information, manage their projects and advertise their activities. People are now connected with their friends and family members on social media such as Facebook, Twitter, Instagram, YouTube and these social media technologies were developed using web design techniques. In this unit, we discussed HTML language used in designing website and web applications.

Below are the main concepts discussed in this unit:

A **website** is a collection of several web pages with information on a subject (documents that are accessed through the internet) that are connected together.
A **Web application (Web app)** is an application program that is stored on a remote server and delivered over the Internet through a browser interface.

A website can be static or dynamic. In this unit, we only discussed about the on static website. A static web site is site that is typically written in plain HTML and what is in the code of the page is what is displayed to the user and it does not use database. A dynamic webpage is one whose contents do change, and generally change very quickly and it uses database.
A static we page is made of different web pages. HTML page has the following structure:

<html>

<head>

Document header related tags

</head>

<body>

Document body related tags

</body>

</Html>

There different HTML tags that create different web pages:

- Tags that identify and name documents such as heading tags, image, formatting tags etc.
- Tags that organize web page contents such as:

  - Ordered and Unordered list:<ol>and
  - Definition and Nested lists<dl>
  - nested lists: a list inside another type of a list
  - Frame and Table tags :<frameset> and <table>
  - HTML Forms: <form>

Nowadays, HTML5 is more useful comparing to other previous HTML versions because of its specifications:

- It offers new features that support multimedia contents
- It is designed to be supported by majority of browsers
- It comes with elements (media elements and new input types)

HTML pages are linked by **hyperlinks** for being called website .HTML link is created by anchor element<a>…. It has this syntax: ***link text***

The website creation project involves these steps:

The exact process will vary slightly from designer to designer, but the basics are the same.

- The **front end** is the part of the website, users can see and interact with. It is developed using Visual Basic, HTML, etc programming languages
- The **back end** can also be referred to as the "**server side**" of a website. It can be built using different Relational Database Management Systems such as Microsoft Access, SQL Server, Oracle etc.

4.7 Additional information

New HTML5 Elements

The new HTML5 elements may be classified into three categories namely: **Structural, Input, and Media elements.**

Structural elements: HTML5 offers new semantic elements used to define the structure of a web page. Examples of structural elements include <article>, <aside>, <header>, <footer>, <main>, <section>, <summary> and <nav>

Input elements: New input types were introduced to address specific form input and formatting requirements for user input such as dates, numbers, and telephone numbers. Examples of new input types include color, date, datetime, time, email, number, tel, url

Media elements: Due to high demand of multimedia content on the web, WC3 introduced new set of media elements in HTML5 to handle different media types without need for additional

plugins such as Adobe flash. New media elements include <embed>, <audio>, <source>, <track> and <video>.

Colors

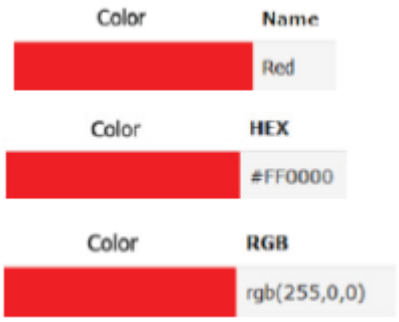
One of the most important formatting features in web design and development has to do with the right application of color. Color can be applied to text (font) or the background of a section or entire page.

In HTML, color can be specified in either of three ways:

1. Using a valid color name as a value in a declaration e.g. “red”, “blue”
2. Using a valid hexadecimal (HEX) value e.g. #ff1100, #BB00CC
3. Using the Red, Green, Blue (RGB) scheme e.g. “rgb(200,1,1)”

Example:

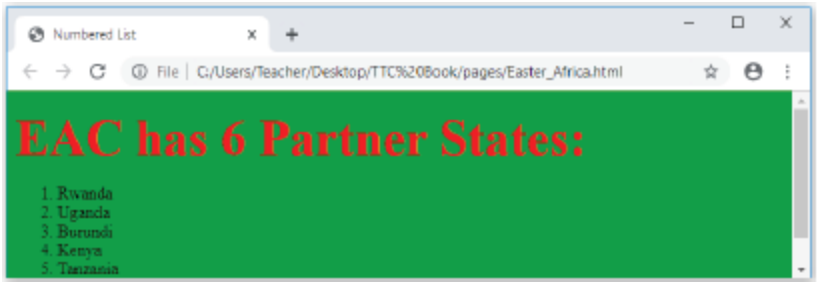
Let apply rgb color to set a background of a page. Consider the following HTML



Let apply rgb color to set a background of a page. Consider the following HTML document:

```
<! DOCTYPE html>
<html>
<head>
<title>Numbered List</title>
</head>
<body bgcolor=”rgb (195,45,203)”>
<p><Strong><font color=”red” size=72>
EAC has 6 Partner States:</font></strong></p>
<ol >
<li>Rwanda</li>
<li>Uganda</li>
<li>Burundi </li>
<li>Kenya</li>
<li>Tanzania</li>
<li>South Sudan</li>
</ol>
</body>
</html>
```

Output:



4.8 End unit assessment

1. Answer of this questions are referred to leson1: Definitions of basic concepts in student text book.
2. An **internet** is the network of computers and other communication devices connected together around the world, allowing information and resources to be shared globally while **web** is the common name for the World Wide Web, a subset of the internet consisting of the pages that can accessed by a web browser.

   A **web** can be also defined as a system of internet servers that support specially formatted documents. The documents are formatted in a markup language called HTML (HyperText Markup Language) that supports links to other documents.**77**

3. A program, such as Mozilla Firefox that lets a user display HTML-developed web pages is referred to as a **web browser**.

4. Three key factors that a web developer should consider before developing a website

- **Usability**

One of the most important aspects of web designing is actually making the site usable for the average user. Most customers who visit your website are not professional HTML coders, so they might need things simplified a little bit (which is fine)

- **Speed**

Website speed can make or break your entire company. If the page does not load within three to five seconds, users will go mad. they will likely exit your web page and never return, causing you to lose out on their potential business.

- **Content**

Users are very picky. Even if your webpage is easily accessible, functions well, works quickly, and looks great, they still won't be pleased unless you have compelling and engaging content on your site. Content marketing plays a major role in any company's advertising campaign. People much prefer video content over written, which is why content video views have exceeded 50 billion views per month.

5. Three types of image formats that can be inserted into a web page:

a. GIF (Graphics Interchange Format): You can take advantage of the characteristics of lzw compression to improve its efficiency and thereby reduce the size of your gif graphics. The gif format allows you to pick colors from the color lookup table of the gif to be transparent.

b. JPEG (Joint Photographic Experts Group): The other graphic file format commonly used on the web to minimize graphics file sizes is the Joint Photographic Experts Group (jpeg) compression scheme. Unlike gif graphics, jpeg images are full-color images that dedicate at least 24 bits of memory to each pixel, resulting in images that can incorporate 16.8 million colors.

c. PNG (Portable Network Graphics): png graphics were designed specifically for use on web pages, and they offer a range of attractive features, including a full range of color depths, support for sophisticated image transparency, better interlacing, and automatic corrections for display monitor gamma. png supports full-color images and can be used for photographic images.

6. An HTML statement which demonstrates how to insert.

a. **An image of a car:**

<img src= "car.jpg" width= "250 px"height= "400px" alt= "car picture">

b. **Page with four horizontal frames**

<frameset rows="20%,20%,20%,20%" > …….</frameset>

c. **Table of 5 rows and 8 columns**

<table border="4" cellpadding="3" cellspacing="3" width="400"height="200"> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr>

<tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>
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</tr>
</table>

7. Answer of this question is referred to lesson 11: HTML forms.
8. Answer of this question is referred to lesson 11: HTML forms.
9. Answer of this question is referred to lesson 11: HTML forms.
10. Difference between hyperlink and hypertext is found in a student text book lesson 13(Creation of links).
11. Three restrictions that were imposed by XHTML that have been relaxed in HTML5:

Attribute	Description
max	Specifies the maximum value for an input field
maxlength	Specifies the maximum number of character for an input Field
min	Specifies the minimum value for an input field
value	Specifies the default value for an input field

Examples:
<input type=" number" min=1 max=20>
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<input type="text" maxlength=12>

4.9. Additional activities

4.9.1. Remedial activity

1) What is the use of colspan and rowspan attributes?

Answer:
The colspan attribute in HTML specifies the number of columns a cell should span. It allows the single table cell to span the width of more than one cell or column.
The rowspan attribute in HTML specifies the number of rows a cell should span. That is if a row spans two rows, it means it will take up the space of two rows in that table.

2) Write the syntax of setting a color a body background

Answer: <body bgcolor="value" **>**
Note that value should be a color name, color in hexadecimal format or RGB format.

4.9.2 Consolidation activity

1) Explain any two objects of an HTML form

2) Differentiate between definition list and nested list

Answer:

- Answer of this question is referred to lesson 11: HTML FORMS in student text book.

Refers to student text book lesson 9; HTML lists: Definition and Nested lists

4.9.3 Extended activity

Write an html document which displays a definition list of three items.

Answer:

```
<! DOCTYPE html>
<html>
<head>
<title>Definition list </title>
</head>
<body>
<dl>
<dt><b>GIF </b></dt>
<dd>GIF stands for Graphics Interchange Format </dd>
<dt><b>PNG</b></dt>
<dd> PNG stands for Portable Network Graphics</dd>
<dt><b>JPEG</b></dt>
<dd>JPEG stands for Joint Photographic Experts Group</dd>
</dl>
</body>
</html>
```