



education

Department of Education  
REPUBLIC OF SOUTH AFRICA

**National Curriculum Statement  
Grades 10 – 12  
(General)**

**INFORMATION TECHNOLOGY**

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## HOW TO USE THIS BOOK

This document is a policy document divided into four chapters. It is important for the reader to read and integrate information from the different sections in the document. The content of each chapter is described below.

### ■ Chapter 1 - Introducing the National Curriculum Statement

This chapter describes the principles and the design features of the National Curriculum Statement Grades 10 – 12 (General). It provides an introduction to the curriculum for the reader.

### ■ Chapter 2 - Introducing the Subject

This chapter describes the definition, purpose, scope, career links and Learning Outcomes of the subject. It provides an orientation to the Subject Statement.

### ■ Chapter 3 - Learning Outcomes, Assessment Standards, Content and Contexts

This chapter contains the Assessment Standards for each Learning Outcome, as well as content and contexts for the subject. The Assessment Standards are arranged to assist the reader to see the intended progression from Grade 10 to Grade 12. The Assessment Standards are consequently laid out in double-page spreads. At the end of the chapter is the proposed content and contexts to teach, learn and attain Assessment Standards.

### ■ Chapter 4 – Assessment

This chapter deals with the generic approach to assessment being suggested by the National Curriculum Statement. At the end of the chapter is a table of subject-specific competence descriptions. Codes, scales and competence descriptions are provided for each grade. The competence descriptions are arranged to demonstrate progression from Grade 10 to Grade 12.

### ■ Symbols

The following symbols are used to identify Learning Outcomes, Assessment Standards, grades, codes, scales, competence description, and content and contexts.



= Learning Outcome



= Assessment Standard



= Grade



= Code



= Scale



= Competence Description



= Content and Contexts



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## ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
CASS	Continuous Assessment
CD-ROM	Compact Disc – Read only Memory
DO	Developmental Outcome
FET	Further Education and Training
FTP	File Transfer Protocol
GET	General Education and Training
GIS	Geographical Information System
GPS	Global Positioning System
GUI	Graphical User Interface
HCI	Human-Computer Interaction
HIV	Human Immunodeficiency Virus
HTTP	Hyper Text Transfer Protocol
IKS	Indigenous Knowledge Systems
I/O	Input/Output
IrDA	Infrared Data Association (a standard defined by the Infrared Data Consortium)
IRC	Internet Relay Chat
ISP	Internet Service Provider
LAN	Local Area Network
NCS	National Curriculum Statement
NQF	National Qualifications Statement
OBE	Outcomes-Based Education
OSI	Open System Interconnect
PDA	Personal Digital Assistant
SAQA	South African Qualifications Authority
TCP/IP	Transmission Control Protocol/Internet Protocol
URL	Uniform Resource Locator
UML	Unified Modelling Language
USB	Universal Serial Bus
WAN	Wide Area Network
WAP	Wireless Application Protocol



## CHAPTER 1

### INTRODUCING THE NATIONAL CURRICULUM STATEMENT

The adoption of the Constitution of the Republic of South Africa (Act 108 of 1996) provided a basis for curriculum transformation and development in South Africa. The Preamble states that the aims of the Constitution are to:

- heal the divisions of the past and establish a society based on democratic values, social justice and fundamental human rights;
- improve the quality of life of all citizens and free the potential of each person;
- lay the foundations for a democratic and open society in which government is based on the will of the people and every citizen is equally protected by law; and
- build a united and democratic South Africa able to take its rightful place as a sovereign state in the family of nations.

The Constitution further states that ‘everyone has the right ... to further education which the State, through reasonable measures, must make progressively available and accessible’.

The National Curriculum Statement Grades 10 – 12 (General) lays a foundation for the achievement of these goals by stipulating Learning Outcomes and Assessment Standards, and by spelling out the key principles and values that underpin the curriculum.

#### PRINCIPLES

The National Curriculum Statement Grades 10 – 12 (General) is based on the following principles:

- social transformation;
- outcomes-based education;
- high knowledge and high skills;
- integration and applied competence;
- progression;
- articulation and portability;
- human rights, inclusivity, environmental and social justice;
- valuing indigenous knowledge systems; and
- credibility, quality and efficiency.

## Social transformation

The Constitution of the Republic of South Africa forms the basis for social transformation in our post-apartheid society. The imperative to transform South African society by making use of various transformative tools stems from a need to address the legacy of apartheid in all areas of human activity and in education in particular. Social transformation in education is aimed at ensuring that the educational imbalances of the past are redressed, and that equal educational opportunities are provided for all sections of our population. If social transformation is to be achieved, all South Africans have to be educationally affirmed through the recognition of their potential and the removal of artificial barriers to the attainment of qualifications.

## Outcomes-based education

Outcomes-based education (OBE) forms the foundation for the curriculum in South Africa. It strives to enable all learners to reach their maximum learning potential by setting the Learning Outcomes to be achieved by the end of the education process. OBE encourages a learner-centred and activity-based approach to education. The National Curriculum Statement builds its Learning Outcomes for Grades 10 – 12 on the Critical and Developmental Outcomes that were inspired by the Constitution and developed through a democratic process.

The Critical Outcomes require learners to be able to:

- identify and solve problems and make decisions using critical and creative thinking;
- work effectively with others as members of a team, group, organisation and community;
- organise and manage themselves and their activities responsibly and effectively;
- collect, analyse, organise and critically evaluate information;
- communicate effectively using visual, symbolic and/or language skills in various modes;
- use science and technology effectively and critically showing responsibility towards the environment and the health of others; and
- demonstrate an understanding of the world as a set of related systems by recognising that problem solving contexts do not exist in isolation.

The Developmental Outcomes require learners to be able to:

- reflect on and explore a variety of strategies to learn more effectively;
- participate as responsible citizens in the life of local, national and global communities;
- be culturally and aesthetically sensitive across a range of social contexts;
- explore education and career opportunities; and
- develop entrepreneurial opportunities.

## High knowledge and high skills

The National Curriculum Statement Grades 10 – 12 (General) aims to develop a high level of knowledge and skills in learners. It sets up high expectations of what all South African learners can achieve. Social justice requires the empowerment of those sections of the population previously disempowered by the lack of knowledge and skills. The National Curriculum Statement specifies the minimum standards of knowledge and skills to be achieved at each grade and sets high, achievable standards in all subjects.

## Integration and applied competence

Integration is achieved within and across subjects and fields of learning. The integration of knowledge and skills across subjects and terrains of practice is crucial for achieving applied competence as defined in the National Qualifications Framework. Applied competence aims at integrating three discrete competences – namely, practical, foundational and reflective competences. In adopting integration and applied competence, the National Curriculum Statement Grades 10 – 12 (General) seeks to promote an integrated learning of theory, practice and reflection.

## Progression

Progression refers to the process of developing more advanced and complex knowledge and skills. The Subject Statements show progression from one grade to another. Each Learning Outcome is followed by an explicit statement of what level of performance is expected for the outcome. Assessment Standards are arranged in a format that shows an increased level of expected performance per grade. The content and context of each grade will also show progression from simple to complex.

## Articulation and portability

Articulation refers to the relationship between qualifications in different National Qualifications Framework levels or bands in ways that promote access from one qualification to another. This is especially important for qualifications falling within the same learning pathway. Given that the Further Education and Training band is nested between the General Education and Training and the Higher Education bands, it is vital that the Further Education and Training Certificate (General) articulates with the General Education and Training Certificate and with qualifications in similar learning pathways of Higher Education. In order to achieve this articulation, the development of each Subject Statement included a close scrutiny of the exit level expectations in the General Education and Training Learning Areas, and of the learning assumed to be in place at the entrance levels of cognate disciplines in Higher Education.

Portability refers to the extent to which parts of a qualification (subjects or unit standards) are transferable to another qualification in a different learning pathway of the same National Qualifications Framework band. For purposes of enhancing the portability of subjects obtained in Grades 10 – 12, various mechanisms have been explored, for example, regarding a subject as a 20-credit unit standard. Subjects contained in the National Curriculum Statement Grades 10 – 12 (General) compare with appropriate unit standards registered on the National Qualifications Framework.

## Human rights, inclusivity, environmental and social justice

The National Curriculum Statement Grades 10 – 12 (General) seeks to promote human rights, inclusivity, environmental and social justice. All newly-developed Subject Statements are infused with the principles and practices of social and environmental justice and human rights as defined in the Constitution of the Republic of South Africa. In particular, the National Curriculum Statement Grades 10 – 12 (General) is sensitive to issues of diversity such as poverty, inequality, race, gender, language, age, disability and other factors.

The National Curriculum Statement Grades 10 – 12 (General) adopts an inclusive approach by specifying minimum requirements for all learners. It acknowledges that all learners should be able to develop to their full potential provided they receive the necessary support. The intellectual, social, emotional, spiritual and physical needs of learners will be addressed through the design and development of appropriate Learning Programmes and through the use of appropriate assessment instruments.

## Valuing indigenous knowledge systems

In the 1960s, the theory of multiple-intelligences forced educationists to recognise that there were many ways of processing information to make sense of the world, and that, if one were to define intelligence anew, one would have to take these different approaches into account. Up until then the Western world had only valued logical, mathematical and specific linguistic abilities, and rated people as ‘intelligent’ only if they were adept in these ways. Now people recognise the wide diversity of knowledge systems through which people make sense of and attach meaning to the world in which they live. Indigenous knowledge systems in the South African context refer to a body of knowledge embedded in African philosophical thinking and social practices that have evolved over thousands of years. The National Curriculum Statement Grades 10 – 12 (General) has infused indigenous knowledge systems into the Subject Statements. It acknowledges the rich history and heritage of this country as important contributors to nurturing the values contained in the Constitution. As many different perspectives as possible have been included to assist problem solving in all fields.

## Credibility, quality and efficiency

The National Curriculum Statement Grades 10 – 12 (General) aims to achieve credibility through pursuing a transformational agenda and through providing an education that is comparable in quality, breadth and depth to those of other countries. Quality assurance is to be regulated by the requirements of the South African Qualifications Authority Act (Act 58 of 1995), the Education and Training Quality Assurance Regulations, and the General and Further Education and Training Quality Assurance Act (Act 58 of 2001).

## THE KIND OF LEARNER THAT IS ENVISAGED

Of vital importance to our development as people are the values that give meaning to our personal spiritual and intellectual journeys. *The Manifesto on Values, Education and Democracy* (Department of Education, 2001:9-10) states the following about education and values:

*Values and morality give meaning to our individual and social relationships. They are the common currencies that help make life more meaningful than might otherwise have been. An education system does not exist to simply serve a market, important as that may be for economic growth and material prosperity. Its primary purpose must be to enrich the individual and, by extension, the broader society.*

The kind of learner that is envisaged is one who will be imbued with the values and act in the interests of a society based on respect for democracy, equality, human dignity and social justice as promoted in the Constitution.

The learner emerging from the Further Education and Training band must also demonstrate achievement of the Critical and Developmental Outcomes listed earlier in this document. Subjects in the Fundamental Learning Component collectively promote the achievement of the Critical and Developmental Outcomes, while specific subjects in the Core and Elective Components individually promote the achievement of particular Critical and Developmental Outcomes.

In addition to the above, learners emerging from the Further Education and Training band must:

- have access to, and succeed in, lifelong education and training of good quality;
- demonstrate an ability to think logically and analytically, as well as holistically and laterally; and
- be able to transfer skills from familiar to unfamiliar situations.

## THE KIND OF TEACHER THAT IS ENVISAGED

All teachers and other educators are key contributors to the transformation of education in South Africa. The National Curriculum Statement Grades 10 – 12 (General) visualises teachers who are qualified, competent, dedicated and caring. They will be able to fulfil the various roles outlined in the Norms and Standards for Educators. These include being mediators of learning, interpreters and designers of Learning Programmes and materials, leaders, administrators and managers, scholars, researchers and lifelong learners, community members, citizens and pastors, assessors, and subject specialists.

## STRUCTURE AND DESIGN FEATURES

### Structure of the National Curriculum Statement

The National Curriculum Statement Grades 10 – 12 (General) consists of an Overview Document, the Qualifications and Assessment Policy Framework, and the Subject Statements.

The subjects in the National Curriculum Statement Grades 10 – 12 (General) are categorised into Learning Fields.

### *What is a Learning Field?*

A Learning Field is a category that serves as a home for cognate subjects, and that facilitates the formulation of rules of combination for the Further Education and Training Certificate (General). The demarcations of the Learning Fields for Grades 10 – 12 took cognisance of articulation with the General Education and Training and Higher Education bands, as well as with classification schemes in other countries.

Although the development of the National Curriculum Statement Grades 10 – 12 (General) has taken the twelve National Qualifications Framework organising fields as its point of departure, it should be emphasised that those organising fields are not necessarily Learning Fields or ‘knowledge’ fields, but rather are linked to occupational categories.

The following subject groupings were demarcated into Learning Fields to help with learner subject combinations:

- Languages (Fundamentals);
- Arts and Culture;
- Business, Commerce, Management and Service Studies;
- Manufacturing, Engineering and Technology;
- Human and Social Sciences and Languages; and
- Physical, Mathematical, Computer, Life and Agricultural Sciences.

### *What is a subject?*

Historically, a subject has been defined as a specific body of academic knowledge. This understanding of a subject laid emphasis on knowledge at the expense of skills, values and attitudes. Subjects were viewed by some as static and unchanging, with rigid boundaries. Very often, subjects mainly emphasised Western contributions to knowledge.

In an outcomes-based curriculum like the National Curriculum Statement Grades 10 – 12 (General), subject boundaries are blurred. Knowledge integrates theory, skills and values. Subjects are viewed as dynamic, always responding to new and diverse knowledge, including knowledge that traditionally has been excluded from the formal curriculum.

A subject in an outcomes-based curriculum is broadly defined by Learning Outcomes, and not only by its body of content. In the South African context, the Learning Outcomes should, by design, lead to the achievement of the Critical and Developmental Outcomes. Learning Outcomes are defined in broad terms and are flexible, making allowances for the inclusion of local inputs.



### ***What is a Learning Outcome?***

A Learning Outcome is a statement of an intended result of learning and teaching. It describes knowledge, skills and values that learners should acquire by the end of the Further Education and Training band.

### ***What is an Assessment Standard?***

Assessment Standards are criteria that collectively describe what a learner should know and be able to demonstrate at a specific grade. They embody the knowledge, skills and values required to achieve the Learning Outcomes. Assessment Standards within each Learning Outcome collectively show how conceptual progression occurs from grade to grade.

## **Contents of Subject Statements**

Each Subject Statement consists of four chapters and a glossary:

- *Chapter 1, Introducing the National Curriculum Statement:* This generic chapter introduces the National Curriculum Statement Grades 10 – 12 (General).
- *Chapter 2, Introducing the Subject:* This chapter introduces the key features of the subject. It consists of a definition of the subject, its purpose, scope, educational and career links, and Learning Outcomes.
- *Chapter 3, Learning Outcomes, Assessment Standards, Content and Contexts:* This chapter contains Learning Outcomes with their associated Assessment Standards, as well as content and contexts for attaining the Assessment Standards.
- *Chapter 4, Assessment:* This chapter outlines principles for assessment and makes suggestions for recording and reporting on assessment. It also lists subject-specific competence descriptions.
- *Glossary:* Where appropriate, a list of selected general and subject-specific terms are briefly defined.

## **LEARNING PROGRAMME GUIDELINES**

A Learning Programme specifies the scope of learning and assessment for the three grades in the Further Education and Training band. It is the plan that ensures that learners achieve the Learning Outcomes as prescribed by the Assessment Standards for a particular grade. The Learning Programme Guidelines assist teachers and other Learning Programme developers to plan and design quality learning, teaching and assessment programmes.



## CHAPTER 2

# INFORMATION TECHNOLOGY

### DEFINITION

Information Technology focuses on activities that deal with the solution of problems through logical thinking, information management and communication. It also focuses on the development of computer applications using current development tools. The subject develops awareness and an understanding of the social, economic and other implications of using computers.

### PURPOSE

The subject Information Technology will enable learners to understand the principles of computing through the use of current programming language, hardware and software, and how these apply to their daily lives, to the world of work and to their communities. Such understanding will be achieved by providing learners with opportunities to:

- demonstrate an understanding of concepts, principles and knowledge of computers and computer applications in various disciplines;
- demonstrate an understanding of how computers impact on the management of natural resources, cultural values, socio-economic and human rights development;
- critically analyse the impact of computers on ethical, social, economic and political relations;
- work competently in a dynamic computer-using environment which includes:
  - effective communication,
  - problem-solving approaches,
  - team work,
  - responsible use of technology,
  - precision and accuracy;
- demonstrate proficiency in the use of computers in managing and critically interpreting information;
- demonstrate how the creative uses of different computer technologies facilitate human interaction;
- show proficiency in selecting and customising appropriate computer applications, hardware and media to provide and communicate innovative solutions across all sectors of society;
- design and programme well-tested and user-friendly computer-based solutions to meet specific requirements; and
- prepare for a career path, Higher Education and lifelong learning, thus enabling learners to become effective members of a computer-using society.

## SCOPE

The knowledge and skills acquired in Information Technology enable learners to use information and communication technology (specifically computers) in social and economic applications, systems analysis, problem solving (using either applications or a current object-oriented programming language), logical thinking, information management and communication. It is envisaged that the fundamental knowledge and skills developed will not be restricted only to Information Technology but also relate to applications in other subjects in Further Education and Training and beyond.

The following focus areas will be included in Information Technology:

- algorithm design;
- career paths;
- computer hardware and devices;
- data structures and types;
- database development;
- electronic communications;
- future trends;
- human-computer interaction;
- management of information;
- networking principles;
- open-source software development;
- problem formulation and solution (projects);
- programming;
- social, accessibility, economic and ethical issues;
- spreadsheets;
- system software; and
- web page authoring.

Information Technology will have close links with the following subjects in Further Education and Training:

- Mathematics;
- Mathematical Literacy;
- Physical Sciences;
- Accounting;
- Economics;
- Engineering Graphics and Design; and
- Computer Applications Technology.

## EDUCATIONAL AND CAREER LINKS

In the General Education and Training band, the Technology Learning Area is an integrated study covering a

wide range of technological areas organised around the following foci:

- technology and society;
- technological capability, knowledge and understanding; and
- information and communication technology.

The Technology Learning Area encourages learners to engage in investigating, designing, evaluating and communicating solutions. Learners are prepared to be competent and confident in accessing and working with various forms of information and data. The knowledge and skills acquired in information gathering, storing, processing, management and communication form the underlying basis for Information Technology in Further Education and Training.

Information Technology specifically forms the underpinning basis for studies in computer science, information systems, engineering and the business sciences. In general, it lays a foundation for programmes such as the following offered in Higher Education and Training:

- bio-informatics;
- business information systems;
- computer engineering;
- computer science;
- computer science education;
- financial information systems;
- geographical information systems;
- informatics;
- information systems; and
- information technology.

The subject Information Technology involves the integration of theory and practice as well as structured experiential learning which affords learners the opportunity to exercise and reinforce the computer skills and knowledge acquired in the school and to provide orientation to further study in this field. It provides computing skills across the entire spectrum of careers and opens pathways for careers such as:

- computer or software architect;
- data communication and network specialist;
- financial and actuarial specialist;
- hardware and software support technician;
- information systems and technology manager;
- information technology educator or trainer;
- information technology sales executive;
- programmer;
- systems developer; and
- telecommunications engineer.

## LEARNING OUTCOMES

In a manner similar to the various layers in the OSI model, the Learning Outcomes have been developed in such a manner that each supports and complements the other. One cannot be studied without the other. Learning Outcome 1 forms the underlying foundation on which the other Learning Outcomes are based. Learning Outcome 2, in contrast, emphasises electronic communication that uses the infrastructure developed in Learning Outcome 1. Learning Outcome 3 will assist learners to understand the socio-economic context in which computers are used. Learning Outcome 4 is a heavily-weighted outcome because it is the crux of the subject. However, in order for the systems that are developed to be implemented they will need the concepts established in Learning Outcomes 1 and 2.



### Learning Outcome 1: Hardware and System Software

*The learner is able to demonstrate an understanding of and competently operate computer-based technologies.*

This Learning Outcome focuses on an understanding of hardware, peripheral devices, processors and their inter-connectivity, as well as the system software which is needed to make the hardware operational. The principles of networks and communications allow learners to make reasoned decisions about the appropriateness of networks of machines in comparison to stand-alone machines for particular applications.



### Learning Outcome 2: e-Communication

*The learner is able to apply creative uses of different computer technologies to facilitate electronic communication.*

Electronic communication is rapidly changing the face of the world and it is, therefore, important for learners to develop an understanding of this field. This understanding includes the legal, ethical, social, political and moral aspects of data protection and access to information.



### Learning Outcome 3: Social and Ethical Issues

*The learner is able to critically analyse the impact of computer technologies on socio-economic, environmental, political and ethical issues.*

This Learning Outcome focuses on a broad knowledge of the economic and social reasons for using computers and the economic, social, cultural, environmental, political and ethical effects of their use across a range of application areas. It develops learners' abilities to critically balance the advantages and disadvantages of

computerised systems. It allows for an understanding of the potential implications of open-source and proprietary software for the development of applications and an appreciation for locally-developed software.



#### **Learning Outcome 4: Programming and Software Development**

*The learner is able to design, implement, test and deliver efficient and effective solutions to problem situations.*

This Learning Outcome focuses on the design and development of appropriate computer-based solutions to specific problems using programming (in an object-oriented way which incorporates appropriate structured data types), databases, spreadsheets, websites and their interconnectivity. Learners will have practical experience in the design and implementation of solutions using a set of core development tools.

## CHAPTER 3

# LEARNING OUTCOMES, ASSESSMENT STANDARDS, CONTENT AND CONTEXTS

### Notes:

- Assessment Standards have been grouped into focus areas to show progression.
- Some Assessment Standards do not progress to Grade 11 or Grade 12, as they form the foundation for other Assessment Standards in Grade 11 or Grade 12.
- In assessing the learners, the Assessment Standards form the foundation against which assessment must take place. The subject competency statement is merely a guide for evaluating the level of performance of learners in the subject per grade.

## Grade 10



### Learning Outcome 1

#### Hardware and System Software

*The learner is able to demonstrate an understanding of and competently operate computer-based technologies.*



### Assessment Standards

We know this when the learner is able to:

- Differentiate between the concepts of hardware and software.
- Identify and distinguish between computer types and associated software.
- Identify the main hardware components of at least two types of computer.



## Grade 11



### Assessment Standards

We know this when the learner is able to:

- Discuss how the various components of computers interact with one another.
- Successfully install, troubleshoot and test various devices and associated device drivers.

## Grade 12



### Assessment Standards

We know this when the learner is able to:

- Analyse factors affecting the overall performance of a computer-based system.
- Produce reports on common problems in computer configurations which identify standard troubleshooting procedures.



### Learning Outcome 1 Continued

#### Hardware and System Software

*The learner is able to demonstrate an understanding of and competently operate computer-based technologies.*



### Assessment Standards

We know this when the learner is able to:

- Display a knowledge of networking in terms of user access.
  
  
  
  
  
  
  
  
  
  
- Distinguish between system software and application software (including user-developed and development software).
- Identify the functions of various types of operating system.
- Understand the concept of file organisation into multi-level directories.
- Distinguish between different types of files by their extensions or applications types.
- Effectively use tools provided by the operating system and other utility packages to organise and manage the computer.

## Grade 11



### Assessment Standards

We know this when the learner is able to:

- Identify basic network configurations, devices and architectures.
- Differentiate between network topologies and evaluate their relative merits.
- Identify and describe various network protocols and switching techniques and compare their relative merits.

- Discuss processing techniques and memory management.

- Describe the names, types and structure of the typical files and directories of the operating system being used.

## Grade 12



### Assessment Standards

We know this when the learner is able to:

- Make recommendations for a hardware solution for a given problem.
- Critically appraise a given specification for a computer-based solution to a specified problem as it relates to the needs of specified users.

- Recommend an operating system for a specific hardware configuration.



### Learning Outcome 1 Continued

#### Hardware and System Software

*The learner is able to demonstrate an understanding of and competently operate computer-based technologies.*



### Assessment Standards

We know this when the learner is able to:

- Demonstrate an ability to successfully install and uninstall new software programmes.
- State and discuss the implications of the latest computer technologies.

Grade 11



**Assessment Standards**

We know this when the learner is able to:

- Demonstrate an ability to ensure data integrity and protection.
  
- State and discuss the implications of the latest computer technologies.

Grade 12



**Assessment Standards**

We know this when the learner is able to:

- State and discuss the implications of the latest computer technologies.



## Learning Outcome 2

### e-Communication

*The learner is able to apply creative uses of different computer technologies to facilitate electronic communication.*



## Assessment Standards

We know this when the learner is able to:

- Describe the role of an internet service provider (ISP) in facilitating communication.
- Make efficient use of e-mail (including attachments, digital signatures, address books) as a means of communication.
- Demonstrate responsible communication styles.
- Navigate the Internet in order to retrieve information.
- State and discuss how the latest technologies facilitate human interaction.

## Grade 11



### Assessment Standards

We know this when the learner is able to:

- Discuss the nature and implications of electronic communication within groups (including chat rooms, list-servers and newsgroups).
- Find additional information about a problem with some software by posting to a discussion board or user group.
- Access the World Wide Web using search engines to retrieve information.
- Demonstrate examples of good and bad navigation from experience on the Internet.
- Demonstrate the ability to transfer files over the Internet.
- State and discuss how the latest technologies facilitate human interaction.

## Grade 12



### Assessment Standards

We know this when the learner is able to:

- Critically analyse information retrieved from the Internet.
- Critically assess Internet security and its implications.
- Propose and justify strategies to protect the value of information produced and communicated by an organisation.
- State and discuss how the latest technologies facilitate human interaction.



### Learning Outcome 3

#### Social and Ethical Issues

*The learner is able to critically analyse the impact of computer technologies on socio-economic, environmental, political and ethical issues.*



### Assessment Standards

We know this when the learner is able to:

- List the broad economic reasons for using computers.
- Discuss the effects of the use of computers across a range of application areas.
  
- Discuss health and ergonomic issues related to frequent computer use.
- Discuss environmental issues relating to computer hardware and consumables.



## Grade 11



### Assessment Standards

We know this when the learner is able to:

- Examine the effects of the use of computers across a range of application areas.
- Research and present information on a broad range of specialist and other careers that utilise computers.
- Research and report on how computers have impacted on the workplace and employment practices.
- Research and comment on the impact of computers in globalising trends (e.g. e-commerce and e-learning).
- Distinguish between effects caused by computer error and human error in a computer-based society.

## Grade 12



### Assessment Standards

We know this when the learner is able to:

- Analyse the effects of the use of computers across a range of application areas.
- Research and report on the ethical issues relating to the use of computers.



## Grade 11



### Assessment Standards

We know this when the learner is able to:

- Comment on the use of computers in providing solutions to issues of national and international importance.
- Explain the responsible use, purpose and significance of any new computer developments.

## Grade 12



### Assessment Standards

We know this when the learner is able to:

- Comment on the use of computers in providing solutions to issues of national and international importance.
- Comment critically on the social, political, economic and other consequences of search engines and group communications.
- Explain the responsible use, purpose and significance of any new computer developments.

## Grade 10



### Learning Outcome 4

#### Programming and Software Development

*The learner is able to design, implement, test and deliver efficient and effective solutions to problem situations.*



### Assessment Standards

We know this when the learner is able to:

- Produce an algorithm and its correct traces of simple sequential statements involving variables, assignments and numeric expressions.
- Produce numerical data tables that include formulae with more advanced mathematical and statistical functions using spreadsheets.
- Produce simple, well-structured and visually effective graphs that illustrate real-world data.
- Distinguish between good and bad user interface design from the visual perspective.
- Design a simple user interface (output and basic input only) for a real activity of an informative nature.
- Design and implement a simple user interface for an application using a package (e.g. database, web form).
- Identify the basics of Boolean conditions and operators and apply this to simple Boolean expressions.

## Grade 11



### Assessment Standards

We know this when the learner is able to:

- Produce numerical data tables that include formulae with more advanced mathematical and statistical functions using spreadsheets.
- Produce well-structured and visually effective graphs that illustrate complex data using real-world data.
- Distinguish between good and bad user error message design in user interfaces.
- Design a simple user interface for a real interactive activity.
- Implement the user interface using a GUI-supported programming environment.
- Apply Boolean conditions successfully in application software such as spreadsheets and search engines.

## Grade 12



### Assessment Standards

We know this when the learner is able to:

- Manipulate real-world data using advanced techniques such as what-if scenarios using spreadsheets.
- Explain the principles of good navigation between different screens of a user-written application, starting from a multi-function menu.
- Design, for a real-world application, a system of several interlinked screens which can successfully be navigated by end-users and members of the public.

## Grade 10



### Learning Outcome 4 Continued

#### Programming and Software Development

*The learner is able to design, implement, test and deliver efficient and effective solutions to problem situations.*



### Assessment Standards

We know this when the learner is able to:

- Draw simple diagrams showing the decision-making process involving simple selection and looping.
- Call the basic mathematical functions and apply them in programmes.
- Understand that simple data comes in different forms and that data typing is important.
- Implement selection and simple looping in a programming environment for a variety of simple algorithms.
- Explain effects of rounding and truncation as seen through an application package.
- Suggest ways in which well-known software can be methodically tested for robustness.

## Grade 11



## Assessment Standards

We know this when the learner is able to:

- Distinguish between selection by condition and selection by key.
- Distinguish between loops by condition and loops by counting.
- Analyse a problem and suggest a suitable structure to group repetitive data.
- Implement looping in a programming environment for a variety of algorithms.
- Define the rules pertaining to arithmetic on a computer and know why it cannot always be exact.
- Master basic techniques for debugging programmes.
- Reiterate the principles of good test data design for simple interactive systems.
- Understand the process of data validation and describe a data validation process to be followed.

## Grade 12



## Assessment Standards

We know this when the learner is able to:

- Apply the principles of object-oriented data structuring for classes and collections.
- Implement solutions to simple problems requiring collections of data in a programming environment.
- Explain the danger of software which has bugs in it.
- Make practical use of a debugger for efficiently finding programming errors.
- Understand the necessity of using automatically-generated or fetched test data for interactive and database systems.
- Interpret and analyse the output of a computerised system.





## Grade 11



### Assessment Standards

We know this when the learner is able to:

- Create and query a multi-table database.
- Create a written user's guide to a system discussed or implemented in class.

## Grade 12



### Assessment Standards

We know this when the learner is able to:

- Know the principles of normalisation for data in databases and can apply them to avoid repetition of data.
- Use a multi-table database to produce advanced queries and reports.
- Query a database via an application package and a programming language.
- Demonstrate the integration of data between various application packages.
- Implement an effective online help system for an existing or new software application.
- Produce well-written and well-presented documentation for an existing or new software application.



## CONTENT AND CONTEXT FOR THE ATTAINMENT OF ASSESSMENT STANDARDS

In this section content and contexts are provided to support the attainment of the Assessment Standards. The content indicated needs to be dealt with in such a way as to assist learners to progress towards the achievement of the Learning Outcomes. Content must serve the Learning Outcomes and not be an end in itself. The contexts suggested will enable the content to be embedded in situations which are meaningful to learners and so assist learning and teaching. The teacher should be aware of and use local contexts, not necessarily indicated here, which could be more suited to the experiences of the learners. Content and context, when aligned to the attainment of the Assessment Standards, provide a framework for the development of Learning Programmes. The Learning Programme Guidelines give more detail in this respect.

As this is a dynamically evolving subject, cognisance must be taken of the fact that other development tools and focus areas will arise and that, where these supersede the tools and focus areas indicated in the Subject Statement, the Learning Programme Guidelines will need to accommodate them so that the subject remains relevant. Because of this, it is envisaged that the Learning Programme Guidelines, including the focus areas and development tools, will, where necessary, be revised regularly.

### Content focus areas

Listed below are a number of focus areas and a brief description of the content that should be included for each one. The focus areas cover the entire band rather than specific grades within the band. Therefore, focus areas normally span more than one year (e.g. either Grades 10 and 11, or Grades 10, 11 and 12).

**Note:** A brief history and a discussion of future trends should be infused into each topic of the focus area.

- Algorithm design:
  - principles and techniques of algorithm design;
  - development and documentation to cover a number of standard algorithms for frequently-performed tasks;
  - use of trace tables;
  - programming diagrams.
  
- Career pathing:
  - careers associated with the use of computer equipment;
  - new products and services;
  - changes in the working environment;
  - changes in employment practices;
  - retraining brought about by the introduction of computer technology.
  
- Case studies: should provide background information on various topics and show how these topics are integrated with one another.

- Computer hardware and devices:
  - computer configuration and trouble-shooting;
  - system types (e.g. PDAs, notebooks, desktop, server, mainframes);
  - I/O devices;
  - embedded computer devices (e.g. cell phones, GPS)
  - factors affecting performance and reliability;
  - installation of devices;
  - device connectivity (e.g. USB, firewire, IrDA, wireless);
  - memory types;
  - processor types.
  
- Database development:
  - forms of simple data;
  - collection of data;
  - development of relational databases;
  - redundancy and normalisation (at conceptual level);
  - reporting.
  
- e-Communication:
  - using e-mail (including attachments, digital signatures, address books);
  - Internet browsers (including searching);
  - group communications (e.g. chat rooms, IRC, newsgroups, discussion boards, mailing lists, web pages, FTP);
  - Internet security (e.g. virus protection, firewalls, passwords);
  - Internet service providers and their role;
  - responsible e-communication.
  
- Future trends: any new developments that impact on the subject content.
  
- Management of information:
  - working with, managing and interpreting data;
  - finding, selecting and exchanging information.
  
- Networking principles:
  - topologies;
  - protocols;
  - network types, intranet and Internet;
  - dialup and dedicated lines;
  - network devices;
  - data compression and encryption.
  
- Problem formulation and solution (projects):
  - principles, techniques and tools which relate to the formulation of a problem and the planning of the solution, including the solution itself;
  - programming documentation.

- Programming (including database query language calls):
  - programming in a language using the accepted current programming paradigms (that is, structured, modular and object-oriented moving towards netcentric);
  - simple and structured data types;
  - control structures;
  - structuring with methods (procedures) and parameters;
  - classes and objects;
  - input-output, GUIs and files;
  - accessing a relational database using calls built into the language;
  - assessment and production of documentation, online and written.
  
- Social, accessibility, economic, ethical and human-computer interaction (HCI) issues:
  - knowledge about applications;
  - a broad knowledge of the economic reasons for using computers;
  - the effects of computer use across a range of application areas (e.g. banking, government, education, health services);
  - the potential effects of any suggested application or development;
  - ability to balance the advantages and disadvantages of a computerised system;
  - computer crime;
  - hacking/cracking;
  - privacy;
  - data security;
  - computer viruses;
  - the social, moral, ethical and legal implications of a computer-based solution;
  - human rights issues, inclusivity, accessibility (from an equipment, disabled and language perspective);
  - impact of indigenous knowledge;
  - issues of national and international importance and how they are affected by computers;
  - open-source versus proprietary software.
  
- Spreadsheets:
  - basic concepts;
  - standard mathematical and logical operations using basic formulae and functions;
  - advanced features (e.g. importing objects, creating graphs and charts);
  - integrating spreadsheet and database applications.
  
- System software:
  - operating systems at a conceptual level;
  - types of operating system (e.g. stand-alone, network);
  - functions of the operating system;
  - processing techniques;
  - file management;
  - installing and uninstalling software;
  - adding devices;

- storage device management;
  - management of system settings;
  - memory management.
- Testing:
- importance of testing programmes;
  - methods for generating test data;
  - data validation.
- User interface:
- assessment of interface design;
  - implementation of user interfaces;
  - principles of good navigation;
  - human-computer interface.
- Website development:
- development of simple websites, some of which contain forms linked to a database.

### Linking focus areas to Learning Outcomes

Table 3.1 shows how the content focus areas are linked to each Learning Outcome. Because of their nature, some of the focus areas are linked to more than one Learning Outcome.

**Table 3.1** Linkages between Learning Outcomes and focus areas

Learning Outcome	Focus Area
<p><b>Learning Outcome 1:</b>  <b>Hardware and System Software</b>  <i>The learner is able to demonstrate an understanding of and competently operate computer-based technologies.</i></p>	<ul style="list-style-type: none"> <li>• Computer hardware and devices</li> <li>• Future trends</li> <li>• Networking principles</li> <li>• System software</li> </ul>
<p><b>Learning Outcome 2:</b>  <b>e-Communication</b>  <i>The learner is able to apply creative uses of different computer technologies to facilitate electronic communication.</i></p>	<ul style="list-style-type: none"> <li>• e-Communication</li> <li>• Future trends</li> </ul>
<p><b>Learning Outcome 3:</b>  <b>Social and Ethical Issues</b>  <i>The learner is able to critically analyse the impact of computer technologies on socio-economic, environmental, political and ethical issues.</i></p>	<ul style="list-style-type: none"> <li>• Future trends</li> <li>• Social, accessibility, economic, ethical and human-computer interaction (HCI)</li> <li>• Career pathing</li> </ul>
<p><b>Learning Outcome 4:</b>  <b>Programming and Software Development</b>  <i>The learner is able to design, implement, test and deliver efficient and effective solutions to problem situations.</i></p>	<ul style="list-style-type: none"> <li>• Algorithm design</li> <li>• Computer hardware and devices</li> <li>• Data structures (including types, arrays, objects)</li> <li>• Database development</li> <li>• e-Communication</li> <li>• Management of information</li> <li>• Networking principles</li> <li>• Problem formulation and solution (projects)</li> <li>• Programming</li> <li>• Special topics (modern developments)</li> <li>• Spreadsheets</li> <li>• Testing</li> <li>• User interface</li> <li>• Website development (using an application)</li> </ul>

## CHAPTER 4

# ASSESSMENT

### INTRODUCTION

Assessment is a critical element of the National Curriculum Statement Grades 10 – 12 (General). It is a process of collecting and interpreting evidence in order to determine the learner’s progress in learning and to make a judgement about a learner’s performance. Evidence can be collected at different times and places, and with the use of various methods, instruments, modes and media.

To ensure that assessment results can be accessed and used for various purposes at a future date, the results have to be recorded. There are various approaches to recording learners’ performances. Some of these are explored in this chapter. Others are dealt with in a more subject-specific manner in the Learning Programme Guidelines.

Many stakeholders have an interest in how learners perform in Grades 10 – 12. These include the learners themselves, parents, guardians, sponsors, provincial departments of education, the Department of Education, the Ministry of Education, employers, and higher education and training institutions. In order to facilitate access to learners’ overall performances and to inferences on learners’ competences, assessment results have to be reported. There are many ways of reporting. The Learning Programme Guidelines and the Assessment Guidelines discuss ways of recording and reporting on school-based and external assessment as well as giving guidance on assessment issues specific to the subject.

### WHY ASSESS

Before a teacher assesses learners, it is crucial that the purposes of the assessment be clear and unambiguous. Understanding the purposes of assessment ensures that an appropriate match exists between the purposes and the methods of assessment. This, in turn, will help to ensure that decisions and conclusions based on the assessment are fair and appropriate for the particular purpose or purposes.

There are many reasons why learners’ performance is assessed. These include monitoring progress and providing feedback, diagnosing or remediating barriers to learning, selection, guidance, supporting learning, certification and promotion.

In this curriculum, learning and assessment are very closely linked. Assessment helps learners to gauge the value of their learning. It gives them information about their own progress and enables them to take control of and to make decisions about their learning. In this sense, assessment provides information about whether teaching and learning is succeeding in getting closer to the specified Learning Outcomes. When assessment indicates lack of progress, teaching and learning plans should be changed accordingly.

## TYPES OF ASSESSMENT

This section discusses the following types of assessment:

- baseline assessment;
- diagnostic assessment;
- formative assessment; and
- summative assessment.

### Baseline assessment

Baseline assessment is important at the start of a grade, but can occur at the beginning of any learning cycle. It is used to establish what learners already know and can do. It helps in the planning of activities and in Learning Programme development. The recording of baseline assessment is usually informal.

### Diagnostic assessment

Any assessment can be used for diagnostic purposes – that is, to discover the cause or causes of a learning barrier. Diagnostic assessment assists in deciding on support strategies or identifying the need for professional help or remediation. It acts as a checkpoint to help redefine the Learning Programme goals, or to discover what learning has not taken place so as to put intervention strategies in place.

### Formative assessment

Any form of assessment that is used to give feedback to the learner is fulfilling a formative purpose. Formative assessment is a crucial element of teaching and learning. It monitors and supports the learning process. All stakeholders use this type of assessment to acquire information on the progress of learners. Constructive feedback is a vital component of assessment for formative purposes.

### Summative assessment

When assessment is used to record a judgement of the competence or performance of the learner, it serves a summative purpose. Summative assessment gives a picture of a learner's competence or progress at any specific moment. It can occur at the end of a single learning activity, a unit, cycle, term, semester or year of learning. Summative assessment should be planned and a variety of assessment instruments and strategies should be used to enable learners to demonstrate competence.



## WHAT SHOULD ASSESSMENT BE AND DO?

Assessment should:

- be understood by the learner and by the broader public;
- be clearly focused;
- be integrated with teaching and learning;
- be based on the pre-set criteria of the Assessment Standards;
- allow for expanded opportunities for learners;
- be learner-paced and fair; and
- be flexible;
- use a variety of instruments;
- use a variety of methods.

## HOW TO ASSESS

Teachers' assessment of learners' performances must have a great degree of reliability. This means that teachers' judgements of learners' competences should be generalisable across different times, assessment items and markers. The judgements made through assessment should also show a great degree of validity; that is, they should be made on the aspects of learning that were assessed.

Because each assessment cannot be totally valid or reliable by itself, decisions on learner progress must be based on more than one assessment. This is the principle behind continuous assessment (CASS). Continuous assessment is a strategy that bases decisions about learning on a range of different assessment activities and events that happen at different times throughout the learning process. It involves assessment activities that are spread throughout the year, using various kinds of assessment instruments and methods such as tests, examinations, projects and assignments. Oral, written and performance assessments are included. The different pieces of evidence that learners produce as part of the continuous assessment process can be included in a portfolio. Different subjects have different requirements for what should be included in the portfolio. The Learning Programme Guidelines discuss these requirements further.

Continuous assessment is both classroom-based and school-based, and focuses on the ongoing manner in which assessment is integrated into the process of teaching and learning. Teachers get to know their learners through their day-to-day teaching, questioning, observation, and through interacting with the learners and watching them interact with one another.

Continuous assessment should be applied both to sections of the curriculum that are best assessed through written tests and assignments and those that are best assessed through other methods, such as by performance, using practical or spoken evidence of learning.

## METHODS OF ASSESSMENT

### Self-assessment

All Learning Outcomes and Assessment Standards are transparent. Learners know what is expected of them. Learners can, therefore, play an important part, through self-assessment, in 'pre-assessing' work before the teacher does the final assessment. Reflection on one's own learning is a vital component of learning.

### Peer assessment

Peer assessment, using a checklist or rubric, helps both the learners whose work is being assessed and the learners who are doing the assessment. The sharing of the criteria for assessment empowers learners to evaluate their own and others' performances.

### Group assessment

The ability to work effectively in groups is one of the Critical Outcomes. Assessing group work involves looking for evidence that the group of learners co-operate, assist one another, divide work, and combine individual contributions into a single composite assessable product. Group assessment looks at process as well as product. It involves assessing social skills, time management, resource management and group dynamics, as well as the output of the group.

## METHODS OF COLLECTING ASSESSMENT EVIDENCE

There are various methods of collecting evidence. Some of these are discussed below.

### Observation-based assessment

Observation-based assessment methods tend to be less structured and allow the development of a record of different kinds of evidence for different learners at different times. This kind of assessment is often based on tasks that require learners to interact with one another in pursuit of a common solution or product. Observation has to be intentional and should be conducted with the help of an appropriate observation instrument.

### Test-based assessment

Test-based assessment is more structured, and enables teachers to gather the same evidence for all learners in

the same way and at the same time. This kind of assessment creates evidence of learning that is verified by a specific score. If used correctly, tests and examinations are an important part of the curriculum because they give good evidence of what has been learned.

### **Task-based assessment**

Task-based or performance assessment methods aim to show whether learners can apply the skills and knowledge they have learned in unfamiliar contexts or in contexts outside of the classroom. Performance assessment also covers the practical components of subjects by determining how learners put theory into practice. The criteria, standards or rules by which the task will be assessed are described in rubrics or task checklists, and help the teacher to use professional judgement to assess each learner's performance.

## **RECORDING AND REPORTING**

Recording and reporting involves the capturing of data collected during assessment so that it can be logically analysed and published in an accurate and understandable way.

### **Methods of recording**

There are different methods of recording. It is often difficult to separate methods of recording from methods of evaluating learners' performances.

The following are examples of different types of recording instruments:

- rating scales;
- task lists or checklists; and
- rubrics.

Each is discussed below.

### ***Rating scales***

Rating scales are any marking system where a symbol (such as A or B) or a mark (such as 5/10 or 50%) is defined in detail to link the coded score to a description of the competences that are required to achieve that score. The detail is more important than the coded score in the process of teaching and learning, as it gives learners a much clearer idea of what has been achieved and where and why their learning has fallen short of the target. Traditional marking tended to use rating scales without the descriptive details, making it difficult to have a sense of the learners' strengths and weaknesses in terms of intended outcomes. A six-point scale of achievement is used in the National Curriculum Statement Grades 10 – 12 (General).

### **Task lists or checklists**

Task lists or checklists consist of discrete statements describing the expected performance in a particular task. When a particular statement (criterion) on the checklist can be observed as having been satisfied by a learner during a performance, the statement is ticked off. All the statements that have been ticked off on the list (as criteria that have been met) describe the learner's performance. These checklists are very useful in peer or group assessment activities.

### **Rubrics**

Rubrics are a combination of rating codes and descriptions of standards. They consist of a hierarchy of standards with benchmarks that describe the range of acceptable performance in each code band. Rubrics require teachers to know exactly what is required by the outcome. Rubrics can be holistic, giving a global picture of the standard required, or analytic, giving a clear picture of the distinct features that make up the criteria, or can combine both. The Learning Programme Guidelines give examples of subject-specific rubrics.

To design a rubric, a teacher has to decide the following:

- Which outcomes are being targeted?
- Which Assessment Standards are targeted by the task?
- What kind of evidence should be collected?
- What are the different parts of the performance that will be assessed?
- What different assessment instruments best suit each part of the task (such as the process and the product)?
- What knowledge should be evident?
- What skills should be applied or actions taken?
- What opportunities for expressing personal opinions, values or attitudes arise in the task and which of these should be assessed and how?
- Should one rubric target all the Learning Outcomes and Assessment Standards of the task or does the task need several rubrics?
- How many rubrics are, in fact, needed for the task?

It is crucial that a teacher shares the rubric or rubrics for the task with the learners before they do the required task. The rubric clarifies what both the learning and the performance should focus on. It becomes a powerful tool for self-assessment.

### **Reporting performance and achievement**

Reporting performance and achievement informs all those involved with or interested in the learner's progress. Once the evidence has been collected and interpreted, teachers need to record a learner's achievements. Sufficient summative assessments need to be made so that a report can make a statement about the standard achieved by the learner.

The National Curriculum Statement Grades 10 – 12 (General) adopts a six-point scale of achievement. The scale is shown in Table 4.1.

**Table 4.1** Scale of achievement for the National Curriculum Statement Grades 10 – 12 (General)

<b>Rating Code</b>	<b>Description of Competence</b>	<b>Marks (%)</b>
6	Outstanding	80-100
5	Meritorious	60-79
4	Satisfactory	50-59
3	Adequate	40-49
2	Partial	30-39
1	Inadequate	0-29

## SUBJECT COMPETENCE DESCRIPTIONS

To assist with benchmarking the achievement of Learning Outcomes in Grades 10 – 12, subject competences have been described to distinguish the grade expectations of what learners must know and be able to achieve. Six levels of competence have been described for each subject for each grade. These descriptions will assist teachers to assess learners and place them in the correct rating. The descriptions summarise the Learning Outcomes and the Assessment Standards, and give the distinguishing features that fix the achievement for a particular rating. The various achievement levels and their corresponding percentage bands are as shown in Table 4.1.

In line with the principles and practice of outcomes-based assessment, all assessment – both school-based and external – should primarily be criterion-referenced. Marks could be used in evaluating specific assessment tasks, but the tasks should be assessed against rubrics instead of simply ticking correct answers and awarding marks in terms of the number of ticks. The statements of competence for a subject describe the minimum skills, knowledge, attitudes and values that a learner should demonstrate for achievement on each level of the rating scale.

When teachers/assessors prepare an assessment task or question, they must ensure that the task or question addresses an aspect of a particular outcome. The relevant Assessment Standard or Standards must be used when creating the rubric for assessing the task or question. The descriptions clearly indicate the minimum level of attainment for each category on the rating scale.

The competence descriptions for this subject appear at the end of this chapter.

## PROMOTION

Promotion at Grade 10 and Grade 11 level will be based on internal assessment only, but must be based on the same conditions as those for the Further Education and Training Certificate. The requirements, conditions, and rules of combination and condonation are spelled out in the *Qualifications and Assessment Policy Framework for the Grades 10 – 12 (General)*.

## WHAT REPORT CARDS SHOULD LOOK LIKE

There are many ways to structure a report card, but the simpler the report card the better, provided that all important information is included. Report cards should include information about a learner's overall progress, including the following:

- the learning achievement against outcomes;
- the learner's strengths;
- the support needed or provided where relevant;
- constructive feedback commenting on the performance in relation to the learner's previous performance and the requirements of the subject; and
- the learner's developmental progress in learning how to learn.

In addition, report cards should include the following:

- name of school;
- name of learner;
- learner's grade;
- year and term;
- space for signature of parent or guardian;
- signature of teacher and of principal;
- date;
- dates of closing and re-opening of school;
- school stamp; and
- school attendance profile of learner.

## ASSESSMENT OF LEARNERS WHO EXPERIENCE BARRIERS TO LEARNING

The assessment of learners who experience any barriers to learning will be conducted in accordance with the recommended alternative and/or adaptive methods as stipulated in the *Qualifications and Assessment Policy Framework for Grades 10 – 12 (General)* as it relates to learners who experience barriers to learning. Refer to *White Paper 6 on Special Needs Education: Building an Inclusive Education and Training System*.



Grade 10



Code



Scale

6

80%-100%  
Outstanding



Competence Descriptions

**By the end of Grade 10 the learner with outstanding achievement can:**

- creatively apply the basics of stand-alone computer hardware and the software that drives the hardware (including the operating system);
- independently explore and demonstrate a thorough understanding of the responsible uses of a wide variety of Internet services including e-mail and the World Wide Web;
- debate economic, health and environmental issues relating to the use of computers;
- create and design unique and innovative solutions to simple problems using an object-oriented programming language, spreadsheets, databases and web applications, with special attention to the design of user interfaces to interact with them.



## Grade 11



### Competence Descriptions

**By the end of Grade 11 the learner with outstanding achievement can:**

- demonstrate a thorough understanding of and easily apply the essentials of networked computers, more technical aspects of computer hardware and software, and data integrity and protection beyond the given;
- independently explore and demonstrate more advanced uses of e-mail and group communications, effective web searches and the transfer of files across the Internet in a wide variety of situations;
- forecast career and employment practices, globalising trends and issues related to the use of computers;
- create and design unique and innovative programmes using object-oriented principles and graphical user interfaces that cope with valid and invalid data;
- independently create and query multi-table databases, and use spreadsheets to produce mathematically-based charts that exceed the standards.

## Grade 12



### Competence Descriptions

**By the end of Grade 12 the learner with outstanding achievement can:**

- display advanced insight into a problem-solving and trouble-shooting environment related to computer-based systems in terms of their configuration, performance and the needs of specified users;
- critically evaluate web-based resources, assess Internet security issues and debate the implications of the right to confidentiality of information;
- debate ethical issues as well as issues of national and international importance related to the use of computers;
- create and design unique and innovative programmes and competently use classes, collections, user interfaces, help files, automatic test-generation and debugging;
- create and design unique and innovative databases and access them from programmes, spreadsheets and the web.

Grade 10



Code

5



Scale

60%-79%  
Meritorious



Competence Descriptions

**By the end of Grade 10 the learner with meritorious achievement can:**

- independently apply the basics of stand-alone computer hardware and the software that drives the hardware (including the operating system);
- explore and demonstrate a thorough understanding of the responsible uses of various Internet services, including e-mail and the World Wide Web;
- compare economic, health and environmental issues relating to the use of computers;
- create and design with technical accuracy solutions to simple problems using an object-oriented programming language, spreadsheets, databases and web applications, with special attention to the design of user interfaces to interact with them.

## Grade 11



### Competence Descriptions

**By the end of Grade 11 the learner with meritorious achievement can:**

- demonstrate an understanding of and apply the essentials of networked computers, more technical aspects of computer hardware and software, and data integrity and protection in a given situation;
- explore and demonstrate more advanced uses of e-mail and group communications, effective web searches and the transfer of files across the Internet;
- compare career and employment practices, globalising trends and issues related to the use of computers;
- develop creative programmes using object-oriented principles and graphical user interfaces that cope with valid and invalid data;
- independently create and query multi-table databases, and use spreadsheets to produce mathematically-based charts that extend beyond the given.

## Grade 12



### Competence Descriptions

**By the end of Grade 12 the learner with meritorious achievement can:**

- creatively analyse and report within a problem-solving and trouble-shooting environment related to computer-based systems in terms of their configuration, performance and the needs of specified users;
- justify the application of web-based resources, assess Internet security issues and investigate the implications of the right to confidentiality of information;
- research ethical issues as well as issues of national and international importance related to the use of computers;
- independently develop programmes and competently use classes, collections, user interfaces, help files, automatic test-generation and debugging;
- independently develop various databases and access them from programmes, spreadsheets and the web.

Grade 10



Code



Scale

4

50%-59%  
Satisfactory



Competence Descriptions

**By the end of Grade 10 the learner with satisfactory achievement can:**

- understand and apply the basics of stand-alone computer hardware and the software that drives the hardware (including the operating system);
- understand and apply the responsible uses of various Internet services, including e-mail and the World Wide Web;
- understand economic, health and environmental issues relating to the use of computers;
- develop solutions to simple problems using an object-oriented programming language, spreadsheets, databases and web applications, with special attention to the design of user interfaces to interact with them.

## Grade 11



### **Cd** Competence Descriptions

**By the end of Grade 11 the learner with satisfactory achievement can:**

- understand the essentials of networked computers, more technical aspects of computer hardware and software, and data integrity and protection;
- independently handle more advanced uses of e-mail and group communications, effective web searches and the transfer of files across the Internet;
- understand career and employment practices, globalising trends and issues related to the use of computers;
- develop programmes using object-oriented principles and graphical user interfaces that cope with valid and invalid data;
- create and query multi-table databases, and use spreadsheets to produce mathematically-based charts.

## Grade 12



### **Cd** Competence Descriptions

**By the end of Grade 12 the learner with satisfactory achievement can:**

- analyse and report within a problem-solving and trouble-shooting environment related to computer-based systems in terms of their performance and the needs of specified users;
- analyse web-based resources, assess Internet security issues and understand the implications of the right to confidentiality of information;
- understand ethical issues as well as issues of national and international importance related to the use of computers;
- develop programmes and competently use classes, collections, user interfaces, help files, automatic test-generation and debugging;
- develop various databases and access them from programmes, spreadsheets and the web.

Grade 10



Code



Scale

3

40%-49%  
Adequate



Competence Descriptions

**By the end of Grade 10 the learner with adequate achievement can:**

- understand the basics of stand-alone computer hardware and the software that drives the hardware (including the operating system);
- understand the responsible uses of various Internet services, including e-mail and the World Wide Web;
- have a general knowledge of economic, health and environmental issues relating to the use of computers;
- with some assistance, develop solutions to simple problems using an object-oriented programming language, spreadsheets, databases and web applications, with special attention to the design of user interfaces to interact with them.

## Grade 11



### Competence Descriptions

**By the end of Grade 11 the learner with adequate achievement can:**

- state the essentials of networked computers, more technical aspects of computer hardware and software, and data integrity and protection;
- handle more advanced uses of e-mail and group communications, effective web searches and the transfer of files across the Internet;
- state career and employment practices, globalising trends and issues related to the use of computers;
- with some assistance, develop programmes using object-oriented principles and graphical user interfaces that cope with valid and invalid data;
- with assistance, create and query multi-table databases, and use spreadsheets to produce mathematically-based charts.

## Grade 12



### Competence Descriptions

**By the end of Grade 12 the learner with adequate achievement can:**

- understand and report within a problem-solving and trouble-shooting environment related to computer-based systems in terms of their performance and the needs of specified users;
- state web-based resources, list Internet security issues and state the implications of the right to confidentiality of information;
- state ethical issues as well as issues of national and international importance related to the use of computers;
- with some assistance, develop programmes and competently use classes, collections, user interfaces, help files, automatic test-generation and debugging;
- with assistance develop various databases and access them from programmes, spreadsheets and the web.

Grade 10



Code



Scale

2

30%-39%  
Partial



Competence Descriptions

**By the end of Grade 10 the learner with partial achievement can:**

- understand on a limited basis the basics of stand-alone computer hardware and the software that drives the hardware (including the operating system);
- show a limited understanding of the responsible uses of various Internet services, including e-mail and the World Wide Web;
- show a limited knowledge of economic, health and environmental issues relating to the use of computers;
- attempt with assistance to partially develop solutions to simple problems using an object-oriented programming language, spreadsheets, databases and web applications, with special attention to the design of user interfaces to interact with them.



## Grade 11



### **d** Competence Descriptions

**By the end of Grade 11 the learner with partial achievement can:**

- show limited knowledge of the essentials of networked computers, more technical aspects of computer hardware and software, and data integrity and protection;
- with assistance, handle more advanced uses of e-mail and group communications, effective web searches and the transfer of files across the Internet;
- show limited knowledge of career and employment practices, globalising trends and issues related to the use of computers;
- attempt with assistance to partially develop programmes using object-oriented principles and graphical user interfaces that cope with valid and invalid data;
- attempt with assistance to partially create and query multi-table databases, and use spreadsheets to produce mathematically-based charts.

## Grade 12



### **d** Competence Descriptions

**By the end of Grade 12 the learner with partial achievement can:**

- show only a narrow and incomplete understanding and reporting within a problem-solving and trouble-shooting environment related to computer-based systems in terms of their performance and the needs of specified users;
- show only a limited knowledge about web-based resources, Internet security issues and the implications of the right to confidentiality of information;
- display a limited knowledge of ethical issues as well as issues of national and international importance relating to the use of computers;
- attempt with assistance to partially develop programmes and show limited competence in using classes, collections, user interfaces, help files, automatic test-generation and debugging;
- attempt with assistance to partially develop various databases and access them from programmes, spreadsheets and the web.

Grade 10



Code



Scale

1

0%-29%  
Inadequate



Competence Descriptions

**By the end of Grade 10 the learner with inadequate achievement can:**

- show little or no understanding of the basics of stand-alone computer hardware and the software that drives the hardware (including the operating system);
- show little or no knowledge of the responsible uses of various Internet services, including e-mail and the World Wide Web;
- be unsure of the economic, health and environmental issues relating to the use of computers;
- be unable to develop solutions to simple problems using an object-oriented programming language, spreadsheets, databases and web applications, with special attention to the design of user interfaces to interact with them.

## Grade 11



### **d** Competence Descriptions

**By the end of Grade 11 the learner with inadequate achievement can:**

- show little or no knowledge of the essentials of networked computers, more technical aspects of computer hardware and software, and data integrity and protection;
- not handle more advanced uses of e-mail and group communications, effective web searches and the transfer of files across the Internet;
- show little or no knowledge of career and employment practices, globalising trends and issues related to the use of computers;
- not develop programmes using object-oriented principles and graphical user interfaces that cope with valid and invalid data;
- not create and query multi-table databases, or use spreadsheets to produce mathematically-based charts.

## Grade 12



### **d** Competence Descriptions

**By the end of Grade 12 the learner with inadequate achievement can:**

- not analyse and report within a problem-solving and trouble-shooting environment related to computer-based systems in terms of their performance and the needs of specified users;
- not list web-based resources, assess Internet security issues or understand the implications of the right to confidentiality of information;
- show little or no knowledge of ethical issues as well as issues of national and international importance relating to the use of computers;
- not develop programmes or show competence in using classes, collections, user interfaces, help files, automatic test-generation and debugging;
- not develop various databases or access them from programmes, spreadsheets and the web.



## GLOSSARY

**algorithm** – a formula or set of steps for solving a particular problem. To be an algorithm, a set of rules must be unambiguous and have a clear stopping point.

**application software/package** – a programme that performs specific tasks (e.g. word processing or database management) (see also **system software** and **utility software**)

**assignment** – giving a value to a variable. This is done with a special symbol called an assignment operator. In many languages, the assignment is the equal sign (=).

**attachment** – a file attached to an e-mail message. Many e-mail systems only support sending text files as e-mail. If the attachment is a binary file or a formatted text file (e.g. an MS Word document), it must be encoded before it is sent and decoded once it is received. There are a number of encoding schemes, the two most prevalent being Uuencode and MIME.

**bio-informatics** – the application of computer technology to the management of biological information

**Boolean operator** – a word such as AND, OR and NOT, generally typed in capital letters, that indicates how search terms should be combined in a Boolean search

**class** – the prototype for an object in an object-oriented language; analogous to a derived type in a procedural language; a set of objects that share a common structure and behaviour. The structure of a class is determined by the class variables which represent the state of an object of that class, and the behaviour is given by a set of methods associated with the class.

**configuration** – the way a system is set up; the assortment of components that make up a system; can refer to either hardware or software or a combination of both

**connectivity** – the extent to which a given computer or programme can function in a network setting

**data integrity** – the accuracy, completeness and internal consistency of the information stored in a database

**data structure** – in programming, a scheme for organising related pieces of information

**data typing** – a classification given to a data field that governs the kind of data that may be entered in the field (e.g. date, numeric, character, logical)

**data validation** – a method of increasing the validity of data by defining acceptable input ranges

**device driver** – a programme that provides the operating system with the information that it needs to work with a specific device (e.g. a printer). A driver acts like a translator between the device and programmes that

use the device. Each device has its own set of specialised commands that only its driver knows. In Windows environments, drivers often have a .DRV extension.

**digital signature** – a digital code that can be attached to an electronically transmitted message to uniquely identify the sender

**directory** – a special kind of file used to organise other files into a hierarchical structure. Directories contain bookkeeping information about files that are, figuratively speaking, beneath them. A directory can be thought of as a **folder** or cabinet that contains files and perhaps other folders. In fact, many graphical user interfaces use the term folder instead of directory.

**discussion board** – an online service oriented towards discussion groups, file downloading and games

**end-user** – the person who uses a computer application, as opposed to those who developed or support it. The end-user may or may not know anything about computers, how they work, or what to do if something goes wrong.

**ergonomics** – the science concerned with designing safe and comfortable machines for human use (e.g. designing furniture that avoids causing backaches and muscle cramps). In the computer field, ergonomics plays an important role in the design of monitors and keyboards. Another term for ergonomics is human engineering.

**fetch test data** – test data obtained from sources that specialise in the provision of appropriate test data

**file** – a collection of information with its own name stored on one's own computer; can be used to store text, numbers, graphics, sound or video

**file extension** – the portion of a file name, following the final point, which indicates the kind of data stored in the file

**folder** – an area of a disk that holds a group of documents. Like a folder in a filing cabinet, a folder makes it easy to find and work with related documents. Also called a **directory**.

**geographical information systems (GIS)** – systems, linked to databases, specifically designed for graphically displaying geographical information

**graphical user interface (GUI)** – a programme interface that takes advantage of the computer's graphics capabilities to make a programme easier to use

**group communication** – a type of software that helps to improve the productivity of people working on a related project. Groupware lets several people work with the same file at the same time. It also helps to coordinate and manage activities (e.g. scheduling meetings).

**human engineering** – see **ergonomics**

**interface** – a boundary across which two independent systems meet and act on or communicate with each other. In computer technology, there are several types of interfaces:

- user interface – the keyboard, mouse or menus of a computer system; allows the user to communicate with the operating system (also see **graphic user interface**)
- software interface – the languages and codes used by applications to communicate with each other and with the hardware
- hardware interface – the wires, plugs and sockets that hardware devices use to communicate with each other

**Internet** – the biggest computer network in the world, reaching millions of people, on thousands of interconnected networks

**internet service provider (ISP)** – a company that provides access to the Internet

**intranet** – any network which provides services within an organisation similar to those provided by the Internet outside it, but which is not necessarily connected to the Internet (e.g. the use by a company of one or more World Wide Web servers on an internal TCP/IP network for distribution of information within the company)

**loop** – a control structure in which a block of instructions repeats until a condition is fulfilled

**memory management** – a collective term for a variety of strategies for ensuring that programmes have sufficient available memory to function correctly

**multi-table database** – see **relational database**

**navigation** – an element that triggers a change in an item (usually a graphic) on a web page when the mouse passes over it. The change usually signifies that the item is a link to related or additional information.

**network architecture** – the complete set of hardware, software and cabling standards for a local area network design

**network device** – hardware items required to set up a network (e.g. network interface cards, hubs, switches, routers, bridges)

**network protocol** – an agreed format for transmitting data between two devices. The protocol determines the following:

- the type of error checking to be used;
- data compression method, if any;
- how the sending device will indicate that it has finished sending a message;
- how the receiving device will indicate that it has received a message.

**network topology** – the shape of a local area network (LAN) or other communications system; may be physical or logical

**normalisation** – a series of steps followed to obtain a database design that allows for efficient access and storage of data in a relational database. These steps reduce data redundancy and the chances of data becoming inconsistent.

**object-oriented** – a type of programming in which programmers define not only the data type of a data structure, but also the types of operations (functions) that can be applied to the data structure. In this way, the data structure becomes an object that includes both data and functions. In addition, programmers can create relationships between one object and another. For example, objects can inherit characteristics from other objects. One of the principal advantages of object-oriented programming techniques over procedural programming techniques is that they enable programmers to create modules that do not need to be changed when a new type of object is added. A programmer can simply create a new object that inherits many of its features from existing objects. This makes object-oriented programmes easier to modify.

**online help system** – a help utility available on-screen while using a network or an application programme

**open-source software** – a method and philosophy for software licensing and distribution designed to encourage use and improvement of software written by volunteers, by ensuring that anyone can access the source code and modify it freely

**operating system** – the master control programme that manages the computer's internal functions (e.g. accepting keyboard input), and provides the means to control the computer's operations and file system. Popular operating systems include Linux, MacOS and Windows.

**peripheral device** – a computer device which is not part of the essential computer. Peripheral devices can be external (e.g. mouse, keyboard, printer, monitor, external Zip drive or scanner) or internal (e.g. CD-ROM drive, CD-R drive, internal modem).

**processing techniques** – the manner in which systems handle tasks (e.g. real-time, multi-tasking)

**programming environment** – a set of tools for programming that is commonly provided with a computer's operating system. Frequently these tools are supplemented by an application development system.

**programming language** – a formal language in which computer programmes are written. The definition of a particular language consists of both syntax (how the various symbols of the language may be combined) and semantics (the meaning of the language constructs).

**proprietary software** – privately-owned and controlled software, design or technique. In the computer industry, proprietary is the opposite of open. The company does not divulge specifications that would allow other companies to duplicate the product.

**query language** – an industry-standard language for creating, updating and querying relational database management systems



**relational database** – a type of database that uses the contents of a particular field as an index to reference particular records (sometimes called a multi-table database)

**search engine** – a programme that searches documents for specified keywords and returns a list of the documents where the keywords were found

**software bug** – an error or defect in software that causes a programme to malfunction

**stand-alone computer** – a computer system dedicated to meeting all the computing needs of an individual user. Links with other computers, if any, are incidental to the system's chief purpose.

**system software** – any software required to support the production or execution of application programmes but which is not specific to any particular application; typically includes:

- an operating system to control the execution of other programmes;
- user environment software (e.g. a command-line interpreter, window system, desktop);
- development tools for building other programmes (e.g. assemblers, compilers, linkers, libraries, interpreters, cross-reference generators, version control, make);
- debugging, profiling and monitoring tools;
- utility programmes (e.g. for sorting, printing, editing)

**systems analysis** – a discipline that is devoted to the rational and organised planning, development and implementation of artificial systems, including information systems

**uninstall software** – software that removes a programme from a computer system by using a special utility designed specifically for that purpose

**user group** – a voluntary association of users of a specific computer system or programme who meet regularly (either physically or electronically) to exchange tips and techniques

**user guide** – a printed document that provides the user with information on how to use an application

**user interface** – the features of a programme or computer that govern the way people interact with the programme or computer

**utility software** – programmes that assist the user to maintain and improve the efficiency of a computer system

**website** – a site (location) on the World Wide Web. Each website contains a home page, which is the first document users see when they enter the site. The site might also contain additional documents and files. Each site is owned and managed by an individual, company or organisation.

**World Wide Web** – an Internet client-server hypertext distributed information retrieval system





