

Table of Contents

Prerequisite of Using the Assessment Framework.....	4
Chapter One	7
Introduction.....	7
Quality of Education	7
The Need for an Assessment Framework	7
The Purpose of Developing Assessment Framework	8
The Purpose of Developing the Mathematics Assessment Framework.....	9
The Cyclic Assessment	10
Chapter Two.....	12
Pre-Assessment	12
Curriculum Mapping: A Pre-Assessment Strategy	12
Table of Specifications	13
Grade VI.....	13
Grade VII	14
Grade VIII.....	15
List of Assessment Codes and Assessment Strategies.....	16
List of Codes, SLOs and Assessment Strategies.....	17
Grade VI.....	17
Grade VII	22
Grade VIII.....	27
Chapter Three.....	34
Assessment during Instruction	34
Designing Classroom Assessment	34
Assessment Strategies	34
Formative Assessment for Deep Learning Approach – Meaningful Examples.....	35
Portfolio Assessment: Practical work in Math-Lab & Concept Exploration.....	35
Group Project Assessment	43
Summative Assessment for Measurement and Evaluation – Frequently Use Examples.....	46
Selected Response - Multiple Choice (Objective Test Item)	46
Constructed Response – Word Problems.....	49
Assessment Validity.....	59
Content Validity.....	59

Chapter Four	61
Supporting Responsive Teaching and Learning through Feedback.....	61
Feedback	61
Examples of Good and Bad Feedback	64
Feedback to Parents	64
Chapter Five.....	70
Post Assessment: Redefined Goals/Curriculum	70
Completing the Assessment Loop.....	70
Balanced Assessment System	70
Concluding Remarks – Exit to the Next Cycle	73
References.....	74
Appendices.....	76
Bloom’s Revised Taxonomy Model – Cognitive Domain.....	77
Bloom’s Revised Taxonomy Model – Affective Domain	80
Bloom’s Revised Taxonomy Model – Psychomotor Domain	82
Curriculum Mapping.....	84
Grade VI.....	84
Grade VII	95
Grade VIII.....	120

Prerequisite of Using the Assessment Framework

This Assessment Framework (AF) provides theory and structured conceptual map of how the learning outcomes of a programme of study should be assessed at the lower secondary school level. It contains guidelines and principles of assessment as well as several practical examples to illustrate the application in the classroom.

The framework can be considered a blueprint of an assessment programme at the middle school level. As with all assessment frameworks, its enactment in schools and classrooms will require professional judgement guided by the following prerequisites.

Teacher and Head Teacher Development – Where needed, teachers and head teachers would require short courses on a. formative assessment, b. the progressive notions of cyclic purposeful assessment and their need in Pakistani context, and, c. the importance and conduct of formative feedback, which facilitates learners’ progression from lower-order thinking skills to higher-order thinking abilities. They may also need to learn how to read the curriculum maps and tables of specification to plan for authentic and valid assessment.

School Based Assessment Planning – School based yearly assessment programmes and monthly assessment schemes must be developed. In addition, to providing principles and guidelines for assessment, the AF also includes illustrative samples to help clarify how the former can be translated into practice. The framework also contains schedules of assessment and assessment weightage. These need to be considered for school level planning.

School Based Mentoring – There is a need to develop mentors who can work with teachers and head teachers in the selected schools to help them translate the AF into various schools’ realities. Pakistan has schools of varying systems – from public to private to madrasah; varying contexts - from rural to urban to semi-urban; varying socio-economic background – from schools for high-income group to low-income groups to middle-income groups. Therefore, mentors will be required for at least the first year of the implementation of the AF.

CHAPTER ONE

INTRODUCTION

Chapter One

Introduction

This chapter introduces the National Assessment Framework (NAF), developed as an integral component of the National Curriculum Framework (NCF). By drawing on essential information from different national policy documents and from the relevant international literature, the chapter discusses the philosophical positioning of the assessment framework. It presents a brief overview of the quality of education and the need for developing a uniform national assessment framework. It further outlines the basic structure and the principles of various forms of assessment for Mathematics, for grades VI to VIII.

Quality of Education

Quality as a complex and contested notion does not have a single definition; the understanding and the provisions of inputs into quality in education vary from society to society and context to context. National Curriculum Framework (NCF) (Government of Pakistan, 2018b) refers to quality of education as a set of elements containing input, process, and output of the education system. Quality also entails all the desirable characteristics of learners, processes, learning materials, content, governance and management, and learning outcomes. Elaborating on the definition, NCF (2018b, p.1) further argues, “Quality education satisfies basic learning needs and enriches the lives of learners and their overall experience of living.” Policy document on Minimum Standards for Quality of Education in Pakistan (Government of Pakistan, 2018a) refers to the definition used in Education for All (EFA) Global Monitoring Report 2005, which draws on two principles. The first principle identifies learners' cognitive development as the major explicit objective of all education systems, and the second emphasizes education's role in nurturing creative and emotional development for promoting the values and attitudes of responsible citizenship. The document on Minimum Standards for Quality of Education (2018) explains the concept of quality in terms of education that is “meaningful, relevant and responsive to the needs of individuals and the society as a whole.” (Government of Pakistan, 2018c, p.5). Similarly, the National Educational Policy (NEP), 2009 recognizes six pillars of quality, which include curriculum, textbooks, assessment, teachers, learning environment and relevance of education to practical life.

The Need for an Assessment Framework

Assessment is an integral part of the quality of education offered to the students. It serves as a tool to measure outputs and outcomes of processes and practices. As such, assessment plays a central role in translating the key ideas in the quality definition into practice.

Erwin (1991) cited in NCF (Government of Pakistan, 2018b) defines assessment as:

...the process of defining, selecting, designing, collecting, analysing, interpreting, and using information to continuously increase students' learning and development. It is the systematic collection, review, and use of information about educational programmes to

improve student learning. Assessment focuses on what students know, what they are able to do, and what values they have when they receive their education... Assessment is concerned with the collective impact of a series of lessons on student learning. (p.69)

The above definition of assessment implies that on the one hand assessment provides evidence of students' learning of academic content (academic domain) and development in other domains (psychosocial/psycho-emotional, language and affective domains). On the other hand, it supports the collection of relevant information for various purposes such as informing teaching and learning, determining students' progress on an ongoing basis, measuring achievement, and providing information needed for monitoring individual and institutional accountability. These all lead to informed decision-making about improving students' learning outcomes and enhance the overall quality of education focusing on efforts at classroom, school and system levels.

NCF (Government of Pakistan, 2018b), emphasises the need to develop a variety of assessment mechanisms to assess students' competence as per curricula and the SLOs. A robust and coherent national assessment system can help in the realization of the aims, goals and purposes of education articulated in NCF and other policy documents. This can be achievable with the help of a comprehensive and coherent national assessment framework to guide and support education systems, schools and teachers in bringing about improvement in student assessment on a sustainable basis.

The Purpose of Developing Assessment Framework

The purpose of developing an assessment framework is to ensure the standardized implementation of different forms of assessment that includes formative and summative school-based classroom assessments and large-scale assessment. It encompasses a paradigm shift from the traditional ways of assessing to a competency-based assessment considering the implication for its utility, reliability and practicality in different contexts. Underpinning different purposes of assessments, the framework serves as guidance for all the stakeholders in the learning system in developing, implementing and using assessments methodically to instate stronger teaching and learning practices.

The above discussion signifies that the assessment needs to be purposeful. It is a broad process of collecting, synthesising and interpreting information to support student learning and to report on the amount learned. The supporting function is known as formative assessment and the reporting function is known as summative assessment (as shown below).

Assessment Type	Formative	Summative
	Looking back and preparing forward. Feeding back and feeding forward.	Feeding back. Providing a snapshot.
Assessment Objectives & Outcomes	Assessment <i>as and for</i> Learning	Assessment <i>of</i> Learning
	Focusing on constructive feedback from the teacher and on developing students' capacity to self-assess and to reflect on their learning to improve their future learning and understanding.	Making judgments about what the student has learned in relation to the teaching and learning goals; should be comprehensive and reflect the learning growth over the time period being assessed.

Source: (Chappuis & Stiggins, 2017)

The Purpose of Developing the Mathematics Assessment Framework

The mathematics curriculum is designed to help students become mathematically literate so that students can acquire knowledge, skills and disposition to appreciate beauty, patterns and relationship in mathematics, use problem solving and reasoning skills to deal with the mathematics involved in real world problems and take informed decisions in personal and professional life.

Aligned with the Mathematics curriculum, Mathematics Assessment Framework is developed to provide different forms of formative and summative assessment along with the purpose with which each assessment is being introduced.

Mathematics Assessment Framework is constructed in the form of tasks that involve taking into account the developmental levels of students. The mathematical framework is a multi-dimensional framework and it provides a variety of assessment tools to gather information from multiple sources to make sense of what students understand and what mathematical ideas are still developing in five different competencies, that is, number and operations, algebra, measurement, geometry and statistics and probability. It will also present a table of specification along with the structure of formative and summative assessment, schedule of assessment and guidelines for providing feedback for improving performance.

The framework also provides samples/examples of selected and constructed items for summative and formative tests including marking guidelines, examples of authentic tasks and rubrics as well as examples of effective feedback.

The Cyclic Assessment

Purposeful assessment is cyclic. There are many versions of cyclic assessment. The one presented here is adapted from Margaret Heritage's model.

DRAFT

Source: Adapted from Greenstein, 2016

The cyclic model illustrates how purposeful assessment systematically supports learning by tracking and enhancing student growth towards standards following the seven steps. The seven-step model will be unpacked in the subsequent sections of the framework.

CHAPTER TWO

PRE-ASSESSMENT

DRAFT

DRAFT

Chapter Two

Pre-Assessment

Curriculum Mapping: A Pre-Assessment Strategy

An important consideration in assessment is how well students have mastered the SLOs, what knowledge, skills, and attitudes they have acquired in a particular learning area during an academic year and where they are expected to be at the end of teaching and learning (Greenstein, 2016). The first stage in planning for assessment is, therefore, to develop curriculum maps illustrating the alignment between the SLOs for Mathematics for grades VI- VIII with the various domains of knowledge, skills and attitudes using pre-specified criteria based on Bloom's taxonomy (see Appendices A, B & C).

The detailed curriculum maps have been developed for Mathematics grades VI- VIII and are attached as appendices from Appendices D, E and F. Curriculum mapping is based on Bloom's Cognitive, Affective and Psychomotor Domains.

The Cognitive Domain comprises six (06) cognitive dimensions, namely remember, understand, apply, analyse, evaluate, create and four (04) knowledge dimensions namely factual, conceptual, procedural and metacognitive. **The Affective Domain** comprises five (05) dimensions comprising receiving, responding, valuing, organising and characterising. **The Psychomotor Domain** comprises seven (07) dimensions namely, perception, set, guided response, mechanism, complex overt response, adaptation and origination.

The description, key words and sample assessment in each dimension are given in Appendices A, B and C. The sources from where the description and examples have been taken are also given underneath the tables in the different appendices.

Curriculum maps were used for the following four purposes:

- Develop topic wise or competency wise weightage
- Develop tables of specifications based on the weightage
- Group SLOs in terms of knowledge, skills, and attitudes they are trying to develop
- Develop assessment codes

The following section presents tables of specifications followed by list of assessment codes, SLOs and assessment strategies.

Table of Specifications

Tables of specifications were prepared for each grade levels to align student-learning outcomes with key competencies or instruction units and calculate the number of assessed items.

Grade VI

Total Percentage Share of the Three Domains for Maths

Domains	Share in Percentage
Cognitive	90%
Affective	0%
Psychomotor	10%

Weightage of Each Unit

Unit	Title	Cognitive	Affective	Psychomotor	Weightage
1	Number & Operations	44%	-	-	44%
2	Algebra	15%	-	-	15%
3	Measurements	8%	-	2%	10%
4	Geometry	15%	-	6%	21%
5	Statistics & Probability	8%	-	2%	10%
	Total Weightage (100%)	90%		10%	100%

Table of Specification

Competency Learning Domains	Numbers & Operations (44%)	Algebra (15%)	Measurements (10%)	Geometry (21%)	Statistics & Probability (10%)	Total 100 %
<i>Cognitive Domain</i>						
Remember (8%)	3	1	1	2	1	8
Understand (11%)	6	2	1	1	1	11
Apply (50%)	24	9	4	9	4	50
Analyse (6%)	3	1	-	1	1	6
Evaluate (13%)	6	2	1	3	1	13
Create (2%)	2	-	-	-	-	2
<i>Psychomotor Domain</i>						
Set (2%)	-	-	-	2	-	2
Guided response (6%)	-	-	3	3	-	6
Mechanism (2%)	-	-	-	-	2	2
Total (100%)	44%	15%	10%	21%	10%	100%

Grade VII

Total Percentage Share of the Three Domains for Maths

Domains	Share in Percentage
Cognitive	95%
Affective	0%
Psychomotor	5%

Weightage of Each Unit

No	Title	Cognitive	Affective	Psychomotor	Weightage
1	Number & Operations	34%	0%	0%	34%
2	Algebra	27%	0%	0%	27%
3	Measurements	14%	0%	0%	14%
4	Geometry	14%	0%	4%	18%
5	Statistics & Probability	6%	0%	1%	7%
	Total Weightage (100%)	95%	0%	5%	100%

Table of Specification

Competency Learning Domains	Numbers & Operations (34%)	Algebra (27%)	Measurements (14%)	Geometry (18%)	Statistics & Probability (7%)	Total 100 %
<i>Cognitive Domain</i>						
Remember (19%)	6	5	3	4	1	19
Understand (14%)	5	4	2	2	1	14
Apply (40%)	14	11	5	7	3	40
Analyse (14%)	5	4	2	2	1	14
Evaluate (8%)	3	2	1	1	1	8
Create (0%)	-	-	-	-	-	-
Organizing (0%)	-	-	-	-	-	-
<i>Psychomotor Domain</i>						
Guided Response (5%)	-	-	-	4	1	5
Total (100%)	33	26	13	20	8	100

Grade VIII

Total Percentage Share of the Three Domains for Maths

Domains	Share in Percentage
Cognitive	91%
Affective	0%
Psychomotor	9%

Weightage of Each Unit

No	Title	Cognitive	Affective	Psychomotor	Weightage
1	Number & Operations	32	-	-	32%
2	Algebra	34	-	-	34%
3	Measurements	7	-	-	7%
4	Geometry	9	-	6	15%
5	Statistics & Probability	9	-	3	12%
	Total Weightage (100%)	91%	-	9%	100%

Table of Specification

Competency	Numbers & Operations (32%)	Algebra (34%)	Measurements (7%)	Geometry (15%)	Statistics & Probability (12%)	Total 100%
Learning Domains						
<i>Cognitive Domain</i>						
Remember (12%)	4	4	1	2	1	12
Understand (12%)	4	4	1	2	1	12
Apply (32%)	10	11	2	5	4	32
Analyse (27%)	9	9	2	4	3	27
Evaluate (8%)	2	3	1	1	1	8
Create (0%)	-	-	-	-	-	-
Organizing (0%)	-	-	-	-	-	-
<i>Psychomotor Domain</i>						
Set (1%)	-	-	-	-	1	1
Guided Response (8%)	-	-	-	6	2	8
Total (100%)	29	31	7	20	13	100

List of Assessment Codes and Assessment Strategies

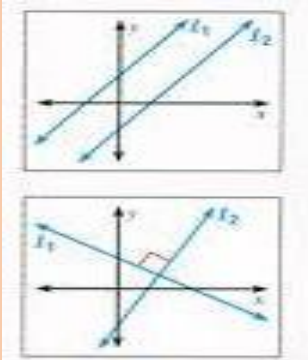
The following processes were used to develop codes.

- The first letters of Cognitive Domain “C”, Remember Cognitive Dimension “R” and Factual Knowledge Dimension “F” to form the overall domain code as “**CRF**”. Similarly, first letters of Cognitive Domain “C”, Understand Cognitive Dimension “U” and Conceptual Knowledge Dimension “C” were combined to form the overall domain code as “**CUC**”. In this way all the overall domain codes were generated for the Cognitive Domain. The same strategy was used for the Affective and Psychomotor Domains.
- The overall domain codes were combined with NCP Reference to form specific codes for each SLO. For example, for the first SLO, “Identify 01 as a 2 - digit number.” falling in NCP Reference A-01: Unit 1 (Numbers and Operations) and in **CRC** overall code, the specific code of **CRCA-01** was developed. The same procedure was used for developing codes for all the SLOs falling in the cognitive and affective domains.
- Specific assessment strategies for each of the overall domain codes suited for assessing specific SLOs were also identified.

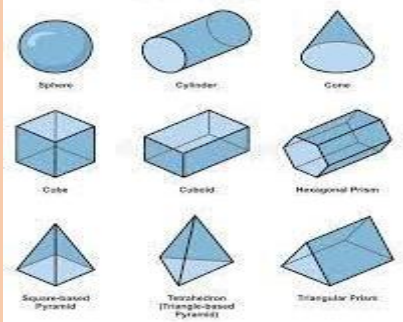
This exercise was important to identify the specific domain code in which the SLO was falling so that a valid assessment strategy could be used for assessing each SLO. The table below presents the overall domain code, NCP reference, list of SLOs and assessment strategies for each grade level. The codes can also be used as a reference point in different types of assessments.

List of Codes, SLOs and Assessment Strategies

Grade VI

Cognitive Domain				
Overall, Domain Code	NCP Reference	SLOs	Codes	Assessment Strategies
CRC Cognitive Remember Conceptual	[SLO: M-06-D-03]	Identify and differentiate between parallel lines, perpendicular lines, and transversal.	CRCD-03	<div style="text-align: center;">  </div> <p>For the ongoing assessment Ask the students to identify and differentiate parallel, perpendicular, and transversal lines in their: i) Classroom ii) Surrounding.</p> <p>Using the similar figures, different assessment items (such as true/false, MCQ, fill in blank etc.) could be designed.</p>
CRP Cognitive Remember Procedural	[SLO: M-06-A-01]	Identify: <ul style="list-style-type: none"> ● Factors of up to 3-digit numbers ● Multiples of up to 2-digit --- --- 	CRPA-01	Students could be asked to make factor trees (as given below) of different numbers. Teachers may give factor tree with missing number to students to fill.

		<ul style="list-style-type: none"> • Common factors of two numbers • Identify and differentiate between multiples and factors and find common multiples of two or more than 2 - digit numbers. • Prime factors of up to 4 - digit numbers and express in index notation. 		
	[SLO: M-06-A-02]	Identify base and exponent and express numbers given in expanded form in index notation and vice versa.	CRPA-02	
	[SLO: M-06-B-01]	Recognise simple patterns from various number sequences.	CRPB-01	
CUC Cognitive Understanding Conceptual	[SLO: M-06-A-05]	Recognize, identify, and represent integers (positive, negative, and neutral integers) and their absolute or numerical value. RRQs (MCQs and short answers and questions) may be added. Ask the students prepare a list for the use of negative integers in real life situation	CUCA-05	Teachers can design worksheet as given below to ask students to recognize and label the given shapes based on their characteristics,

	[SLO: M-06-A-17]	Recognize and calculate squares of up to 2 -digit numbers.	CUCA-17	 <p>[SLO: M-06-A-17]: MCQs may be added.</p> <p>[SLO: M-06-E-02] RRQs (MCQs and short answers & questions may be added)</p>
	[SLO: M-06-D-01]	Recognize and identify 3-D shapes (i.e., cube, cuboid, cone, cylinder, sphere, hemisphere, and cone) with respect to their characteristics.	CUCD-01	
	[SLO: M-06-E-02]	Identify and organize different types of data (i.e., discrete, continuous, grouped and ungrouped).	CUCE-02	
CUP Cognitive Understanding Procedural	[SLO: M-06-A-10]	[SLO: M-06-A10] Recognise the order of operations and use it to solve mathematical expressions involving whole numbers, decimals, fractions, and integers.	CUPA-10	MCQs and CRQs (perform CRQs – perform algorithms (addition and subtraction) and solve word problems
CAC Cognitive Application Conceptual	[SLO: M-06-A-09]	SLO: M -06 - A - 09] Divide like and unlike integers.	CACA-09	Design word/story problems (CRQs) Game for identifying rule hidden in number pattern.
	[SLO: M-06-A-12]	Solve real-world word problems involving percentage.	CACA-12	[SLO: M-06-A-09]: RRQs (MCQs and short answers and questions) may be added.
	[SLO: M-06-B-02]	SLO: M-06-B02] Continue a given number sequence and find: -term to	CACB-02	[SLO: M-06-A-12]: CRQs may be added.

		term rule -position to term rule.		
CAP Cognitive Application Procedural	[SLO: M-06-A-03]	Find H.C.F and L.C.M of two or three numbers (up to 3 -digits) using various methods (for instance prime factorization and division method).	CAPA-03	<p>CRQs – perform algorithms (addition and subtraction) and solve word problems. For example (A-04)</p> <p>Sara goes to the market to buy vegetables every 6th day. Anil goes to the same market every 7th day. How many times will they meet in the market in the month of December and January if we start counting from 1st December?</p> <p>[SLO: M-06-A-03] , [SLO: M-06-A-07] and [SLO: M-06-A-08] : CRQs and RRQs (MCQs and short answer and question) may be added</p>
	[SLO: M-06-A-04]	Solve real -world word problems involving H.C.F and L.C.M	CAPA-04	
	[SLO: M-06-A-07]	Add and subtract up to - 2 -digit like and unlike integers and verify commutative and associative laws (where applicable).	CAPA-07	
	[SLO: M-06-A-08]	Multiply up to 2 - digit like and unlike integers and verify commutative, associative, and distributive laws.	CAPA-08	
	[SLO: M-06-A-14]	Calculate ratio of two numbers (up to 3 -digit) and simplify ratios.	CAPA-14	
	[SLO: M-06-A-16]	Solve real -world word problems involving ratio and rate	CAPA-16	
	[SLO: M-06-A-18]	Use language, notation, and Venn Diagrams to represent different types of sets and their elements. (Finite, infinite, empty, singleton and universal set).	CAPA-18	
	[SLO: M-06-B-	Solve linear equations involving	CAPB-09	

	09]	integers, fractions, and decimal coefficients.		
	[SLO: M-06-B-10]	Solve real -world problems involving linear equations.	CAPB-10	
	[SLO: M-06-B-03]	Solve real life problems involving number sequences and patterns.	CAPB-03	
	[SLO: M-06-B-06]	Manipulate simple algebraic expressions using addition and subtraction.	CAPB-06	
	[SLO: M-06-C-01]	Calculate the area of; a path (inside or outside) a rectangle or square, parallelogram, triangle, and trapezium.	CAPC-01	
	[SLO: M-06-C-02]	Solve real life word problems involving perimeter and area.	CAPC-02	
	[SLO: M-06-C-03]	Calculate the surface area and volume of cube and cuboids.	CAPC-03	
	[SLO: M-06-C-04]	Solve real life word problems involving the surface area and volume of cubes and cuboids.	CAPC-04	
	[SLO: M-06-D-02]	Reflect an object using grid paper and compass and find the line of reflection by construction.	CAPD-02	
	[SLO: M-06-D-04]	Identify adjacent angles and find unknown angles related to parallel lines and transversals. (Corresponding, alternate, and	CAPD-04	

		vertically opposite angles).		
	[SLO: M-06-D-05]	Recognise rotational symmetry, find the point of rotation and order of rotational symmetry.	CAPD-05	
	[SLO: M-06-D-06]	Construct angles of specific measures (30, 45, 60, 75, 90, 105 and 120) and bisect angles using a compass.	CAPD-06	
	[SLO: M-06-D-07]	Construct a perpendicular (from a point on the line and outside the line) and a perpendicular bisector.	CAPD-07	
	[SLO: M-06-E-03]	Calculate the mean, median and mode for ungrouped data and solve related real -world problems.	CAPE-03	
CANC Cognitive Analysis Conceptual	[SLO: M-06-A-06]	Arrange a given list of integers and their absolute value in ascending and descending order.	CANCA-06	CRQs –for example Arrange the following integers in ascending / descending order. - 8, - 4, 0, - 11, 13, - 27, 19 [SLO: M-06-A-06]: RRQs (MCQs and short answer and question) may be added.
CANP Cognitive Analysis Procedural	[SLO: M-06-A-11]	Express one quantity as a percentage of another, compare two quantities by percentage and increase or decrease a quantity by a given percentage.	CANPA-11	CRQs – Real life situations / word problems can be given. For example :Anum sold 19 boxes of biscuits for a local charity while Raheel sold 14 boxes. Calculate the number of boxes Anum sold as a percentage to those of Raheel. [SLO: M-06-A-11]: RRQs (MCQs and short answers and

	[SLO: M-06-B-04]	Explain the term algebra as an extension of arithmetic, where letters, numbers and symbols are used to construct algebraic expressions.	CANPB-04	questions) may be added.
	[SLO: M-06-E-01]	Draw, read and interpret horizontal and vertical multiple bar graphs and pie charts. (Including real-world problem.	CANPE-01	
CEC Cognitive Evaluation Conceptual	[SLO: M-06-A-13]	Explain rate as a comparison of two quantities where one quantity is 1.	CECA-13	CRQs – Real life problems can be designed. For example Two numbers are in the ratio 3: 2. If 2 is added to the first and 6 is added to the second number, they are in the ratio 4 : 5. Find the numbers.
	[SLO: M-06-A-15]	Explain and calculate continued ratio.	CECA-15	
	[SLO: M-06-B-07]	Simplify algebraic expressions.	CECB-07	
CEP Cognitive Evaluation Procedural	[SLO: M-06-B-05]	Evaluate algebraic expressions by substitution of variables with numerical values.	CEPB-05	CRQs – real world word problem can be designed. For example A die is thrown 350 times and the score of 6 is obtained 28 times. Find the probability of (i) getting the score of 6 (ii) getting a score under 6. [SLO: M-06-E-04]: CRQs and RRQs (MCQs and short answers and questions) may be added
	[SLO: M-06-E-04]	Explain experiments, outcomes, sample space, events, equally likely events, and probability of a single event. Differentiate the outcomes that are equally likely and not equally likely to occur. (Including real - world word problems).	CEPE-04	

CCC Cognitive Creative Conceptual	[SLO: M-06-B-08]	Recognise and construct linear equations in one variable. RRQs (MCQs and short answers and questions) may be added.	CCCB-08	MCQs – to recognize
---	------------------	---	---------	---------------------

Psychomotor Domain

Overall, Domain Code	NCP Reference	SLOs	Codes	Assessment Strategies
PS Psychomotor Set	[SLO: M-06-D-02]	Reflect an object using grid paper and compass and find the line of reflection by construction	PSD-02	Project work; presentation of project work in the class
PGR Psychomotor Guided Response	[SLO: M-06-C-01]	Calculate the area of; a path (inside or outside) a rectangle or square, parallelogram, triangle, and trapezium	PGRC-01	Project work; presentation of project work in the class For example, find the area the floor of your school building or area of school playground if there is. CRQs can also be used
	[SLO: M-06-D-06]	Construct angles of specific measures (30, 45, 60, 75, 90, 105 and 120) and bisect angles using a compass	PGRD-06	
	[SLO: M-06-D-07]	Construct a perpendicular (from a point on the line and outside the line) and a perpendicular bisector	PGRD-07	
PM Psychomotor Mechanism	[SLO: M-06-E-01]	Draw, read, and interpret horizontal and vertical multiple bar graphs and pie charts. (Including real world problems)	PME-01	Make a report based on the data collection on one of the issues in the school. For example, junk food students eat during the break etc.

List of Codes, SLOs and Assessment Strategies

Grade VII

Cognitive Domain

Overall, Domain Code	NCP Reference	SLOs	Codes	Assessment Strategies
CRC Cognitive Remember Conceptual	[SLO: M-07-B-05]	Students will know Muhammad bin Musa Al - Khwarizmi as the founding father of Algebra.	CRC-B05	MCQs; Match the M-06-B-07: True and false; Fill in the blanks, Short CRQs may be added [SLO: M-07-B-20] and [SLO: M-07-D-02]: RRQs (MCQs and short answer and questions) may be added.
	[SLO: M-07-B-06]	Recall variables as a quantity which can take various numerical values.	CRC-B06	
	[SLO: M-07-B-07]	Recognise open and close sentences, like and unlike terms, variable, constant, expression, equation, and inequality.	CRC-B07	
	[SLO: M-07-B-08]	Recognise polynomials as algebraic expressions in which the powers of variables are whole numbers.	CRC-B08	
	[SLO: M-07-B-09]	Identify a monomial, a binomial, and a trinomial as a polynomial.	CRC-B09	
	[SLO: M-07-B-18]	Introduction to Cartesian coordinate system	CRC-B18	
	[SLO: M-07-B-20]	Recognise and state the equation of a horizontal line and a vertical line.	CRC-B20	
	[SLO: M-07-D-02]	Differentiate between convex and concave polygons.	CRC-D02	
	[SLO: M-07-D-04]	Know that the perpendicular distance from a point to a line is the shortest distance to the line.	CRC-D04	
	[SLO: M-07-E-0 2]	Recognise the difference between discrete, continuous, grouped, and ungrouped data.	CRC-E02	
CRP Cognitive	[SLO: M-07-A-04]	Recall H.C.F and L.C.M	CRP-A04	MCQs
	[SLO: M-07-B-01]	Recall recognizing simple patterns from various number	CRP-B01	

Remember Procedural		sequences.		
	[SLO: M-07-B-02]	Recall how to continue a given number sequence and find: - term to term rule -position to term rule	CRP-B02	
	[SLO: M-07-B -17]	Recall solving linear equations in one variable.	CRP-B17	
	[SLO: M-07-D-01]	Recognise quadrilaterals and their characteristics (parallel sides, equal sides, equal angles, right angles, lines of symmetry etc). (Square, rectangle, parallelogram, rhombus, trapezium, and kite)	CRP-D01	
CUC Cognitive Understanding Conceptual	[SLO: M-07-A-17]	Identify and differentiate between selling price, cost price, loss, discount, profit percentage and loss percentage. Real life examples/problems, activities, and group work may be added	CUC-A17	Short CRQs [SLO: M-07-A-17] and [SLO: M-07-A-18]: Real life examples /problems, activities, and group work may be added
	[SLO: M-07-A-18]	Explain income tax, property tax, general sales tax, value - added tax, zakat and ushr.	CUC-A18	
	[SLO: M-07-A-24]	Identify and differentiate between: <ul style="list-style-type: none"> • subset and superset • proper and improper • equal and equivalent • disjoint and overlapping. 	CUC-A24	
	[SLO: M-07-D-05]	Describe the properties of a circle; centre, radius, diameter, chord, arcs, major and minor arc, semi-circle, and segment of a circle.	CUC-D05	
	[SLO: M-07-D-07]	Understand the relationship between interior and exterior angles of polygons and between opposite interior and exterior angles in a triangle.	CUC-D07	
CUP	[SLO: M-07-A-05]	Recall - Recognise, identify, and represent integers (positive,	CUP-A05	MCQs and Short CRQs

Cognitive Understanding Procedural		negative and neutral integers) and their absolute or numerical value.		
	[SLO: M-07-A-06]	Identify and represent (on a number line) rational numbers.	CUP-A06	
	[SLO: M-07-A-07]	Represent whole numbers, integers, and decimal numbers on a number line.	CUP-A07	
	[SLO: M-07-A-09]	Compare (using symbols $<$, $>$, $=$, \leq and \geq) and arrange (in ascending or descending order) whole numbers, integers, rational numbers and decimal numbers (P)	CUP-A09	
	[SLO: M-07-A-23]	Use language, notation, and Venn Diagrams to represent different sets and their elements. (natural numbers, whole numbers, integers, even numbers, odd numbers, prime numbers)	CUP-A23	
	[SLO: M-07-D-03]	Translate an object and give precise description of transformation	CUP-D03	
CAC Cognitive Application Conceptual	[SLO: M-07-A-01]	With increasing degree of challenge, use the concept of place value for whole numbers, integers, rational numbers, and decimal numbers.	CAC-A01	CRQs – perform algorithms and construct / plot the given situation and solve real world word problems [SLO: M-07-B -16]: CRQs and RRQs (MCQs, & short answer question) may be added.
	[SLO: M-07-A-02]	Round off whole numbers, integers, rational numbers and decimal numbers to a required degree of accuracy, significance or decimal places (up to 3 decimal places).	CAC-A02	
	[SLO: M-07-B -16]	Construct linear equations in two variables such as $ax + by = c$, where a and b are not zero.	CAC-B16	
CAP Cognitive Application Procedural	[SLO: M-07-A-08]	Identify and convert between various types of fractions.	CAP-A08	MCQs and CRQs – perform algorithms and construct / plot and the given situation solve real world word problems
	[SLO: M-07-A-13]	Recognise the order of operations and use it to solve mathematical expressions involving whole numbers, decimals, fractions and integers.	CAP-A13	

[SLO: M-07-A-14]	Calculate rate and average rate of quantities.	CAP-A14
[SLO: M-07-A-15]	Calculate increase and decrease in a ratio based on change in quantities.	CAP-A15
[SLO: M-07-A-20]	Recognise and calculate squares of numbers up to 3-digits.	CAP-A20
[SLO: M-07-A-21]	Find the square roots of perfect squares of (up to 3-digit) natural numbers, fractions, and decimals.	CAP-A21
[SLO: M-07-A-25]	Describe and perform operations on sets (union, intersection, difference and complement).	CAP-A25
[SLO: M-07-B-03]	Find terms of a sequence when the general term (nth term) is given.	CAP-B03
[SLO: M-07-B - 10]	Add and subtract two or more polynomials.	CAP-B10
[SLO: M-07-B - 11]	Find the product of: - monomial with monomial - monomial with binomial/trinomial - binomials with binomial/trinomial	CAP-B11
[SLO: M-07-B - 12]	Simplify algebraic expressions (by expanding products of algebraic expressions by a number, a variable, or an algebraic expression) involving addition, subtraction, and multiplication division.	CAP-B12
[SLO: M-07-B - 14]	Factorize algebraic expressions (by taking out common terms and by regrouping)	CAP-B14
[SLO: M-07-B -15]	Factorize quadratic expressions (by middle term breaking method).	CAP-B15
[SLO: M-07-B -19]	Plot the graph of the linear equation $ax + b=0$ where $a \neq 0$ and of linear equations in two variables.	CAP-B19
[SLO: M-07-B -21]	Find values of 'x' and 'y' from the graph.	CAP-B21
[SLO: M-07-C-01]	Convert different units of distance.	CAP-C01

	[SLO: M-07-C-02]	Convert 12-hour clock to 24-hour clock and vice versa.	CAP-C02	
	[SLO: M-07-C-03]	Convert between different units of time and speed.	CAP-C03	
	[SLO: M-07-C-04]	Calculate arrival time, departure time and journey time in a given situation (on the previous day and the next day).	CAP-C04	
	[SLO: M-07-C-07]	Calculate the area and perimeter of the shaded/unshaded region in composite shapes.	CAP-C07	
	[SLO: M-07-C-08]	Calculate the circumference and area of a circle.	CAP-C08	
	[SLO: M-07-C-09]	Calculate the surface area and volume of any simple 3-D shape including right prisms and cylinders.	CAP-C09	
	[SLO: M-07-C-10]	Convert between standard units of area (m ² , cm ² , mm ² and vice versa) and volume (m ³ , cm ³ and mm ³ and vice versa)	CAP-C10	
	[SLO: M-07-D-06]	Calculate unknown angles in quadrilaterals using the properties of quadrilaterals. (Square, rectangle, parallelogram, rhombus, trapezium, and kite).	CAP-D06	
	[SLO: M-07-D-08]	Calculate the interior and exterior angles of a polygon and the sum of interior angles of a polygon.	CAP-D08	
	[SLO: M-07-D-09]	Recognise identity and draw lines of symmetry in 2- D shapes and rotate objects using rotational symmetry; and find the order of rotational symmetry.	CAP-D09	
	[SLO: M-07-D -10]	Calculate unknown angles in a triangle	CAP-D10	
	[SLO: M-07-D -11]	Construct different types of triangles. (Equilateral, isosceles, scalene, acute - angled, right - angled and obtuse -angled)	CAP-D11	
CANC Cognitive Analysis	[SLO: M-07-C06]	Differentiate between uniform and average speeds.	CANC-C06	Short CRQs

Conceptual				
CANP Cognitive Analysis Procedural	[SLO: M-07-A-12]	Solve real-world word problems involving operations on rational numbers.	CANP-A12	CRQs – perform algorithms and construct / plot and the given situation and solve real world word problems [SLO: M-07-A - 16]: solving real -world word problems related to direct and inverse proportion may be added. [SLO: M-07-E-04]: CRQs may be added eg. Construct a frequency table, Draw a frequency distribution table, which may give a better picture of the given data than a simple list. [SLO: M-07-E-05]: CRQs and (MCQs and short answer and question) may be added eg. If a coin is tossed 8 times, and heads occur 3 times, then find the probability of tail, A glass jar contains 15 red marbles. If a single marble is chosen at random from the jar, what is the probability that it is red?
	[SLO: M-07-A - 16]	Explain and calculate direct and inverse proportion and solve real -world word problems related to direct and inverse proportion.	CANP-A16	
	[SLO: M-07-A - 19]	Solve real world word problems involving profit, loss, discount, commission, tax, zakat and ushr.	CANP-A19	
	[SLO: M-07-A - 22]	Solve real -world word problems involving squares and square roots.	CANP-A22	
	[SLO: M-07-B04]	Solve real life problems involving number sequences and patterns.	CANP-B04	
	[SLO: M-07-B - 13]	Explore the following algebraic identities and use them to expand expressions: $(a + b)^2 = a^2 + b^2 + 2ab$ $(a - b)^2 = a^2 + b^2 - 2ab$ $(a + b)(a - b) = a^2 - b^2$	CANP-B13	
	[SLO: M-07-C-05]	Solve real-world word problems involving distance, time, and average speed.	CANP-C05	
	[SLO: M-07-C-11]	Solve real life word problems involving the surface area and volume of right prisms and cylinders.	CANP-C11	
	[SLO: M-07-E-04]	Construct frequency distribution tables for given data (i.e., frequency, lower class limit, upper class limit, class interval and mid-point) and solve related real-world problems.	CANP-E04	
	[SLO: M-07-E-05]	Explain and compute the probability of certain events, impossible events, and the complement of an event. (Including real world word problems).	CANP-E05	

CEC Cognitive Evaluation Conceptual	[SLO: M-07-A03]	Use knowledge of rounding off to give an estimate to a calculation; to check the reasonableness of the solution.	CEC-A03	MCQs [SLO: M-07-A03: CRQs and (MCQs and short answers and questions) may be added eg. Estimate the value of: i): 345 295 ii): 346 25 and then compare with the exact value (answer) If the price of a shirt is Rs 4542.80 round up to Rs 4500.
	[SLO: M-07-A-10]	Verify associative and commutative properties of rational numbers.	CEP-A10	CRQs; Calculate means using statistical data; plotting graphs and verify given properties of rational numbers [SLO: M-07-E-01]: Solving real world problems while comparing and justifying the results may be added.
CEP Cognitive Evaluation Procedural	[SLO: M-07-A-11]	Verify associative, commutative, and distributive properties of rational numbers.	CEP-A11	
	[SLO: M-07-A - 26]	Verify the following: $A \cap Ac = \emptyset$ $A \cup Ac = U$ $(A \cup B) c = Ac \cap Bc$ $(A \cap B) c = Ac \cup Bc$	CEP-A26	
	[SLO: M-07-E-01]	Recognise drawing and interpreting of bar graphs, line graphs and pie charts. -Differentiate between a histogram and a bar graph. -Construct and compare histograms for both discrete and continuous data with equal interval range. -Select and justify the most appropriate graph(s) for a given data set and draw simple conclusions based on the shape of the graph.	CEP-E01	
	[SLO: M-07-E - 03]	Calculate the mean, median and mode for ungrouped data and the mean for grouped data and solve related real - world problems; Compare, choose, and justify the appropriate measures of central tendency for a given set of data.	CEP-E03	

Psychomotor Domain

Overall, Domain Code	NCP Reference	SLOs	Codes	Assessment Strategies
PGR Psychomotor Guided Response	[SLO: M-07-D-03]	Translate an object and give precise description of transformation	PGR-D03	Make a drawing for classroom wall hanging using translation of the object. or floor plan using tessellation.
	[SLO: M-07-D-09]	Recognise identity and draw lines of symmetry in 2-D shapes and rotate objects using rotational symmetry; and find the order of rotational symmetry.	PGR-D09	
	[SLO: M-07-D -11]	Construct different types of triangles. (Equilateral, isosceles, scalene, acute - angled, right - angled and obtuse -angled)	PGR-D11	
	[SLO: M-07-E04]	Construct frequency distribution tables for given data (i.e., frequency, lower class limit, upper class limit, class interval and mid-point) and solve related real world problems	PGR-E04	

List of Codes, SLOs and Assessment Strategies

Grade VIII

Cognitive Domain

Overall, Domain Code	NCP Reference	SLOs	Codes	Assessment Strategies
CRF Cognitive Remember Factual	[SLO: M-08-B-05]	Recall the difference between: → open and close sentences → expression on and equation	CRF-B05	MCQs' True and false (if false then write the true statement/value)

		→ equation and inequality		
	[SLO: M-08-B-17]	Identify base, index/ exponent, and its value.	CRF-B17	
CRC Cognitive Remember Conceptual	[SLO: M-08-A-06]	Represent real numbers on a number line and recognise the absolute value of a real number	CRC-A06	CRQs; Plot Venn diagram;
	[SLO: M-08-A -20]	Describe sets using language (tabular, descriptive, and set - builder notation) and Venn diagrams	CRC-A20	
	[SLO: M-08-B-21]	Recognise the gradient of a straight line. Recall the equation of horizontal and vertical lines i.e., $y = c$ and $x = a$	CRC-B21	
	[SLO: M-08-D-03]	Describe chord, arcs, major and minor arc, semi-circle, segment of a circle, sector, central angle, secant, tangent and concentric circles.	CRC-D03	
	[SLO: M-08-E-02]	Recognise the difference between discrete, continuous, grouped, and ungrouped data.	CRC-E02	
CRP Cognitive Remember Procedural	[SLO: M-08-B - 06]	Recall the addition and subtraction of polynomials RRQs (MCQs/short Answer & questions) questions can also be constructed on the given topic e.g., the sum of the polynomials A= ---- & B=----- is:	CRP-B06	CRQs [SLO: M-08-B - 06]: RRQs (MCQs/short Answer & questions) questions can also be constructed on the given topic e.g., the sum of the polynomials A= ---- & B=----- is:
	[SLO: M-08-B-07]	Recall the multiplication of polynomials (P) in two variables	CRP-B07	
CUF Cognitive Understanding Factual	[SLO: M-08-A-14]	Explain insurance, partnership, and inheritance.	CUF-A14	CRQs

CUC Cognitive Understanding Conceptual	[SLO: M-08-A-05]	Differentiate between rational and irrational numbers	CUC-A05	MCQs; [SLO: M-08-A-14, A-10, B-02, B-20, B-24] : RRQs (MCQs/short Answer & questions) questions can also be constructed on the given topic
	[SLO: M-08-A-10]	Identify and differentiate between decimal numbers as terminating (non-recurring) and nonterminating (recurring).	CUC-A10	
	[SLO: M-08-B-01]	Differentiate between an arithmetic sequence and a geometric sequence.	CUC-B01	
CUP Cognitive Understanding Procedural	[SLO: M-08-B-02]	Find the terms of an arithmetic sequence using: - term to term rule -position to term rule	CUP-B02	CRQs; solving real world word problems
	[SLO: M-08-B-20]	Represent the solution of linear inequality on the number line	CUP-B20	
	[SLO: M-08-B-24]	Interpret the gradient/ slope of the straight line.	CUP-B24	
	[SLO: M-08-D-01]	Rotate an object and find the centre of rotation by construction	CUP-D01	
	[SLO: M-08-E-07]	Compare experimental and theoretical probability in simple events	CUP-E07	
CAF Cognitive Application Factual	[SLO: M-08-A-01]	Round off numbers up to 5 significant figures	CAF-A01	MCQs; CRQs; performing algorithm and solving word problems
	[SLO: M-08-A-04]	Convert Pakistani currency to well-known international currencies and vice versa	CAF-A04	
	[SLO: M-08-A-07]	Demonstrate the ordering properties of real numbers	CAF-A07	
	[SLO: M-08-A-16]	Find the square root of natural numbers, common fractions, and decimal numbers (up to 6 -digit)	CAF-A16	

	[SLO: M-08-A-21]	Find the power set (P) of set A where A has up to four elements.	CAF-A21	
CAP Cognitive Application Procedural	[SLO: M-08-A-08]	Demonstrate the following properties: -closure property -associative property - existence of identity element -existence of inverses - commutative property - distributive property	CAP-A08	MCQs; CRQs; performing algorithm and solving real world word problems
	[SLO: M-08-A-12]	Explain and calculate profit percentage, loss percentage and discount	CAP-A12	
	[SLO: M-08-A-13]	Explain and calculate profit/markup, principal amount, and markup rate.	CAP-A13	
	[SLO: M-08-A-18]	Recognise perfect cubes and find: -cubes of up to 2-digit numbers - cube roots of up to 5 -digit numbers which are perfect cubes	CAP-A18	
	[SLO: M-08-B-08]	Divide a polynomial of degree up to 3 by -a monomial -a binomial	CAP-B08	
	[SLO: M-08-B-09]	Simplify algebraic expressions involving addition, subtraction, multiplication, and division	CAP-B09	
	[SLO: M-08-B-12]	Factorize the following types of expressions: <ul style="list-style-type: none"> ● $ka + kb + kc$ ● $ac + ad + bc + bd$ ● $a^2 \pm 2ab + b^2$ ● $a^2 - b^2$ 	CAP-B12	
	[SLO: M-08-B-15]	Solve simultaneous linear equations in two variables using: - elimination method - substitution method - graphical method division and factorisation method	CAP-B15	

[SLO: M-08-B-19]	Solve simple linear inequalities, i.e., $ax > b$ or $cx < d$ $ax + b < c$ $ax + b > c$	CAP-B19
[SLO: M-08-B-22]	Find the value of 'y' when 'x' is given from the equation and vice versa.	CAP-B22
[SLO: M-08-B-23]	Plot graphs of linear equations in two variables i.e., $y = mx$ and $y = mx + c$	CAP-B23
[SLO: M-08-C-01]	State the Pythagoras theorem and use it to solve right angled triangles.	CAP-C01
[SLO: M-08-C-02]	Calculate the arc length and the area of the sector of a circle	CAP-C02
[SLO: M-08-C-04]	Calculate the surface area and volume of the pyramid, sphere, hemisphere, and cone.	CAP-C04
[SLO: M-08-D-04]	Construct a triangle when: -three sides (SSS) -two sides and included angle (SAS) -two angles and included side - a right - angled triangle when hypotenuse and one side (HS) are given	CAP-D04
[SLO: M-08-D-05]	Construct different types of quadrilaterals (square, rectangle, parallelogram, trapezium, rhombus, and kite).	CAP-D05
[SLO: M-08-D-06]	Draw angle and line bisectors to divide angles and sides of triangles and quadrilaterals	CAP-D06
[SLO: M-08-E-06]	Perform probability experiments (for example tossing a coin, rolling a die, spinning a spinner etc. for certain number of times) to estimate probability of a simple event	CAP-E06

CANF Cognitive Analysis Factual	[SLO: M-08-A-02]	Analyse approximation error when numbers are rounded off	CANF-A02	CRQs [SLO: M-08-A-02]: RRQs test items can also be used to assess these learning outcomes.
CANC Cognitive Analysis Conceptual	[SLO: M-08-A-03]	Solve real-world word problems involving approximation	CANC-A03	CRQs; performing algorithm and solving word problems
	[SLO: M-08-A-19]	Solve real -world word problems involving cubes and cube roots.	CANC-A19	
	[SLO: M-08-A-09]	Solve real-world word problems involving calculation with decimals and fractions	CANC-A09	
	[SLO: M-08-A-24]	Apply sets in real-life word problems	CANC-A24	
	[SLO: M-08-B-25]	Determine the y - intercept of a straight line	CANC-B25	
CANP Cognitive Analysis Procedural	[SLO: M-08-A-11]	Calculate direct and inverse, and compound proportion and solve real -world word problems related to direct, inverse and compound proportion. (Using table, equation, and graph)	CANP-A11	CRQs RRQs; performing algorithm and solving word problems
	[SLO: M-08-A-15]	Solve real world word problems involving profit %, loss %, discount, profit, markup, insurance, partnership, and inheritance.	CANP-A15	
	[SLO: M-08-A-17]	Solve real -world word problems involving squares and square roots	CANP-A17	
	[SLO: M-08-B-04]	Solve real life problems involving number sequences and patterns	CANP-B04	
	[SLO: M-08-B-11]	Apply algebraic identities to solve problems like	CANP-B11	

	(103) 2, (1.03) 2, (99) 2, 101 × 99.	
[SLO: M-08-B-13]	Manipulation of algebraic expressions $(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$ $(a - b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$	CANP-B13
[SLO: M-08-B-16]	Solve real -world word problems involving two simultaneous linear equations in two variables	CANP-B16
[SLO: M-08-B-18]	Deduce and apply the following laws of Exponents/Indices: -Product Law -Quotient Law -Power Law	CANP-B18
[SLO: M-08-C-03]	Solve real life word problems using Pythagoras theorem.	CANP-C03
[SLO: M-08-C-05]	Solve real life word problems involving the surface area and volume pyramid, sphere, hemisphere, and cone.	CANP-C05
[SLO: M-08-D-02]	Enlarge a figure (with the given scale factor) and find the centre and scale factor of enlargement.	CANP-D02
[SLO: M-08-D-07]	Identify congruent and similar figures (in your surroundings), apply properties of two figures to be congruent or similar and apply postulates for congruence between triangles.	CANP-D07
[SLO: M-08-E-03]	Calculate range, variance and standard deviation for ungrouped data and solve related real -world problems.	CANP-E03
[SLO: M-08-E-04]	Construct frequency distribution tables, histograms (of equal widths) and frequency polygons and solve related real-world problems.	CANP-E04

	[SLO: M-08-E-05]	Explain and compute the probability of; mutually exclusive, independent, simple combined and equally likely events. (Including real-world word problems)	CANP-E05	
CEC Cognitive Evaluation Conceptual	[SLO: M-08-A - 22]	Describe operations on sets and verify commutative, associative, distributive laws with respect to union and intersection.	CEC-A22	MCQs; CRQs
	[SLO: M-08-A-23]	Verify De Morgan’s laws and represent through Venn diagram	CEC-A23	
	[SLO: M-08-B-03]	Construct the formula for the general term (nth term) of an arithmetic sequence	CEC-B03	
	[SLO: M-08-B-14]	Construct simultaneous linear equations in two variables.	CEC-B14	
CEP Cognitive Evaluation Procedural	[SLO: M-08-B-10]	Recognise the following algebraic identities and use them to expand expressions: $(a + b)^2 = a^2 + b^2 + 2ab$ $(a - b)^2 = a^2 + b^2 - 2ab$ $(a + b)(a - b) = a^2 - b^2$	CEP-B10	CRQs; performing algorithm and write conclusions
	[SLO: M-08-E-01]	Select and justify the most appropriate graph(s) for a given data set and draw simple conclusions based on the shape of the graph	CEP-E01	

Psychomotor Domain

Overall, Domain Code	NCP Reference	SLOs	Codes	Assessment Strategies
----------------------	---------------	------	-------	-----------------------

PS Psychomot or Set	[SLO: M-08-E -06]	Perform probability experiments (for example tossing a coin, rolling a die, spinning a spinner etc. for certain number of times) to estimate probability of a simple event	PS-E06	Through games based on guessing probability of outcomes and then actually finding probability through experiment and reflect on the difference
PGR Psychomot or Guided Response	[SLO: M-08-D-01]	Rotate an object and find the centre of rotation by construction	PGR-D01	Through tracing a geometric object across a point, make a drawing
	[SLO: M-08-D-02]	Enlarge a figure (with the given scale factor) and find the centre and scale factor of enlargement	PGR-D02	CRQ or MCQs (which one is the small sized pictures of a given picture)
	[SLO: M-08-D-04]	Construct a triangle when: -three sides (SSS) -two sides and included angle (SAS) -two angles and included side - a right - angled triangle when hypotenuse and one side (HS) are given	PGR-D04	
	[SLO: M-08-D-05]	Construct different types of quadrilaterals (square, rectangle, parallelogram, trapezium, rhombus and kite).	PGR-D05	
	[SLO: M-08-D-06]	Draw angle and line bisectors to divide the angles and sides of triangles and quadrilaterals	PGR-D06	
	[SLO: M-08-E-04]	Construct frequency distribution tables, histograms (of equal widths) and frequency polygons and solve related real-world problems.	PGR-E04	

CHAPTER THREE

ASSESSMENT DURING INSTRUCTION

Chapter Three

Assessment during Instruction

Designing Classroom Assessment

The design of classroom assessment depends on how classroom learning is approached. The three commonly understood approaches to learning are surface learning, strategic learning and deep learning (Entwistle & Ramsden, 2015). Differences between deep, surface, and strategic learners are summarised below.

Surface Approach	Strategic Approach	Deep Approach
Reproducing Intention – merely to cope with course requirements by: <ul style="list-style-type: none">- Treating the course as unrelated bits of knowledge- Memorizing facts and carrying out procedures routinely- Finding difficulty in making sense of new ideas presented- Seeing little value or meaning in either courses or tasks set- Feeling undue pressure and worry about work	Reflective Organising Intention - to achieve the highest possible grades by: <ul style="list-style-type: none">- Putting consistent effort into studying- Managing time and effort effectively- Finding the right conditions and materials for studying- Monitoring the effectiveness of ways of studying- Being alert to assessment requirements and criteria- Using previous exam papers and assessments to predict questions	Seeking Meaning Intention - to understand ideas by: <ul style="list-style-type: none">- Relating ideas to previous knowledge and experience- Looking for patterns and underlying principles- Examining logic and argument cautiously and critically- actively interacting with the course content- Reading and studying beyond the course requirements- Taking interest

Note: Adapted from Entwistle, 1988; Entwistle and Ramsden, 2015

It is the teachers' responsibility to foster deep and/or strategic learning so that students can engage with the subject with the help of purposeful assessment strategies.

Assessment Strategies

Literature abounds with the different types of assessment strategies. The important question that perplexes teachers is which strategy to use and for what purposes. The simple response is that teachers must align their assessment with the SLOs. However, this alignment is not easy. Chapter Two presents a list of codes aligned with the SLOs and sample assessment strategies.

This chapter presents an explanation and examples of selected formative and summative assessment strategies, which are aimed at fostering deep approaches to learning.

Formative Assessment for Deep Learning Approach – Meaningful Examples

This framework further elaborates the following three strategies for assessing students' knowledge, skills, and dispositions at the lower secondary school level with examples. This framework provides examples for the formative purposes of the first two strategies and summative purposes of the last two strategies.

1. Portfolio Assessment: Practical work in Math-Lab & Problem-solving Tasks
2. Group Project Assessment
3. Selected Response (Multiple Choice/Matching/True & False)
4. Constructed Response (Short and long essay questions)

Portfolio Assessment: Practical work in Math-Lab & Concept Exploration

A portfolio is a record of the development in learners' thinking and ideas. A portfolio enables learners to assemble examples of their work to tell stories of their learning over a period of time. It enables teachers to assess learners' progress in ideas and understanding that cannot be adequately measured in any other way (Chappuis & Stiggins, 2017; Crockett & Churches, 2017). A portfolio can include the following:

- Examples of students' work with feedback about quality – multiple drafts with revisions
- Students' self-assessment
- Student reflections on their growth as learners

Portfolio Assessment in the Mathematics Classroom – An Example

Teachers can use portfolios to assess learners' growth and achievement in concept exploration as well as practical work done in the math-lab. The following are the uses of portfolios to learners and teachers.

Benefits of Portfolios to the Learners

Portfolios offer opportunities for reflection and the development of self-awareness.

Learners develop a sense of ownership of their work through selection of portfolio contents, which leads to a sense of responsibility.

Learners can self-assess their performance with the help of clear criteria and opportunity to revise their work.

Benefits of Portfolios to Teachers

Portfolio assessment becomes an integral part of the instructional process rather than a separate activity.

Portfolios give teachers more information about the learners' process than do scores or grades on final product/tests. The variety of texts within a portfolio can give teachers insights into the learners' strengths and weaknesses (Murphy & Camp, 1996).

Essential Elements of a Portfolio

- Cover page
- Introduction to the portfolio
- Table of contents
- Entries with dates
- Drafts of your work (writing sample, essays, projects and assignments, science experiments/lab reports [Math-Lab work, problem-solving tasks], tests and quizzes, etc.)
- Artefacts (awards and certificates, photos, images, concept maps, etc.)
- Reflections

Adapted from: <https://www.slideshare.net/ilovelagrosal/portfolio-assessment-42422639>

A Sample of Introduction to the Portfolio

An Introduction to My Portfolio

Date: _____ **I am in Class** _____ **at** _____ **School**

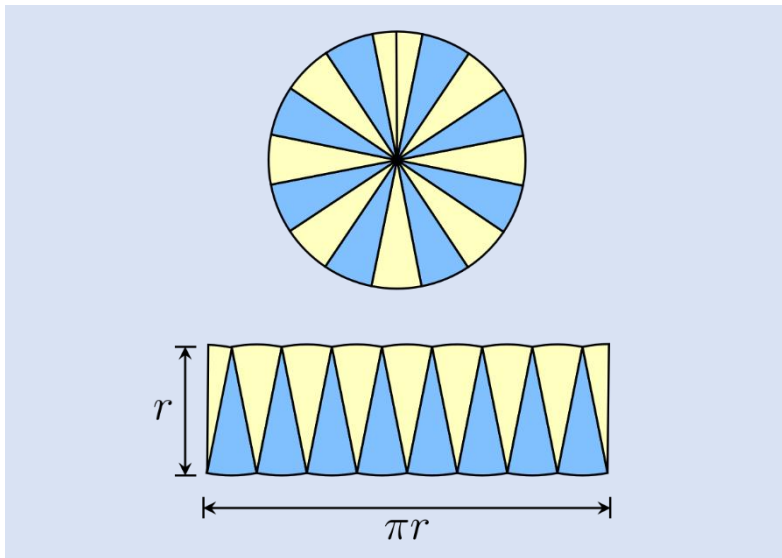
My name is _____ **My teacher's name is** _____

- You will find different things in my portfolio. These are _____

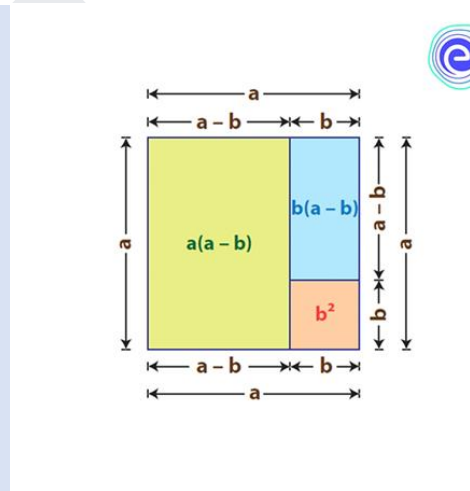
- I am making this project work because I want to (focus on learning target and the portfolio type)

Student's signature: _____

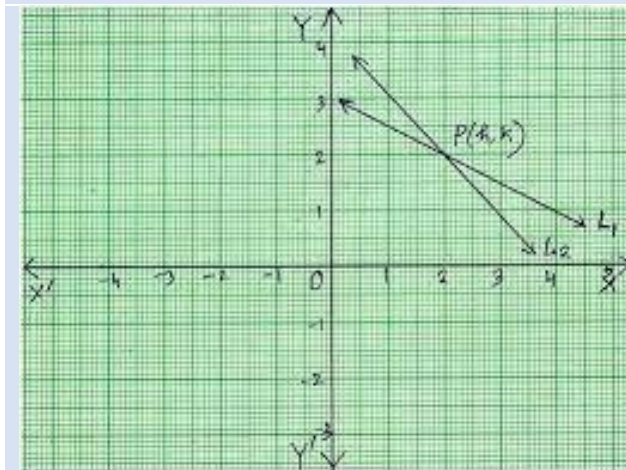
A Sample of Concept Exploration and Practical Work



Source: Exploring area of a circle
https://en.wikipedia.org/wiki/Area_of_a_circle#/media/File:CircleArea.svg



Source: Exploring Algebraic Identities
<https://www.embibe.com/exams/algebraic-identities/>



Surface Area of a Triangular Prism

The **surface area of a triangular prism** is the sum of the areas of the faces of the triangular prism.

To calculate the surface area, we work out the area of each face and add them together.

Face	Area
Front	$\frac{1}{2} \times 3 \times 4 = 6$
Back	6
Bottom	$3 \times 9 = 27$
Left side	$4 \times 9 = 36$
Right side	$5 \times 9 = 45$

Surface area is measured in square units (e.g. mm², cm², m²).

Total surface area = $6 + 6 + 27 + 36 + 45$
 = 120cm²

Source: Plotting and reading Graph of Linear Equation
<https://www.math-only-math.com/simultaneous-equations-graphically.html>

Source: Exploring Surface Area of 3D Shape
<https://thirdspacelearning.com/gcs-e-maths/geometry-and-measure/surface-area-of-a-triangular-prism/>

Learners can be encouraged to record the steps and process they use to explore the mathematical concepts or derive / generalize rules and formula or develop resources such as a fraction wall or a paper protractor. These can be collected in their portfolio.

A Sample of Periodic Student Self-Reflection

Prompts to activate Self-Reflection

Portfolio Type	Starters
Celebration	I am happiest/proudest of _____ because _____. I really liked doing _____ because _____. What this portfolio says about me... I have learnt that _____. I now understand _____. . I can now do _____. I now feel _____.
Growth	I have become better at _____, I used to _____, but now I _____. Here is what has helped me improve: _____ . Here is what has helped me as a learner: _____. Here is what I learned about myself as a learner: _____ . Here is what gets in my way as a learner: _____ . Here is what is difficult for me: _____. This used to be hard, but now it is easy: _____ Here is what made it easier: _____. Here are “before” and “after” pictures of my learning. The first one shows _____. The second shows _____.
Project	Here is what I learnt about myself as a learner while doing this project: _____ .

	<p>I developed the following skills while doing this project: _____.</p> <p>Here is what I liked least/most about doing this project _____.</p> <p>Here's why: _____.</p> <p>Here is how my thinking changed about _____ because of doing this project: _____.</p> <p>This project has affected my interest in _____. It has caused me to _____.</p>
Achievement	<p>My selections have shown I have mastered _____. Here is how they show that _____.</p> <p>My strength in (subjects or learning target) are _____.</p> <p>I still need to work on _____.</p> <p>Here is how I achieved mastery of _____ (learning target): _____.</p> <p>Here how I would change what I did if I had it to do over: _____.</p> <p>Here is what doing _____ has taught me about myself as a learner:</p> <p>_____.</p>

Criterion Referenced Assessment

Criterion referenced assessment (CRA) is the process of evaluating students' learning against some pre-specified qualities or criteria (Brown, 1998; Harvey, 2004). The criteria are presented to the students in the form of a rubric, so that they know what is being assessed. The teacher can also involve the students in developing rubrics.

Course Number(s): _____ Date Submitted: _____

RUBRIC FOR PORTFOLIO-BASED ASSESSMENT					
Assessment Ratings	1 Does not meet expectations (6 points)	2 Partially meets expectations (12 points)	3 Meets expectations (18 points)	4 Exceeds expectations (24 points)	Score
Sources of Learning <i>Experiences relevant to learning outcomes</i>	Documentation and description of learning experiences related to course learning outcomes are lacking or inadequate .	Documentation and description of learning experiences related to course learning outcomes are not effectively or completely presented .	Documentation and description of learning experiences related to course learning outcomes are appropriate and effectively presented	Documentation and description of learning experiences related to course learning outcomes exceed expectations	
Demonstration of Learning <i>Artifacts</i>	The portfolio's materials and artifacts are not appropriate and/or adequate and are not supported by the presentation.	The portfolio materials and artifacts are not fully supported by or connected to the course's learning outcomes	The portfolio includes appropriate artifacts that support the demonstration of learning outcomes	The presentation of artifacts is convincing , with strong support for the course's learning outcomes	
Evidence of Learning <i>Competencies</i>	The portfolio shows little, or no evidence of learning tied to sound educational theory	The portfolio documents some, but not sufficient , learning tied to sound educational theory (Or grounded in appropriate academic frameworks)	The portfolio adequately documents learning tied to sound educational theory (or grounded in appropriate academic frameworks)	The portfolio provides clear evidence of learning tied to sound educational theory (or grounded in appropriate academic frameworks)	
Mastering Knowledge & Skills <i>Application of Learning</i>	The portfolio provides little evidence of the student's ability to use knowledge and skills for the course's learning outcomes in practice	The portfolio demonstrates the student's ability to use the knowledge and skills for the course learning outcomes in practice is limited .	The portfolio documents the acquisition of knowledge and skills for the course learning outcomes, with some ability to apply them in practice	The portfolio demonstrates the student has mastered the knowledge and skills for the course learning outcomes and can apply them in practice	

Reflection on Learning <i>Aligned with course learning outcomes</i>	The portfolio provides little or no evidence of reflection to increase learning aligned with the course learning outcomes for which credit is being sought.	The portfolio provides inadequate evidence of reflection to increase learning aligned with the course learning outcomes for which credit is being sought.	The portfolio provides evidence of reflection to increase learning aligned with the course learning outcomes for which credit is being sought.	The portfolio shows that the student has reflected with substantial depth upon how the prior learning experience is aligned to the course learning outcomes for which credit is being sought.	
	Assembly instructions have not been followed with critical portfolio elements not included; the quality of written, visual and/or digital presentation does not meet postsecondary standards	Most of the expected elements are included; the quality of written, visual and/or digital presentation does not meet postsecondary standards with too many errors in spelling, grammar and punctuation	The portfolio is well organized with all critical elements included; the quality of written, visual and/or digital the presentation is competent with minor errors in spelling, grammar and punctuation	The portfolio is well organized with all critical elements included; learning is well-documented with writing and production skills that exceed those of most students	
Overall Assessment	The recommended cut score for a successful (i.e., passing) portfolio is 12 , with a score of at least 02 in each of the six assessment criteria.				TOTAL

Name of Assessor (print): _____ Date: _____
Source: <https://www.starkstate.edu/wp-content/uploads/2016/02/REVISED-MASTER-RUBRIC.pdf>

Group Project Assessment

Group projects are based on cooperative learning goals, which are reflected in the illustration below.

In cooperative learning structures, a student can obtain his or her goal only when other students in the group obtain theirs (Arends, 2007). Project work is a very good example of group work.

According to the Buck Institute of Education (BIK, 2021), students' work on a project over an extended period of time – from a week up to a semester – that engages them in solving a real-world problem or answering a complex question. They demonstrate their knowledge and skills by developing a public product or presentation for a real audience. As a result, students develop deep content knowledge as well as critical thinking, creativity, and communication skills in the context of doing an authentic, meaningful project.

The assessment in the group project can be done at two levels – the whole group presentation and an individual student performance within the project. Rubrics for both levels are given below.

Multimedia Project and Performance Rubrics (Group Performance)

Criteria	Exceeds Expectations (24 points, 4 for each criterion)	Meets Expectations (18 points, 3 for each criterion)	Almost Meets Expectations (12 points, 2 for each criterion)	Does Not Meet Expectation (6 points 1 for each criterion)
Organisation	Students present information in a logical and creative sequence that the audience can follow.	Students present information in a logical sequence that the audience can follow.	Audience has difficulty following presentation because student does not consistently use a logical sequence.	Audience cannot understand presentation because there is no sequence of information.
Subject Knowledge	Students demonstrate complete knowledge by answering all questions with explanations and elaborations.	Students are at ease and provide expected answers to all questions but do not provide elaborations.	Students are uncomfortable with information and are able to answer only rudimentary questions.	Students do not have grasp of information and are not able to answer many questions.
Graphics	Students' graphics explain and reinforce screen text and presentation.	Students' graphics relate to text and presentations.	Students occasionally use graphics that rarely support text and presentation.	Student uses superficial graphics or no graphics.
Mechanics	Presentation has no misspellings or grammatical errors.	Presentation has no more than two misspellings or grammatical errors.	Presentation has three misspellings or grammatical errors.	Presentation has four misspellings or grammatical errors.
Eye Contact	Students maintain eye contact with audience, seldom returning to notes.	Students maintain eye contact most of the times, but frequently return to notes.	Students occasionally use eye contact but still read most of report.	Students read all of the report with no eye contact.
Elocution	Student uses a clear voice and correct, precise pronunciation of words.	Students' voice is clear and most of the words are pronounced correctly.	Students' voice is not very clear, and they incorrectly pronounce most	Students mumble, incorrectly pronounce words, and

			of the words.	Speak in a low tone.
--	--	--	---------------	----------------------

Source: Fisher and Frey (2007)

Rubric for Assessing Collaboration Fluency (Individual)

Criteria	Phase 1 (awareness, connection, remembering) (4 points)	Phase 2 (Understanding, applying) (8 points)	Phase 3 (analyzing, evaluating) (12 points)	Phase 4 (evaluating, creating) (16 points)
Interacts with others to generate ideas and develop products	Listens to others' input and occasionally combines his or her own and peers' concepts to produce an understanding of the task, problem, or issue.	Frequently, listens to others' input and occasionally combines his or her own and peers' concepts to produce an understanding of the task, problem, or issue. Attempts to make sure team members contribute.	Listens to others' input and combines his or her own and peers' concepts to produce an understanding of the task, problem, or issue. Uses techniques to make sure team members contribute. Explains the task to the team members.	Listens to others' input and effectively combines his or her own and peers' concepts to produce an understanding of the task, problem, or issue. Uses suitable techniques to make sure all team members contribute. Uses effective probing questioning to develop a realistic understanding of the task.
Develops and implements effective plans	Shows an awareness of the process and the current stage of development.	Uses checkpoints to measure progress in the project. Describes problems and develops some solutions.	Uses regular checkpoints to measure progress in the project. Defines each person's tasks within the process.	Manages progress on the assigned task using regular checkpoints. Clearly defines each person's roles and responsibilities within each element of the process. Discusses problems and develops suitable solutions.
Works collaboratively toward a common, shared goal or objective	Sometimes works with peers. Is sometimes on tasks when working collaboratively.	Works with peers collaboratively or individually to achieve the group's goal.	Works with peers collaboratively or individually to achieve the group's goal. Analyses individual or group progress against the goals and objectives and sometimes offers appropriate critique.	Works with peers collaboratively and economically or individually to achieve the group's goal. Analyses individual or group progress against the goals and objectives and offers appropriate critique or undertakes suitable actions as required.
Revisits, reflects, and revises	Sometimes reflects on overall progress.	Reflects on overall progress. Often accept feedback.	Reflects on overall progress and analyses his or her performance.	Reflects on overall progress evaluating his or her contribution and that of peers fairly. Accept

group process	Struggles to accept feedback.	Sometimes offer useful reflection.	Accept feedback, sometimes modifies behaviour. Sometimes offer useful reflection.	feedback, modifying tasks, action and behaviours based on this. Offers critical reflection that are task focussed and appropriate, enabling growth and development.
----------------------	-------------------------------	------------------------------------	---	---

Source: Adapted from Crockett and Churches (2017)

Summative Assessment for Measurement and Evaluation – Frequently Use Examples

This framework is proposing two teaching terms of four months in a year (see section on Balanced Assessment Schedule for details). There will be a school wide summative assessment at the end of each semester. The key purpose of these summative assessments is to obtain valid and accurate information for evaluating each student’s performance. This evaluation is the basis of a student’s academic progression.

Measurement accuracy is determined by *what* is being measured and the *instrument* used to make the measurements. For example, a teacher can obtain a more precise measurement of a students’ knowledge of parts of speech rather than his or her creative ability.

In addition, the instrument used to make the measurements also determines measurement accuracy. Teacher made tests are the most common form of measurement instruments used at the school level. In the subsequent sections, the framework provides examples of the two most common types of test questions - Multiple Choice Questions (MCQs) from selected response and word problems from constructed response category.

Selected Response - Multiple Choice (Objective Test Item)

Multiple Choice is the most common type of objective test question (Linn & Miller, 2005). They are easy to administer and analyse. Multiple choice questions consist of a stem (question or statement) with several answer choices (distracters). In mathematics, distractors are thoughtfully designed to know a student’s misconceptions.

The table below gives four guidelines of developing multiple choice with an example and a non-example. These have been borrowed from TIMSS 2015 test item writing guidelines available at https://timssandpirls.bc.edu/publications/timss/T15_item_writing_guidelines.pdf

Guideline 1: Please phrase all stems as a direct question. The following is an example of a stem formulated as a question:

Example	Non-Example
Ejaz travelled 6 hours 34 minutes 45 seconds in a bus and 4 hours 20 minutes 12 seconds in a train. How much more time did he travel in the bus than the train? (Ref Grade IV	Ejaz travelled 6 hours 34 minutes 45 seconds in a bus and 2 hours 14 min and 33 seconds less compared to what he travelled by bus in a train. How much time did he travel in the

mathematics textbook page # 126).

- A) 10 hrs 54 min 57 sec
- B) 6 hrs 34 min 45 sec
- C) 4 hrs 20 min 12 sec
- D) 2 hrs 14 min 33 sec

train?

- A) 10 hrs 54 min 57 sec
- B) 6 hrs 34 min 45 sec
- C) 4 hrs 20 min 12 sec
- D) 2 hrs 14 min 33 sec

Guideline 2: Arrange the response options in a logical order if this makes sense and saves the student time in reading the options (e.g. years in chronological order, numbers from least to greatest).

Example

What is the place value of the circled digit in the four-digit number? (Ref. Grade III textbook, Page # 19, item i).

4 5 6 7

- A) Ones
- B) Tens
- C) Hundreds
- D) Thousands

Non-Example

What is the place value of the circled digit in the four-digit number? (Ref. Grade III textbook, Page # 19, item i).

4 5 6 7

- A) Ones
- B) Thousands
- C) Hundreds
- D) Tens

Guideline 3: Make sure there is one and only one correct answer

The length of two ropes is 24 meters and 14 meters. Ali wants to cut the ropes into pieces of equal length without any rope left. What will be the maximum length of each piece? (Ref. Grade V textbook page # 34, item # 3).

- A) 24 meters
- B) 14 meters
- C) 2 meters
- D) 1 meter

The length of two ropes is 24 meters and 14 meters. Ali wants to cut the ropes into pieces of equal length without any rope left. What will be the length of each piece? (Ref. Grade V textbook page # 34, item # 3).

- A) 24 meters
- B) 14 meters
- C) 2 meters
- D) 1 meter

Note: the word 'maximum' is deleted so there are now two correct answers 'C' and 'D'

Guideline 4: Do NOT use "none of these" and "all of these" as response options.

Example

Non-Example

What is the name of the triangle when it has all sides equal? (Ref Grade V textbook, page # 126).

- A) Equilateral Triangle
- B) Scalene triangle
- C) Isosceles triangle
- C) Acute triangle

What is the name of the triangle when it has all sides equal? (Ref Grade V textbook, page # 126).

- A) Scalene triangle
- B) Isosceles triangle
- C) Acute triangle
- D) None of these

In addition, a checklist for reviewing one best MCQ is also given.

One-Best MCQ Review Checklist

#	Overall	Yes*	No*
1	Is appropriate for the level of the learner		
2	Is aligned to the Student Learning Outcome and its number is referenced		
3	Exam specification number is referenced		
4	Concept to be tested is stated appropriately/ Item is aligned with the concept being assessed		
5	The item is conceptually correct		
6	The cognitive level of the item is identified appropriately		
7	The difficulty level of the item is identified appropriately		
8	Assesses an essential (Must Know) or an important (Good to Know) item		
9	Can be answered with the options covered (Cover Test)		
10	Cannot be answered with the stem/ case covered (Test for Cognitive Level)		
11	Item author's name is mentioned		
12	An authentic reference is mentioned		
13	There are no spelling or grammar mistakes		
14	Task can be completed by the students in the assigned time		
	Stem/ Case		
1	Clearly defined with no ambiguities		
2	Is contextual and relevant		
3	Contains all essential information; however, avoids irrelevant information		
4	Avoids abbreviations, uncommon terminologies, and brand names		
	Lead-in		
1	Focuses on one feature or concept		
2	Avoids negative phrases such as 'Except' and 'Not'		
3	Is clearly understandable at the level of the students		
	Options		
1	Congruent with the lead-in		
2	Aligned with the lead-in in grammar		

3	Are of similar length		
4	Homogenous in content		
5	Distractors are plausible		
6	Listed in an alphabetical order		
7	Use generic and common terms		
8	Mutually exclusive (non-overlapping)		
9	Avoid phrases like ‘all of the above’ and ‘none of the above’		
10	Avoid vague terms such as ‘usually’ and ‘frequently’		
11	Avoids key terms from the stem or lead-in		
12	The key is clearly the best/ correct option for the level of the learners		
13	The key/ correct answer is identified		

Source: Aga Khan University Examination Board.

Constructed Response – Word Problems

Constructed response is a very useful way of testing students’ higher order thinking skills. It requires students to organise the ideas they have learnt and respond accordingly. Test items can present a problem or a situation and ask students to construct their own response. In this way, students are expected to analyse, evaluate, and synthesise.

Guidelines for Writing Constructed-response Items

- Write questions in easily accessible language appropriate to the age and experience of the students. Use simple vocabulary and sentence structure.
- Select real life problem settings that are likely to be “real” to students at the target grade levels, and that involve quantities that are realistic for the situations.
- Students should be able to complete the task in the time allocated for each constructed-response item.
- It is essential to produce a scoring guide with well-defined categories for allocating score points. It is also helpful for those who are reviewing the question.

Sample Constructed Response Item

Nadia has a rectangular frame. The frame is 12 cm long and 8 cm wide. Nadia wants to put a ribbon around the frame.

- Find the required length of the ribbon.
 - What will be the total cost of ribbon if 1 meter of it costs Rs. 5?
- (Ref: Grade V textbook, page # 155).

The table below gives the TIMSS generalized scoring guidelines for constructed response items. (See TIMSS 2015 test item writing guidelines available at https://timssandpirls.bc.edu/publications/timss/T15_item_writing_guidelines.pdf)

The TIMSS Generalized Scoring Guidelines:

The generalized scoring guidelines used for 1- and 2-point constructed-response items are described in the table below (sample 1):

Sample 1

Score Points for 1-point system

1 Point (Full credit)

A one-point response is correct. The response indicates that the student has completed the task correctly.

0 Points (No credit)

A zero-point response is incorrect, irrelevant, or incoherent.

Score Points for 2-point system

2 Points (Full credit)

A two-point response is complete and correct. The response demonstrates a thorough understanding of the concepts and/or procedures embodied in the task.

- Indicates that the student has completed all aspects of the task, showing correct application of concepts and/or procedures
- Contains clear, complete explanations, supporting work, or evidence when required

1 Point (Partial credit)

A one-point response is only partially correct. The response demonstrates only a partial understanding of the concepts and/or procedures embodied in the task.

- Addresses some elements of the task correctly but may be incomplete
- May contain a correct answer but an incomplete explanation when required
- May contain an incorrect answer with an explanation or supporting work indicating a correct understanding of the concepts

0 Points (No credit)

A zero-point response is inaccurate or inadequate, irrelevant, or incoherent.

Rubric for Assessing Constructed Response Question (Sample 2)

Criteria	Exceeds Expectations	Meets Expectations	Almost Meets Expectations	Does Not Meets Expectation
Explanation	A complete response with a detailed explanation. Student can explain how to solve and WHY the chosen methods work.	Good solid response with clear explanation. Student can explain how to solve but not why the method works.	Explanation is unclear. Student can explain only a small part of the work.	Misses key points. Student does not explain the majority of the work.
Use Of Visuals	Clear diagram or sketch with some detail.	Clear diagram or sketch.	Inappropriate or unclear diagram.	No diagram or sketch.
Accuracy	No math errors.	No major math errors or serious flaws in reasoning.	May be some serious math errors or flaws in reasoning.	Major math errors or serious flaws in reasoning.
Plan	Student understands the problem, identifies key information for solving the problem, and develops a plan to solve.	Student understands the problem but can only identify some key information needed to solve or develops an	Student understands the problem but cannot identify necessary information needed to solve	Student does not understand the problem, does not create a plan to solve.

		inaccurate plan to solve.	or create a plan to solve.	
Process	Student's process is completely shown. Another student can easily follow the student's work.	Student's process is mostly shown, with a few steps combined. A teacher could easily follow the student's work.	Student's process is missing many steps. It would be difficult for another person to follow the student's work.	Little to no work is shown.
Check	Student self-checked their answer and reworked the problem if necessary.			Student failed to self-check his or her answer.

Ref: <https://paizymath.files.wordpress.com/2013/07/math-portfolio-rubric.docx>

Sample Summative Test Paper

Grade VI

Max Marks: 60

Max Time: 2.5 Hours

Name: _____ **Section:** _____ **Roll no:** _____ **Date:** _____

Section I: Circle the correct response.

[1 Mark each]

Strand / Content	Topic	Cognitive Domain
Numbers and Operation	Factors and Multiples	Knowing

1. Of the following numbers, 2, 3, 4, 7, 8, 11, 12, which are Composite numbers?

A. 2 and 4

B. 11 and 12

C. 12 and 8

D. 3 and 12

Strand / Content	Topic	Cognitive Domain
------------------	-------	------------------

2. Which number below is the greatest common factor (HCF), of the numbers 24 and 36

A. 72

B. 24

C. 12

D. 4

Strand / Content

Topic

Cognitive Domain

Numbers and Operation

Factors and Multiples

Understanding

3. Which number below has the greatest number of prime factors?

A. 24

B. 36

C. 75

D. 100

Strand / Content

Topic

Cognitive Domain

Number

Ratio and proportion

Reasoning

4. There are 20 boys and 40 girls in the class. The ratio of the number of boys to the total number of girls is

A. 1:2

B. 1:3

C. 1:4

D. 2:3

Strand / Content

Topic

Cognitive Domain

Geometry

Parallel lines

Knowing

5. Which of the following pairs of lines are parallel?

1.

2.

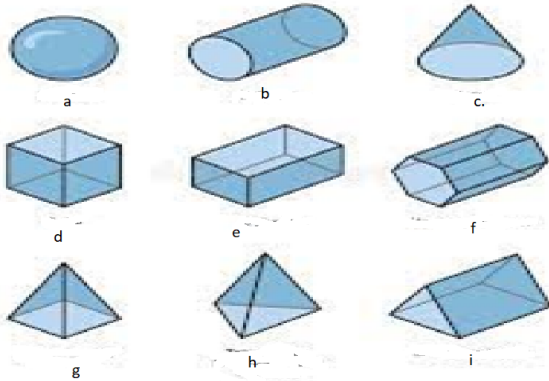
3.

4.

- A. Only Figure 4 B. Figures 1, 3 & 4 C. 3 & 4 D. All

Strand / Content	Topic	Cognitive Domain
Geometry	Solid Shape	Understanding

6. Which of the following shapes are prisms?



- A. Shapes b, d, e, f and i
 B. Shapes d, e, and f
 C. Only Shape i
 D. Only shapes d and e

Strand / Content	Topic	Cognitive Domain
Algebra	Solving linear equations	Applying

7. What is the value of x in a given linear equation $4x + 20 = 100$? [2 Marks]

- A. 80 B. 30 C. 25 D. 30

Strand / Content	Topic	Cognitive Domain
Numbers and Operation – Fractions	Simplifying linear equation	Applying

8. Simplify $4x + 5y = 10x + y$?

- A. $15x - 6y$ B. $15x + 6y$ C. $6x = 4y$ D. $-6x = 4y$

Strand / Content	Topic	Cognitive Domain
Data Handling	Mean	Applying

9. The mean of the first five whole number

- A. 2 B. 5 C. 3 D. 4

Strand / Content	Topic	Cognitive Domain
Measurement	Surface area and volume	Understanding

10. The ratio of the volume of two cubes is 8: 125, the ratio of total surface areas of two cubes is

- A. 4: 25 B. 2: 75 C. 2: 15 D. 4: 25

Section II Sample Constructive response questions

Strand / Content	Topic	Cognitive Domain
Numbers and Operation –	Percentage	Applying

1. Express the following in percentage form.

[8 Marks]

- i) 13 out of 30
- ii) 21 eggs out of 30 are good
- iii) $\frac{3}{200}$

iv) 0.032

Strand / Content	Topic	Cognitive Domain
Numbers and Operation	Integers	Understanding and Reasoning

2. i) Create a visual model which shows the position of each number at, above, or below zero.
3. ii) Explain the model in words. [4 Marks]

Strand / Content	Topic	Cognitive Domain
Numbers and Operation –	Integers	Applying

4. Solve the following. [4 Marks]

i) $-3 \times -3 + 4 \times -3$

- ii) The temperature in Chicago city was -20 celsius last week. This week it has further decreased by 10 celsius. What is the temperature of Chicago city this week?

Content Domain	Topic	Cognitive Domain
Number and Operation	Percentage (Word problem)	Applying

5. A shop sold 48 packets of orange juice in a day, which was 40% of the total number of Juice packets sold that day. What was the total number of juices packeting the shop sold

that day?

[4 Marks]

Content Domain	Topic	Cognitive Domain
Algebraic expression	Algebra	Understanding

6. Represents the phrases in the form of algebraic expressions.

[8 Marks]

- i) 3 fewer than a number p
- ii) 4 times a number q is less 4
- iii) square of the sum of two numbers a and b is 5 more than 20
- iv) sum of the squares of two numbers a and b is more 100

Content Domain	Topic	Cognitive Domain
Algebraic expression	Algebra	Applying

7. Kausar and Taimur are making necklaces. Kausar makes 25 necklaces. Taimur makes more necklaces than Kausar. Write an expression to represent the total number of necklaces Kausar and Taimure made. **[2 Marks]**

Content Domain	Topic	Cognitive Domain
Algebraic expression	Algebra	Reasoning

8. Two students, Student A and Student B, claim to know the correct representation of the $\frac{9}{y}(3t)$ expression.
 Student A represents the expression as the product of 9 and y times the product of 3 and t .
 Student B represents the expression as the quotient of 9 and y times the sum of 3 and t .
 Evaluate their claims. **[8 marks]**

Content Domain	Topic	Cognitive Domain
Measurement	Volume	Applying

9. Box a has dimensions of 12, 7, and 2 cm. Box B has dimensions 3, 3 and 2. What is the difference in volume, in cubic centimetres, between the two boxes?

Show your work.

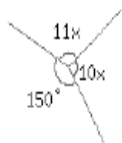
[4 Marks]

Content Domain	Topic	Cognitive Domain
Geometry	Finding value of Angles	Applying -Reasoning

10. Find the value of angle in the given figures. And show the working.

[8 Marks]

(1)

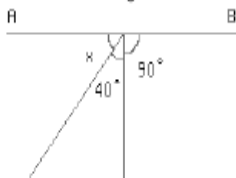


Find the value of x .

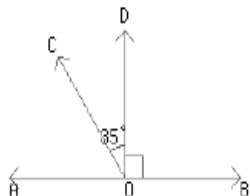
(2) If AB and PQ are parallel, compute the angle Z .



(3) Find value of angle x



(4) If OD is perpendicular to AB , and $\angle DOC = 35^\circ$, find $(\angle BOC - \angle AOC)$.



Assessment Validity

The assessment must be valid, that is, it should actually measure what it is supposed to measure. There are three kinds of validity evidence considered during assessment. These are:

- Criterion
- Construct
- Content

Criterion and construct validity measures are beyond the scope of a class teacher's work. They should best be done by assessment experts. For purposeful assessment, content validity is extremely important and can be controlled by teachers.

Content Validity

As the name suggests, a valid assessment covers the content completed in the class. This means that a valid assessment covers all relevant parts of a subject. If any part, covered in the

subject, is left out or if any irrelevant part, not covered, in the subject is included then it is not a valid assessment. The entire purpose of developing list of codes and tables of specification and aligning them with the assessment strategies was to ensure content validity of the assessment. The assessment should be written at the level of difficulty required by the standards and student learning outcomes covered in the term. The assessment must also be in a format that allows students to demonstrate the particular ability being assessment. For example, if a teacher wishes to assess how a student has improved her writing abilities, then MCQ is not the best option.

Ways to Improve Content Validity

Clearly defined objectives. Student learning outcomes should be clearly defined and operationalised.

Alignment. Assessment measures must be matched with student learning outcomes.

Review by Subject Matter Experts (SMEs). Subject experts may be asked to rate each question on a scale from very relevant/very essential to not relevant/not essential at all. The more SMEs agree that items are essential, the higher the content validity.

Objective Review. The test/assessment question/instrument can be reviewed by faculty at other schools to obtain feedback from an outside party who has not been involved in the instrument development.

Item Analysis. Item analysis is helpful in analysing student responses to individual test/exam questions with the intention of evaluating test/exam quality.

Review and update tests frequently. Many tests that were valid two years ago, are not valid today. It is important to review and update or retire questions that are no longer relevant.

Item Bank. An item bank facility is important to manage and update questions.

CHAPTER FOUR

SUPPORTING RESPONSIVE TEACHING AND LEARNING THROUGH FEEDBACK

DRAFT

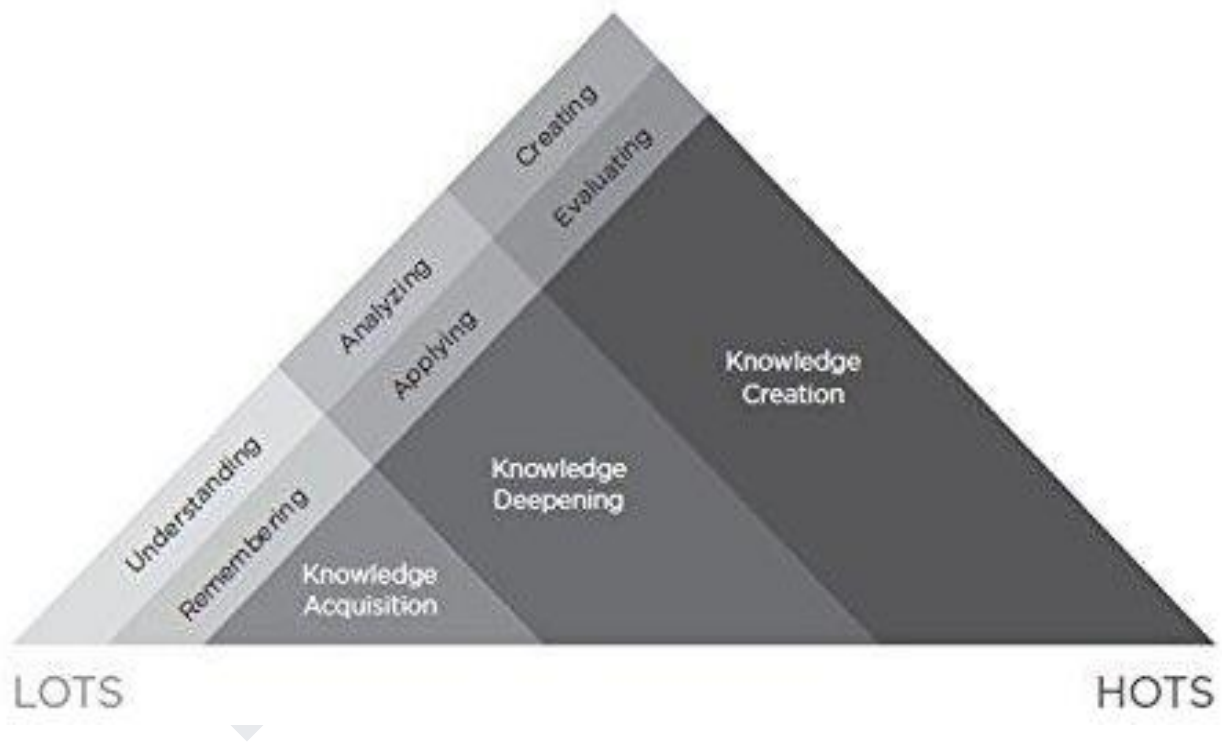
Chapter Four

Supporting Responsive Teaching and Learning through Feedback

Feedback

In order to help students, succeed in the 21st century world, teachers must see their teaching as a response to learning, rather than seeing learning as an outcome of teaching (Crockett & Churches, 2017). This calls for the integration of classroom assessment processes into teaching in ways that enhances students' achievement and their motivation to learn.

The formative feedback cycle helps learners to know where they are now in terms of high quality work and where they ought to be. This gap analysis facilitates learners' progression from Bloom's lower-order thinking skills (LOTS) which focuses on knowledge acquisition to higher-order thinking skills (HOTS) where the learners are able to create knowledge.



Source: Crockett & Churches (2017)

Hattie's (2012) findings from his meta-analysis of hundreds of education papers indicate that providing formative evaluation and feedback has some of the largest effects on student learning. For an assessment to be formative, student must be receptive to the feedback and use it to adjust their learning. "Without feedback, assessment is not a learning activity; it is a compliance task" (Crockett & Churches, 2017, p. 21).

Churches (n.d.) outlines five characteristics of high-quality feedback. These are:

Timely: The end of the task is too late. Feedback must be provided often and in detail during the process.

Appropriate and reflective: Feedback must reflect the students' ability, maturity, and age. It must be understandable.

Honest and supportive: Receiving a critique that identifies weaknesses of one's work can be very disheartening. The feedback must provide encouragement to continue and guidance on how to achieve the desired goals.

Focused on learning: The feedback should provide information which allows the learner to close the gap between the current and the desired performance. The clarity and descriptive nature of the feedback the teacher presents are major influences on students' achievement (Hattie, 2012).

Enabling: Receiving feedback without the opportunity to act on it is frustrating, limiting, and counterproductive. Students must be able to learn from the formative assessments and apply the feedback and corrections.

One of the best models of feedback is developed by Dr. Jodie Nyquist (Crocket & Churches, 2017). This model of effective feedback has five stages going from weakest to strongest.

DRAFT

The teacher who provides feedback at the Kare and a specific action or ideally KCR+e and an immediate activity gives the learners opportunity to maximise their learning. Based on the above model, three specific criteria for good and bad feedback can be developed.

Criteria for Good and Bad Feedback

Good Feedback	Bad Feedback
<ul style="list-style-type: none">• Being positive.• Even when criticizing, being constructive.• Making suggestions (not prescriptions or pronouncements).	<ul style="list-style-type: none">• Finding fault.• Describing what is wrong and offering no suggestions about what to do.• Punishing or denigrating students for poor work.

Examples of Good and Bad Feedback

Feedback	Good or Bad?
Your answer is the best one in the class.	This is an example of bad feedback. It does not tell the student what is good about the answer.
Your details strongly support your claim that it is not necessary that when perimeter of a rectangle increases, the area also increases. That's great. How have you figured this out?	This is an example of good feedback. It confirms for the students that the work meets one of the targets (strong supporting details) and connects the success to students' effort (the student has found out the relationship, and the teacher noticed).
You are the last one in the class to answer and yet incorrect. You didn't put enough in it.	This is an example of bad feedback. It implies that the student is competing with others (as opposed to aiming for a learning target) and the reason the work is poor is that the student "did something bad." The student ends up feeling judged and not motivated to improve.
How did you arrive at this answer? I would want to know more about the process that helped you to get the right answer.	This is an example of good feedback for a student who the teacher believes that the process is more important than only knowing that the student arrived at the right answer.
Your report is late. What is the matter with you?	This is an example of bad feedback. It may not inspire the student to complete his or her work and turn it in for assessment.
[Name], I do not have your answer sheet. Can you tell me what happened?	This is a better example than the previous one of feedback to deliver the message that the work is late.

Feedback to Parents

The most common form of communicating grades to parents is the report card. The report card at the lower secondary level should also provide information on satisfactory or unsatisfactory performance in other dimensions.

A report card is only one way of sharing feedback to parents about their students' performance. A written report is another way of communicating with students. The reports should be written in a positive, direct, and easy to understand manner.

The most effective way of communicating with parents is through a conference, generally known as parent-teacher meeting, which allows the parent to ask questions and the teachers to provide

explanation. Conferences provide avenues to teachers to learn about students' home environment and to parents to be more involved in their children's learning.

Sample Report Card

(Front Page)

School's Name

School's Logo

Annual Report Card

[Month] 2022 – [Month] 2023

(First inside Leaflet)

Name: _____

Term One: [Date]

Class: _____



Rarely







Sometimes







Most of the times



Always

Your child as a learner				
Interested in learning				
Listens carefully				
Works well independently				
Keeps trying even when tasks are difficult				
Teachers' Comment:				

Your child's social and personal development				
				
Happy at school				
Behaves well in the class				
Mixes well with other children				
Behaves well in the playground				
Manages and expresses own feelings well				
Teachers' Comments:				

DRAFT

(Second inside Leaflet – Sample for Grades VI to VIII)

	Key Competencies	Child's Performance					
		Term I Marks			Term II Marks		
		Formative	Summative	Total	Formative	Summative	Total
1	Numbers and Operations	20	35	55	20	35	55
2	Algebra	2	3	5	2	3	5

3	Measurement	08	12	20	08	12	20
4	Geometry	06	08	14	06	08	14
5	Data Handling	04	02	6	04	02	6
Total Marks Obtained							
Out of Total Marks		40 Marks	60 Marks	100 Marks	40 Marks	60 Marks	100 Marks

Teacher's Comments (Term I):

Teacher's Comments (Term II):

(Last inside Leaflet)

Students Comment (My Learning in School)

Parents' Comments (How can you further support your child's learning)

Teacher's Overall Comment:

Attendance

Punctuality

Teachers' Signature: _____

Date: _____

Principal's Signature: _____

Date: _____

Parent's Signature: _____

Date: _____

CHAPTER FIVE

POST ASSESSMENT: REDEFINED GOALS/CURRICULUM

DRAFT

Chapter Five

Post Assessment: Redefined Goals/Curriculum

Completing the Assessment Loop

This manual provides a framework of purposeful assessment. It brings forth the philosophy, the principles, the policy, and the practice of purposeful assessment for evaluating teaching and learning targets at the classroom level, the school and national level. However,

unless the evaluation is constructively utilised to inform changes to curriculum, learning targets and teaching methodology in a balanced manner, its real purpose will not be achieved.

Balanced Assessment System

The success of any assessment system will depend on how formative and summative assessments are balanced to meet the need of all stakeholders. The tables below summarize the use of the two types of assessments across three levels – the classroom, school and district/province.

Elements of Balanced Assessment System

Level of Assessment	Purpose of Assessment	User of Information	Type of Assessment
Classroom assessment	To measure the level of student achievement on learning targets taught.	Teacher	Summative: To determine grades for reporting purposes. Formative: To revise teaching plans for next year/semester.
	To diagnose student strengths and areas needing further work.	Teacher student	Formative: To plan further instruction Formative: To provide feedback to students. Formative: To self-assess and set goals for next steps.
School based exam	To measure the level of student achievement on pre-set content standards.	Teacher School Leadership District Education Office	Summative: To evaluate the achievement level of each student and summarise across students. Summative: To determine programme or curriculum effectiveness. Formative: To identify programme or curriculum needs.
District, provincial or national large-scale assessments	To measure level of student achievement toward content standards and/or international standards To identify students and/or portions of the curriculum needing additional/ different instruction	Teacher School Leadership District Education Office	Summative: To evaluate programme effectiveness Formative: to identify standards in need of more effective programmes Formative: To plan interventions for groups or individuals

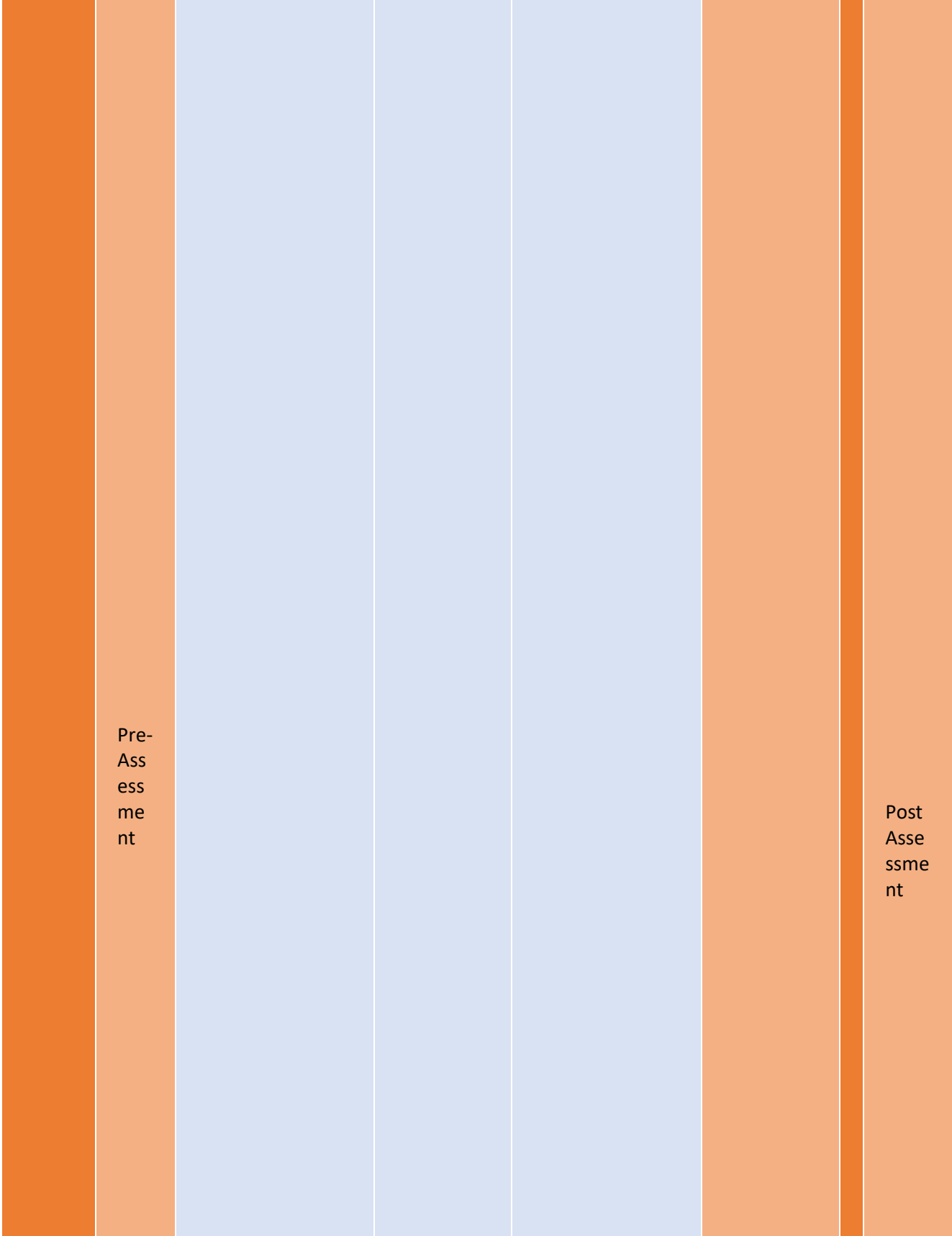
Source: Chappuis and Stiggins, 2017

Implicit within this balanced assessment system is the cyclic approach to assessment, which emerges as a response to teaching and learning and further informs teaching and learning.

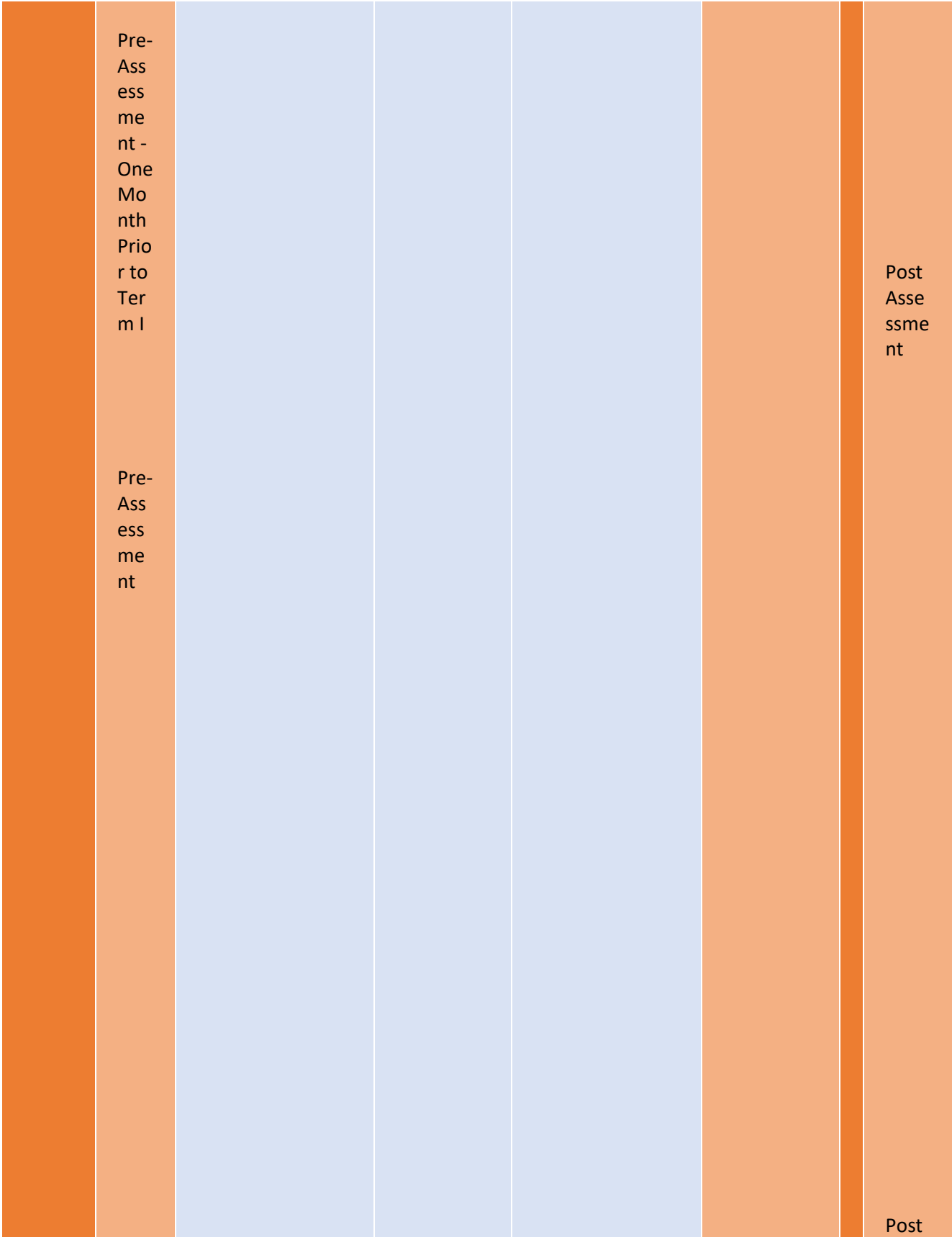
The following section presents schedules of assessment for grades I to V to illustrate how the three streams or levels of assessment can be employed in a balanced manner during an academic year. The schedule is also aligned with the SLOs.

Balanced Assessment Schedule for Grades VI-VIII

Overall Domain Code*	Assessment Schedule							
	One Month	Term I (4 Months)	One Month	Term II (4 Months)	One Month	One Month		
CRF	Pre-Assessment	Formative Assessment (40% Marks based on Ongoing)	School based Summative Assessment (60% Marks)			Post Assessment - One Month After Term II		
CRC								
CRP								
CUF								
CUC								
CUP								
CAC								
CAF								
CAP								
PS								
CAP								
CANF			Formative Assessment (40% Marks based on Ongoing)	School based Summative Assessment (60% Marks) And/or Large scale assessments wherever required				
CANC								
CANP								
CEC								
CEP								
CCC								
PGR								
PM								
	Pre-Assessment							Post Assessment



	Pre- Ass ess me nt							Post Asse ssme nt



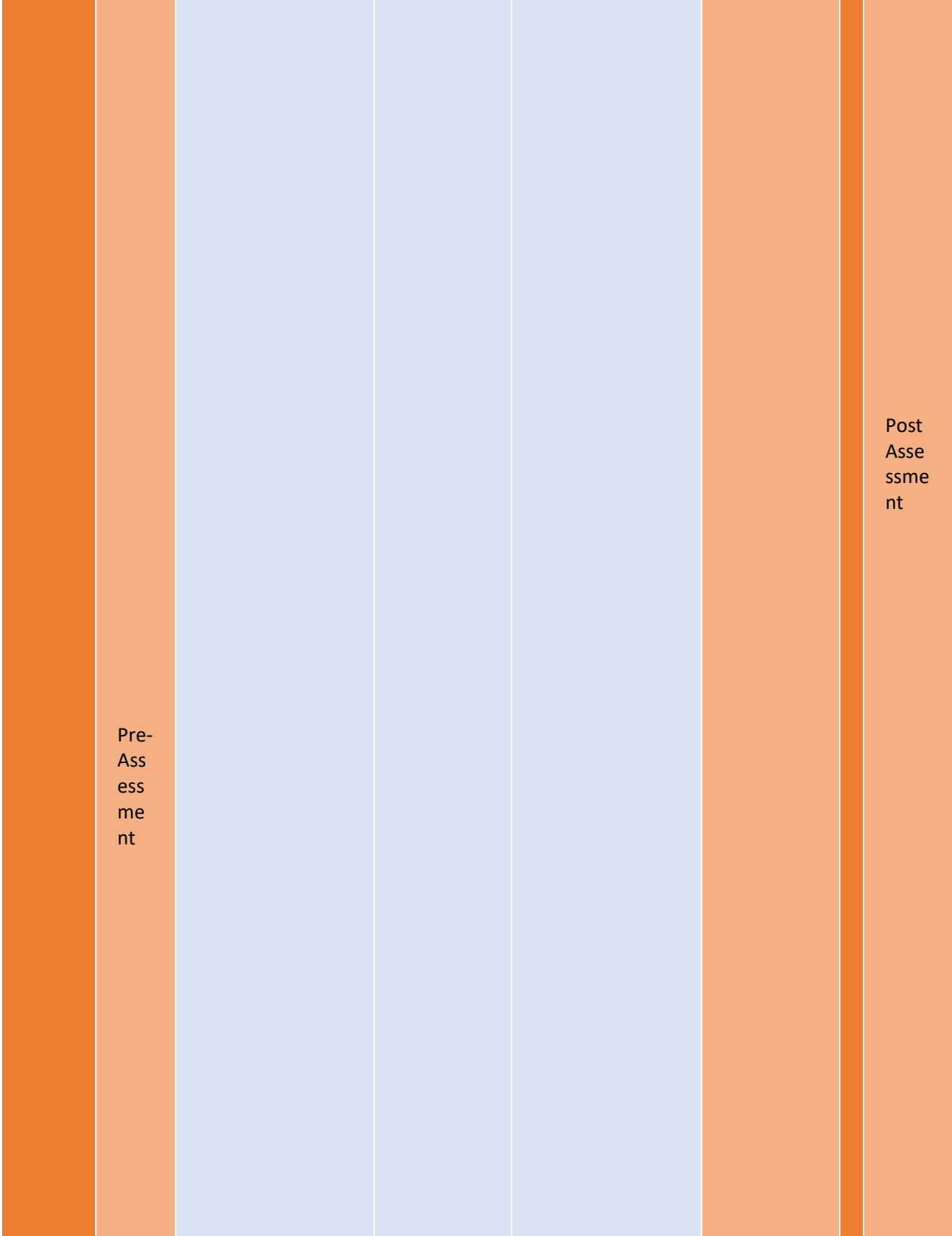
Post
Assessment

Pre-
Assessment -
One
Month
Prior to
Term I

Pre-
Assessment

Post

	Pre-Assessment					Assessment
	Pre-Assessment					Post Assessment



Pre-
Ass
ess
me
nt

Post
Ass
sme
nt

	Pre- Ass ess me nt						Post Asse ssme nt
							Post Asse ssme nt

	Pre-Assessment						
--	----------------	--	--	--	--	--	--

* This includes all the SLOs contained within the Domain Code

Concluding Remarks – Exit to the Next Cycle

The framework can be considered a blueprint of an assessment programme at the lower secondary school level. It provides the broad overview of policy guidelines for assessment framework 2021 while guiding the alignment of student learning outcomes with assessment strategies. It identifies the learning targets, the deep learning approaches, and the strategies for assessing the same. In doing this, it ensures that the assessments are interconnected and purposeful.

While the blueprint is necessary as an overarching guide, its enactment will require professional judgement. Its real purpose will be realised when teachers use it at the classroom level to modify their teaching to match students' learning needs, when school leaders use it to accomplish their goals more effectively by replacing some programmes or practices with better ones (Fullan, 2001) and when the public education departments use it to invest in practices that yield positive results. The education practices, redefined in this manner, are again put to the test and the process of ongoing purposeful assessment continues.

DRAFT

References

- Anderson, L. W., Krathwohl, D. R., Bloom, B. S., Airasian, P., Cruikshank, K., Richard, M... Wittrock, M. (Eds.). (2001). *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives*. London: Longman.
- Arends, R. I. (2007). *Learning to teach*. New York: McGraw-Hill,
- Buck Institute of Education (BIE). (2021). PBL Works. Retrieved from <https://www.pblworks.org/>
- Brown, S. (1998). Criterion-referenced assessment: *British Journal of Educational Psychology, Monograph Series*, 3, 1-14.
- Chappuis, J., & Stiggins, R. J. (2017). *An introduction to student-involved assessment for learning* (7th Edition). New York, NY: Pearson.
- Crockett, L. W., & Churches, A. (2017). *Mindful assessment: The 6 essential fluencies of innovative learning*. Solution Tree Press.
- Dial, E. (2016). *Assessment for Learning: A Practical Approach for the Classroom*. Rowman & Littlefield.
- Entwistle, N. (1988). Motivation and learning strategies: *Effective learning. Educational and Child Psychology*, 5(3), 5–20.
- Entwistle, N. and Ramsden, P. (2015). *Understanding Student Learning*. London: Routledge.
- Erwin, T. D. (1991). *Assessing Student Learning and Development: A Guide to the Principles, Goals, and Methods of Determining College Outcomes*. Jossey-Bass. San Francisco.
- Fisher, D., & Frey, N. (2014). *Checking for understanding: Formative assessment techniques for your classroom*. Association for Supervision and Curriculum Development. Alexandria.
- Fullan, M. (2001). *The New Meaning of Educational Change*. New York: Teachers' College.
- Government of Pakistan (2009). *National Education Policy 2009. Ministry of Federal Education & Professional Training, Islamabad*.
- Government of Pakistan (2018a). *Minimum Standards for Quality Education in Pakistan: Attaining Standards for Improved Learning Outcomes and School Effectiveness*. Ministry of Federal Education & Professional Training, Islamabad
- Government of Pakistan (2018b). *National Curriculum Framework Pakistan*. Ministry of Federal Education & Professional Training, Islamabad.

- Government of Pakistan. (2018c). *National Education Policy Framework (2018/20)*. Ministry of Federal education and Professional training, Islamabad. Retrieved from: <http://www.mofept.gov.pk/SiteImage/Policy/National%20Educaion%20Policy%20Framework%202018%20Final.pdf>
- Greenstein, L. (2016). *Sticky assessment: Classroom strategies to amplify student learning*. London: Routledge.
- Hall, G. E., Quinn, L. F., & Gollnick, D. M. (2017). *Introduction to teaching: Making a difference in student learning*. California: Sage Publications.
- Harvey, L. (2004). *Analytic quality glossary*. Retrieved from <http://www.qualityresearchinternational.com/glossary/#c>
- Hattie, J. (2012). *Visible learning for teachers: Maximising impact on learning*. London: Routledge.
- Linn, R. L. & Miller, M. D. (2005). *Measurement and Assessment in Teaching*. Michigan: Prentice Hall.
- National Centre for Education Statistics., National Assessment of Educational Progress (Project), Educational Testing Service., & United States. (1992). *NAEP ... reading report card for the nation and the states*. Washington, D.C: National Centre for Education Statistics, Office of Educational Research and Improvement, U.S. Dept. of Education.
- Tully, M. (1996). *Helping students revise their writing*. New York: Professional Books.
- UNESCO. (2005). *Education for All Global Monitoring Report 2005: The Quality Imperative*. Retrieved from: [http://lst-iiep.iiep-unesco.org/cgi-bin/wwwi32.exe/\[in=epidoc1.in\]/?t2000=020273/](http://lst-iiep.iiep-unesco.org/cgi-bin/wwwi32.exe/[in=epidoc1.in]/?t2000=020273/) (100).

DRAFT

Appendices

Bloom's Revised Taxonomy Model – Cognitive Domain

Cognitive Dimension	The Knowledge Dimension			
	Factual The basic elements a student must know to be acquainted with a discipline or solve problems in it.	Conceptual The interrelationships among the basic elements within a larger structure that enable them to function together.	Procedural How to do something, methods of inquiry, and criteria for using skills, algorithms, techniques, and methods.	Metacognitive Knowledge of cognition in general as well as awareness and knowledge of one's own cognition
Remember Recall or retrieve previous learned information from long-term memory	List primary and secondary colours.	Recognize action words.	Recall how to perform a sum based on four operations.	Identify strategies for retaining information.
Key Words (Verbs)	labels, lists, names, outlines, states.	Defines, describes, identifies, knows.	Recalls, recognizes, matches.	reproduces, selects.
Sample Assessment	MCOs, list times table, list symbols and units used in their curriculum, state formula	Describe different types of numbers; define 1D, 2D and 3D shapes; identify properties of the given numbers/shapes	Use algorithm to solve the numeric and word problems, recognize shapes based on given clues; measure the given line segment using cm	Select and use appropriate algorithm to solve the numeric and word problems; draw line segment for the given measurement in cm
Understand Construct meaning from instructional messages, including oral, written, and graphic communication.	Summarize features of a new product.	Explain the main ideas of a play or piece of literature.	Explain in one's own words the steps for performing a complex task.	Predict one's response to a performance.

Key Words (Verbs)	Summarizing (Abstracting, generalizing) Explaining (constructing models).	Classifying (Categorizing, subsuming) Exemplifying (Illustrating, instantiating).	Interpreting (Clarifying, paraphrasing, representing, translating) Comparing (contrasting, mapping, matching).	Inferring (Concluding, extrapolating, interpolating, predicting).
Sample Assessment	Change number in words to numeric representation	Classify shapes in given categories (triangles categorized based on sides and angles)	Compare numbers and shapes based on their properties	Read graphs and conclude the message depicted; observe the given pattern and infer the next.
Apply Carry out or use a procedure in a given situation.	Respond to frequently asked questions.	Provide advice to juniors.	Divide one whole number by another whole number, both with multiple digits.	Use techniques that match one's strengths. Use class rules in situations in which it is appropriate.
Key Words (Verbs)	Demonstrates, discovers,	Constructs, relates,	Computes, demonstrates, manipulates, operates, prepares, produces, solves	Changes, discovers, modifies, predicts, uses
Samples Assessment	Calculate area of square using side times sides formula	Construct graph based on the data collected/given	Solve problem-solving tasks using appropriate algorithm	Prove odd + odd = Even using manipulatives and pictorial representation
Analyse Break material into its constituent parts & determine how the parts relate to one another and to an overall structure or purpose.	Select the most complete list of activities.	Distinguish between relevant and irrelevant numbers in a mathematical word problem.	Compare and contrast four ways of serving foods made with apples and examine which ones have the highest health benefits.	Determine the point of view of the author of an essay.
Key Words (Verbs)	Focusing, selecting.	Differentiating (discriminating, distinguishing).	Organizing (finding, coherence, integrating, outlining, structuring).	Attributing (deconstructing).
Samples	Sample Assessment	Order the given types of	Differentiate given	Summarizing data in the form

Assessment		numbers (including fractions) both in ascending and descending order	numbers and shapes based on their properties	of graphs, pictures, tables etc.
Evaluate Make judgments based on criteria and standards.	Select the most complete list of activities.	Determine which kinds of apples are best for baking a pie, and why.	Judge which of the two methods is the best way to solve a given problem.	Reflect on one's progress.
Key Words (Verbs)	Describes, explains.	Checking (coordinating, detecting, monitoring, testing).	Interprets, justifies, relates, summarizes, supports.	critiquing (judging).
Sample Assessment	Explain which object will occupy maximum / minimum area if placed on the floor by evaluating on the basis of area	Determine appropriate measuring units such as kg, g, mg, km, m, cm, mm, l, ml for the given situations	Interpreting a graph, a picture etc. to take decisions	Solve the problem-solving task selecting appropriate steps and explain the reason for selecting those steps
Create Put elements together to form a coherent or functional whole; reorganize elements into a new pattern or structure	Generate a log of daily activities.	Compose a story.	Design an efficient project workflow.	Inventing a product.
Key Words (Verbs)	Compiles, explains, reorganizes, summarizes.	planning (designing).	producing (construct).	generating (hypothesizing).
Sample Assessment	Reorganise shapes to form other shapes	Form a rectangle with the given wire length. Which rectangle has maximum area / minimum area? Explain your response	Create five-digit number using two even numbers and three odd numbers for example 25,163 (placing one number on place value grid). Which	Identify a health/societal issue that need to be understood using family survey and plot it on an appropriate graph. Explain the reasons for such

			is the highest possible five-digit number? How many possibilities exist? Justify	observation to further understand the issue. (for example how much money family member spend on junk food)
--	--	--	--	--

DRAFT

Bloom's Revised Taxonomy Model – Affective Domain

Affective Domain			
Dimension	Examples	Key words/Verbs	Sample Assessment
Receiving The lowest level. Awareness of feelings, emotions, ideas, material, and phenomenon etc. Passively paying attention.	Demonstrates a willingness to participate in the activity	Asks, chooses, describes, follows, gives, holds, identifies, locates, names, points to, selects, replies, uses, acknowledge, attentive, courteous, dutiful, follows, listens, understands	Listen to others with respect; acknowledge the beauty of mathematical patterns
Responding The student actively participates in the learning process, not only attends to a stimulus; the student also reacts in some way.	Shows interest in the objects, phenomena, or activity by seeking it out or pursuing it for pleasure.	answers, assists, aids, complies, conforms, discusses, greets, helps, labels, performs, tells, practices, presents, reads, recites, reports, selects, writes.	Confidently engage in mathematical tasks; Completion of class tasks/homework; participation in class/group discussion; presentation; response to questions; compliance with class rules and certain procedures.
Valuing The worth or value a person attaches to a particular object, phenomenon, or behaviour. This ranges from simple acceptance to the more complex state of commitment.	Simpler acceptance could be being part of the team, while a more complex level of commitment may include being responsible for the overall improvement of the team.	appreciates, cherish, treasure, demonstrates, initiates, invites, joins, justifies, proposes, respect, shares Completes, differentiates, explains, follows, forms, initiates, invites, joins, justifies, proposes, reads, reports, selects, studies, works.	Shows the positive attitude towards learning mathematics; demonstrate ability to solve non-routine problems individually and in groups.
Organizing Organizes values into priorities by contrasting different values, resolving conflicts between them, and creating an unique	The student can put together different values, information, and ideas, and can accommodate them within his/her own schema; the student is comparing, relating and	compares, relates, synthesizes, adheres, alters, arranges, combines, completes, defends, explains, formulates, generalizes, identifies, integrates,	Explains the role of systematic planning in solving problems. Accepts ethical standards. Spending more time studying than playing sports; organizes

value system. The emphasis is on comparing, relating, and synthesizing values.	elaborating on what has been learned.	modifies, orders, organizes, prepares.	and compares different cultures, evaluating the differences between them
Characterizing Highest level. Internalizing values. Student has a value system that controls their behaviour. The behaviour is pervasive, consistent, predictable.	Shows self-reliance when working independently, cooperates in group activities (displays teamwork); uses an objective approach in problem solving; follows rules and regulations on daily basis.	Acts, discriminates, displays, influences, modifies, performs, qualifies, questions, revises, serves, solves, verifies.	Group work and group project.

DRAFT

Bloom's Revised Taxonomy Model – Psychomotor Domain

Psychomotor Domain			
Dimension	Examples	Key words/Verbs	Sample Assessment
Perception (awareness) The ability to use sensory cues to guide motor activity. This ranges from sensory stimulation, through cue selection, to translation.	Detects non-verbal communication cues. Estimate where a ball will land after it is thrown and then moving to the correct location to catch the ball.	chooses, describes, detects, differentiates, distinguishes, identifies, isolates, relates, selects.	Use handspan to estimate the length/height of the given object
Set Readiness to act. Mental, physical, and emotional dispositions that make one respond in a certain way to a situation.	Knows and acts upon a sequence of steps in a process. Shows desire to learn a new process Attend project exhibition. Observe demonstrations through audio, videos, visuals. Set-up lab equipment for experiments.	Begins, displays, explains, moves, proceeds, reacts, shows, states, volunteers.	Use body moment to follow the given instructions such as (i) to show the geometric shape (ii) follow the pattern (jump, jump and walk one step forward; jump, jump, jump, take one step backward)
Guided Response The early stages in learning a complex skill that includes imitation and trial and error. Adequacy of performance is achieved by practicing.	Performs a mathematical equation as demonstrated. Follows instructions to build a model.	Copies, traces, follows, react, reproduce, responds.	Follow instruction to make a model using different geometric shapes and its placement/direction
Mechanism (basic proficiency) This is the intermediate stage in learning a complex skill. Learned responses have become habitual and the movements can be performed with some	Use a personal computer. Repair a toy. Drive a bicycle. Holding a pencil	Assembles, calibrates, constructs, dismantles, displays, fastens, fixes, grinds, heats, manipulates, measures, mends, mixes, organizes, sketches.	Assemble unit square to form the given shape with given area/perimeter. Performance in a game (football, hockey). Solving a problem, using pre-set

confidence & proficiency.			procedures
Complex Overt Response Performs task or objective in a confident, proficient, and habitual manner	Control and use correct movements when playing instruments; drawing with pencil and painting proficiently. Operate and run machines (e.g. computer) efficiently ☑ Use equipment with confidence	Assembles, builds, calibrates, constructs, dismantles, displays, fastens, fixes, grinds, heats, manipulates, measures, mends, mixes, organizes, sketches. NOTE: The Key Words are the same as Mechanism, but will have adverbs or adjectives that indicate that the performance is quicker, better, more accurate, etc.	Use geometric tools such as protractor, compass, and scale accurately to develop geometric designs
Adaptation Skills are well developed, and the individual can modify movement patterns to fit special requirements.	Use tools for situations outside typical discipline Responds effectively to unexpected experiences. Modifies instruction to meet the needs of the learners.	Adapts, alters, changes, rearranges, reorganizes, revises, varies.	Field based tasks. Revise and improve procedures of movements, written responses Portfolio
Origination Creating new movement patterns to fit a particular situation or specific problem. Learning outcomes emphasize creativity based upon highly developed skills.	Constructs a new theory/story. Develops a new teamwork approach. Creates a new project; a new programme	Arranges, builds, combines, composes, constructs, creates, designs, initiate, makes, originates.	Project work; Creating different models;

Curriculum Mapping

Grade VI

COGNITIVE DOMAIN

Low Order Taxonomies (Cognitive)						High Order Taxonomies (Cognitive)						
Remember	No of times	Understand	No of times	Apply	No of times	Analyse	No of times	Evaluate	No of times	Create	No of times	Total
Number & Operations												
SLO: M-06-A01] Identify: ●Factors of up to 3-digit numbers ●Multiples of up to 2-digit --- ● common factors of two numbers [SLO: M - 04 - A -17] Identify and differentiate between multiples and factors and find: ● common	01	[SLO: M -06 - A - 05] Recognize, identify, and represent integers (positive, negative and neutral integers) and their absolute or numerical value(C)	01	SLO: M -06 - A - 03] Find H.C.F and L.C.M of two or three numbers (up to 3 -digits) using various methods (for instance prime factorization and division method) (P)	01	SLO: M - 06 - A - 06] Arrange a given list of integers and their absolute value in ascending and descending order.(C)	01	[SLO: M -06 - A - 13] Explain rate as a comparison of two quantities where one quantity is 1. (C)	01	SLO: M - 06 - B - 08] Recognise and construct linear equations in one variable(C)	01	06
		[SLO: M-06-	01		01	[SLO: M-	01		01			

<p>multiples of two or more than 2 - digit numbers. numbers</p> <ul style="list-style-type: none"> ●Prime factors of up to 4 -digit numbers and express in index notation(P) 		<p>A10] Recognize the order of operations and use it to solve mathematical expressions involving whole numbers, decimals, fractions and integers.(P)</p>		<p>[SLO: M -06 - A - 04] Solve real -world word problems involving H.C.F and L.C.M(P)</p>		<p>06-A11] Express one quantity as a percentage of another, compare two quantities by percentage and increase or decrease a quantity by a given percentage. (P)</p>		<p>SLO: M -06 - A - 15] Explain and calculate continued ratio(C)</p>					04
<p>[SLO: M - 06 - A - 02] Identify base and exponent and express numbers given in expanded form in index notation and vice versa(P)</p>	01	<p>[SLO: M -06 - A - 17] Recognize and calculate squares of up to 2 -digit numbers(C)</p>	1	<p>[SLO: M -06 - A - 07] Add and subtract up to - 2 -digit like and unlike integers and verify commutative and associative laws (where applicable)(P)</p>	01								03

				SLO: M -06 - A - 08] Multiply up to 2 - digit like and unlike integers and verify commutative, associative, and distributive laws(P)	01							01
				SLO: M -06 - A - 09] Divide like and unlike integers. ()	01							01
				[SLO: M-06- A12] Solve real-world word problems involving percentage. (C)	01							01
				[SLO: M -06 - A - 14] Calculate ratio of two numbers (up to 3 -digit) and simplify ratios. (P)	01							01
				[SLO: M -06 - A - 16] Solve real -world word problems involving ratio	01							01

				and rate. (P)								
				[SLO: M -06 - A - 18] Use language, notation, and Venn Diagrams to represent different types of sets and their elements. (finite, infinite, empty, singleton and universal set) (P)	01						01	
				[SLO: M -06 - B - 09] Solve linear equations involving integers, fractions and decimal coefficients. (P)	01						01	
				[SLO: M -06 - B - 10] Solve real -world problems involving linear equations. (P)	01						01	
Total	02		03		11		02		02		01	21

Frequency												
Algebra												
[SLO: M-06-B01] Recognize simple patterns from various number sequences. (P)	01			SLO: M-06-B02] Continue a given number sequence and find: -term to term rule - position to term rule(C)	01			[SLO: M -06 - B - 04] Explain the term algebra as an extension of arithmetic, where letters, numbers and symbols are used to construct algebraic expressions. (P)	01			03
				[SLO: M-06-B03] Solve real life problems involving number sequences and patterns. (P) [SLO: M -06 - B - 06] Manipulate simple algebraic expressions using addition and subtraction.	01 01			[SLO: M -06 - B - 05] Evaluate algebraic expressions by substitution of variables with numerical values. (P)	01			02 01

				(P)								
								[SLO: M -06 - B - 07] Simplify algebraic expressions(C)	01			01
Total Frequency	01				03				03			07
Measurements												
				[SLO: M-06-C01] Calculate the area of; a path (inside or outside) a rectangle or square, parallelogram, triangle, and trapezium. (P)	1							01
				SLO: M-06-C02] Solve real life word problems involving perimeter and area(P)	01							01
				[SLO: M-06-C03] Calculate the surface area and volume of cube and	01							01

				cuboids. (P)								
				[SLO: M-06-C04] Solve real life word problems involving the surface area and volume of cubes and cuboids. (P)	01							01
Total Frequency					04							04
Geometry												
[SLO: M-06-D03] Identify and differentiate between parallel lines, perpendicular lines, and transversal. (C)	1	SLO: M-06-D01] Recognise and identify 3-D shapes (i.e., cube, cuboid, cone, cylinder, sphere, hemisphere, and cone) with respect to their characteristics. (C)	1	[SLO: M-06-D02] Reflect an object using grid paper and compass and find the line of reflection by construction. (P)	01							03
				SLO: M-06-D04] Identify adjacent angles and find unknown angles related	01							01

				to parallel lines and transversals. (Corresponding, alternate, and vertically opposite angles) (P)								
				SLO: M-06-D05] Recognize rotational symmetry, find the point of rotation and order of rotational symmetry. (P)	01							01
				[SLO: M -06 - D - 06] Construct angles of specific measures (30, 45, 60, 75, 90, 105 and 120) and bisect angles using a compass. (P)	01							01
				[SLO: M-06-D07] Construct a perpendicular (from a point on the line and outside the	01							01

				line) and a perpendicular bisector. (P)								
Total Frequency	01		01		05							07
Statistics & Probability												
		[SLO: M -06 - E - 02] Identify and organize different types of data (i.e., discrete, continuous, grouped, and ungrouped). (C)	01	[SLO: M -06 - E - 03] Calculate the mean, median and mode for ungrouped data and solve related real - world problems. (P)	01	[SLO: M-06-E01] Draw, read and interpret horizontal and vertical multiple bar graphs and pie charts. (Including real-world problem. (P)	01	[SLO: M-06-E04] Explain experiments, outcomes, sample space, events, equally likely events, and probability of a single event. Differentiate the outcomes that are equally likely and not equally likely to occur. (Including real - world word problems). (P)	01			04
Total Frequency			01		01		01		01			04
Overall Total	04		05		24		03		06		01	43

PSYCHOMOTOR DOMAIN

From Low Order Taxonomies to High Order Taxonomies														
Perception	No of Times	Set	No of Times	Guided Response	No of Times	Mechanism	No of Times	Complex Overt Response	No of Times	Adaptation	No of Times	Origination	No of Times	Total
Measurements														
				SLO: M-06-C01] Calculate the area of; a path (inside or outside) a rectangle or square, parallelogram, triangle and trapezium	01									01
Total Frequency					01									01
Geometry														
		[SLO: M-06-D02] Reflect an object using grid	01	[SLO: M - 06 - D - 06] Construct angles of specific	01									02

		paper and compass and find the line of reflection by construction		measures (30, 45, 60, 75, 90, 105 and 120) and bisect angles using a compass										
				[SLO: M-06-D07] Construct a perpendicular (from a point on the line and outside the line) and a perpendicular bisector	01									01
Total Frequency			01		02									03
Statistics & Probability														
						Draw, read and interpret horizontal and vertical multiple bar graphs and pie charts. (Including real world problems)	01							01
Total							01							01

<i>Frequency</i>														
<i>Overall Total</i>			01		03		01							05

Appendix E

CURRICULUM MAPPING

Grade VII

COGNITIVE DOMAIN

Low Order Taxonomies (Cognitive)						High Order Taxonomies (Cognitive)						
Remember	No of times	Understand	No of times	Apply	No of times	Analyse	No of times	Evaluate	No of times	Create	No of times	Total
Number & Operations												
				M-07-A01 With increasing degree of challenge, use the concept of place value for whole numbers, integers, rational numbers and decimal numbers. (C)	01							01
				M-07-A02 Round off whole numbers, integers, rational numbers and decimal numbers	01							01

				to a required degree of accuracy, significance or decimal places (up to 3 decimal places). (P)								
								M-07-A03 Use knowledge of rounding off to give an estimate to a calculation; to check the reasonableness of the solution. (C)	01			01
M -07 - A - 04 Recall H.C.F and L.C.M (P)	01											01
		M -07 - A - 05 Recall - Recognise, identify and represent integers (positive, negative and neutral integers) and their absolute or numerical	01									01

		value. (P)										
		M-07-A06 Identify and represent (on a number line) rational numbers. (P)	01									01
		M-07-A07 Represent whole numbers, integers and decimal numbers on a number line. (P)	01									01
				M-07-A08 Identify and convert between various types of fractions. (P)	01							01
		M-07-A09 Compare (using symbols $<$, $>$, $=$, \leq and \geq) and arrange (in ascending or descending order) whole numbers, integers, rational numbers and	01									01

		decimal numbers (P)										
							M-07-A10 Verify associative and commutative properties of rational numbers. (P)	01				01
							M-07-A11 Verify associative, commutative, and distributive properties of rational numbers. (P)	01				01
						M-07-A12 Solve real-world word problems involving operations on rational numbers. (P)	01					01
				M-07-A13 Recognise the order of operations and use it to solve mathematical expressions involving whole	01							01

				numbers, decimals, fractions and integers. (P)								
				M -07 - A - 14 Calculate rate and average rate of quantities. (P)	01							01
				M -07 - A - 15 Calculate increase and decrease in a ratio based on change in quantities. (P)	01							01
						M -07 - A - 16 Explain and calculate direct and inverse proportion and solve real -world word problems related to direct and inverse proportion. (P)	01					01
		M -07 - A - 17 Identify and differentiate	01									01

		between selling price, cost price, loss, discount, profit percentage and loss percentage. (C)										
		M -07 - A - 18 Explain income tax, property tax, general sales tax, value - added tax, zakat and ushr. (C)	01									01
					M -07 - A - 19 Solve real world word problems involving profit, loss, discount, commission, tax, zakat and ushr. (P)	01						01
				M -07 - A – 20 Recognise and calculate squares of numbers up to	01							01

				3-digits. (P)								
				M -07 - A – 21 Find the square roots of perfect squares of (up to 3-digit) natural numbers, fractions, and decimals. (P)	01							01
						M -07 - A - 22 Solve real - world word problems involving squares and square roots. (P)	01					01
		M -07 - A - 23 Use language, notation, and Venn Diagrams to represent different sets and their elements. (natural numbers, whole numbers, integers, even	01									01

		numbers, odd numbers, prime numbers) (P)										
		M -07 - A - 24 Identify and differentiate between: <ul style="list-style-type: none"> ● subset and superset ● proper and improper ● equal and equivalent ● disjoint and overlapping (C)	01								01	
				M -07 - A – 25 Describe and perform operations on sets (union, intersection, difference and complement). (P)	01							01
							M -07 - A - 26 Verify the following: $A \cap A^c = \emptyset$ $A \cup A^c = U$ $(A \cup B)^c = A^c \cap B^c$ $(A \cap B)^c = A^c \cup B^c$	01				01

) $c = A \cup Bc$ (P)				
Total Frequency	01		08		09		04		04			26
Algebra												
M-07-B01 Recall recognizing simple patterns from various number sequences. (P)	01											01
M-07-B02 Recall how to continue a given number sequence and find: -term to term rule - position to term rule (P)	01											01
				M-07-B03 Find terms of a sequence when the general term (nth term) is given. (P)	01							01
						M-07-B04 Solve real life problems involving	01					01

						number sequences and patterns. (P)						
M -07 - B - 05 Students will know Muhammad bin Musa Al - Khwarizmi as the founding father of Algebra. (C)	01											01
M -07 - B - 06 Recall variables as a quantity which can take various numerical values. (C)	01											01
M -07 - B - 07 Recognise open and close sentences, like and unlike terms, variable, constant, expression,	01											01

equation, and inequality. (C)												
M -07 - B - 08 Recognise polynomials as algebraic expressions in which the powers of variables are whole numbers. (C)	01											01
M -07 - B - 09] Identify a monomial, a binomial, and a trinomial as a polynomial. (C)	01											01
				M -07 - B – 10 Add and subtract two or more polynomials. (P)	01							01
				M -07 - B – 11 Find the product of: - monomial with monomial - monomial with binomial/trinomi al - binomials with	01							01

				binomial/trinomial (P)								
				M -07 - B – 12 Simplify algebraic expressions (by expanding products of algebraic expressions by a number, a variable, or an algebraic expression) involving addition, subtraction, and multiplication division. (P)	01							01
						M -07 - B - 13] Explore the following algebraic identities and use them to expand expressions : $(a + b)^2 = a^2 + b^2 + 2ab$ $(a - b)^2 = a^2 + b^2 - 2ab$ $(a + b)(a - b) = a^2 -$	01					01

						<i>b</i> ² (P)						
				M -07 - B – 14 Factorize algebraic expressions (by taking out common terms and by regrouping) (P)	01							01
				M -07 - B -15 Factorize quadratic expressions (by middle term breaking method). (P)	01							01
				M - 07 - B -16 Construct linear equations in two variables such as $ax + by = c$, where a and b are not zero. (C)	01							01
M - 07 - B - 17 Recall solving linear equations in one variable. (P)	01											01
M- 07 - B - 18] Introduction to Cartesian	01											01

coordinate system (C)												
				M - 07 - B - 19 Plot the graph of the linear equation $ax + b=0$ where $a \neq 0$ and of linear equations in two variables. (P)	01							01
M - 07 - B - 20 Recognise and state the equation of a horizontal line and a vertical line. (C)	01											01
				M - 07 - B - 21 Find values of 'x' and 'y' from the graph. (P)	01							01
Total Frequency	10		0		09		02		0		0	21
Measurements												
				M-07-C01 Convert different units of distance. (P)	01							01
				M-07-C02 Convert 12-hour clock to 24 hour clock and vice versa. (P)	01							01

				M-07-C03 Convert between different units of time and speed. (P)	01							01
				M-07-C04 Calculate arrival time, departure time and journey time in a given situation (on the previous day and the next day). (P)	01							01
						M-07-C05 Solve real-world word problems involving distance, time, and average speed. (P)	01					01
						M-07-C06 Differentiate between uniform and average speeds. (C)	01					01
				M-07-C07 Calculate the area and perimeter of the shaded/unshaded region in composite	01							01

				shapes. (P)								
				M-07-C08 Calculate the circumference and area of a circle.	01							01
				M-07-C09 Calculate the surface area and volume of any simple 3-D shape including right prisms and cylinders. (P)	01							01
				M-07-C10 Convert between standard units of area (m ² , cm ² , mm ² and vice versa) and volume (m ³ , cm ³ and mm ³ and vice versa) (P)	01							01
						M-07-C11 Solve real life word problems involving the surface area and volume of right prisms and cylinders.	01					01

						(P)						
Total Frequency	0		0		08		03		0		0	11
Geometry												
M-07- D-01 Recognise quadrilaterals and their characteristics (parallel sides, equal sides, equal angles, right angles, lines of symmetry etc). (Square, rectangle, parallelogram, rhombus, trapezium, and kite) (P)	01											01
M-07- D-02 Differentiate between convex and concave polygons. (C)	01											01
		M-07- D-03 Translate an object and give precise description of transformatio	01									01

		n (P)										
M-07- D-04 Know that the perpendicular distance from a point to a line is the shortest distance to the line. (C)	01											01
		M-07- D-05 Describe the properties of a circle, centre, radius, diameter, chord, arcs, major and minor arc, semi-circle and segment of a circle. (C)	01									01
				M-07- D-06 Calculate unknown angles in quadrilaterals using the properties of quadrilaterals. (Square, rectangle, parallelogram,	01							01

				rhombus, trapezium, and kite). (P)									
		M-07- D-07 Understand the relationship between interior and exterior angles of polygons and between opposite interior and exterior angles in a triangle. (C)	01										01
				M-07- D-08 Calculate the interior and exterior angles of a polygon and the sum of interior angles of a polygon. (P)	01								01
				M-07- D-09 Recognise identity and draw lines of symmetry in 2-D shapes and rotate objects using rotational symmetry; and find the order of	01								01

				rotational symmetry. (P)							
				M -07 - D -10 Calculate unknown angles in a triangle (P)	01						01
				M -07 - D -11 Construct different types of triangles. (Equilateral, isosceles, scalene, acute - angled, right - angled and obtuse -angled) (P)	01						01
Total Frequency	03		03		05		0		0	0	11
Statistics & Probability											
								M-07-E01 - Recognise drawing and interpreting of bar graphs, line graphs and pie charts. - Differentiate between a histogram and a bar graph. - Construct and compare histograms	01		01

								for both discrete and continuous data with equal interval range. -Select and justify the most appropriate graph(s) for a given data set and draw simple conclusions based on the shape of the graph. (P)				
M -07 - E - 02] Recognise the difference between discrete, continuous, grouped, and ungrouped data. (C)	01											01
								M -07 - E - 03 Calculate the mean, median and mode for ungrouped data and the	01			01

								mean for grouped data and solve related real - world problems; Compare, choose and justify the appropriate measures of central tendency for a given set of data. (P)				
						M-07-E04 Construct frequency distribution tables for given data (i.e., frequency, lower class limit, upper class limit, class interval and mid-point) and solve related real-world problems. (P)	01					01

						M-07-E05 Explain and compute the probability of, certain events, impossible events, and the complement of an event. (Including real world word problems). (P)	01					01
Total Frequency	01		0		0		02		02			05
Overall Total	15		11		31		11		6			74

PSYCHOMOTOR DOMAIN

From Low Order Taxonomies to High Order Taxonomies														Total
Perception	No of Times	Set	No of Times	Guided Response	No of Times	Mechanism	No of Times	Complex Overt Response	No of Times	Adaptation	No of Times	Origination	No of Times	
Geometry														

				M-07- D-03 Translate an object and give precise description of transformation	01								01	
				M-07- D-09 Recognise identity and draw lines of symmetry in 2- D shapes and rotate objects using rotational symmetry; and find the order of rotational symmetry.	01								01	
				M -07 - D - 11 Construct different types of triangles. (Equilateral, isosceles, scalene, acute - angled,	01								01	

				right - angled and obtuse - angled)										
Total Frequen cy					03								03	
Statistics & Probability														
				M-07-E04 Construct frequency distribution tables for given data (i.e., frequency, lower class limit, upper class limit, class interval and mid-point) and solve related real world problems	01								01	
Total Frequen cy					01								01	
Overall Total	0		0		04								04	

CURRICULUM MAPPING

Grade VIII

COGNITIVE DOMAIN

Low Order Taxonomies (Cognitive)						High Order Taxonomies (Cognitive)						
Remember	No of Times	Understand	No of Times	Apply	No of Times	Analyse	No of Times	Evaluate	No of Times	Create	No of Times	Total
Number & Operations												
				M-08-A-01 Round off numbers up to 5 significant figures (F)	01							01
						M-08-A02 Analyse approximation error when numbers are rounded off (F)	01					01

						M-08-A03 Solve real-world word problems involving approximation (C)	01					01
				M-08-A-04 Convert Pakistani currency to well-known international currencies and vice versa (F)	01							01
		M-08-A05 Differentiate between rational and irrational numbers (C)	01									01
M-08-A06 Represent real numbers on a number line and recognise the absolute value of a real number (C)	01											01

				M-08-A07 Demonstrate the ordering properties of real numbers (F)	11							01
				M-08-A08 Demonstrate the following properties: - closure property - associative property - existence of identity element - existence of inverses - commutative property - distributive property (P)	01							01
						M-08-A09 Solve real-world word problems involving calculation with decimals and fractions (C)	01					01

		M-08-A10 Identify and differentiate between decimal numbers as terminating (non-recurring) and nonterminating (recurring). (C)	01									01	
						M -08 - A - 11 Calculate direct and inverse, and compound proportion and solve real -world word problems related to direct, inverse and compound proportion. (Using table, equation, and graph) (P)	01						01

				M -08 - A - 12 Explain and calculate profit percentage, loss percentage and discount (P)	01							01
				M -08 - A - 13 Explain and calculate profit/markup, principal amount, and markup rate. (P)	01							01
		M -08 - A - 14 Explain insurance, partnership, and inheritance. (F)	01									01
						M -08 - A - 15 Solve real world word problems involving profit %,	01					01

						loss %, discount, profit, markup, insurance, partnership, and inheritance. (P)						
				M -08 - A - 16 Find the square root of natural numbers, common fractions and decimal numbers (up to 6 -digit) (F)	01							01
						M -08 - A - 17 Solve real - world word problems involving squares and square roots (P)	01					01
				M -08 - A - 18 Recognise perfect cubes	1							1

				and find: - cubes of up to 2-digit numbers - cube roots of up to 5 -digit numbers which are perfect cubes (P)									
						M -08 - A - 19 Solve real - world word problems involving cubes and cube roots. (C)	01						01
M - 08 - A - 20 Describe sets using language (tabular, descriptive, and set - builder notation) and Venn diagrams (C)	01												01
				M -08 - A - 21 Find the	01								01

				power set (P) of set A where A has up to four elements. (F)								
								M -08 - A - 22 Describe operations on sets and verify commutative, associative, distributive laws with respect to union and intersection. (C)	01			01
								M-08-A23 Verify De Morgan's laws and represent through Venn diagram (C)	01			01
						M-08-A24 Apply sets in real-life word problems (C)	01					01

Total Frequency	02		03		09		08		02		24
Algebra											
		M-08-B01 Differentiate between an arithmetic sequence and a geometric sequence. (C)	01								01
		M-08-B02 Find the terms of an arithmetic sequence using: -term to term rule - position to term rule (P)	01								01
							M-08-B03 Construct the formula for the general term (nth term) of an arithmetic sequence (C)		01		01
						M-08-B04 Solve real life problems involving	01				01

						number sequences and patterns (P)							
M -08 - B - 05 Recall the difference between: → open and close sentences → expression on and equation → equation and inequality (F)	01												01
M -08 - B - 06 Recall the addition and subtraction of polynomials (P)	01												01
M -08 - B - 07 Recall the multiplicatio	01												01

n of polynomials (P) in two variables (P)													
				M -08 - B-08 Divide a polynomial of degree up to 3 by -a monomial -a binomial (P)	01								01
				M -08 - B - 09 Simplify algebraic expressions involving addition, subtraction, multiplicatio n, and division (P)	01								01
								M -08 - B - 10 Recognise the following algebraic identities and use them to expand expressions: $(a + b)^2 =$	1				01

						13 Manipulation of algebraic expressions $(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$ $(a - b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$ (P)					
							M -08 - B - 14 Construct simultaneous linear equations in two variables. (C)	01			01
				M -08 - B - 15 Solve simultaneous linear equations in two variables using: - elimination method - substitution method - graphical	01						01

				method division and factorisation method (P)								
						M -08 - B - 16 Solve real - world word problems involving two simultaneous linear equations in two variables (P)	01					01
M -08 - B - 17 Identify base, index/ exponent, and its value. (F)	01											01
						M -08 - B - 18 Deduce and apply the following laws of Exponents/ Indices: - Product Law -Quotient Law -Power	01					01

						Law (P)						
				M -08 - B - 19 Solve simple linear inequalities, i.e., $ax > b$ or $cx < d$ $ax + b < c$ $ax + b > c$ (P)	01							01
		M -08 - B - 20 Represent the solution of linear inequality on the number line (P)	01									01
M -08 - B - 21 Recognise the gradient of a straight line. Recall the equation of horizontal and vertical lines i.e., $y = c$ and $x = a$ (C)	01											01
				M -08 - B - 22	01							01

				Find the value of 'y' when 'x' is given from the equation and vice versa. (P)							
				M -08 - B - 23 Plot graphs of linear equations in two variables i.e., $y = mx$ and $y = mx + c$ (P)	01						01
		M -08 - B - 24 Interpret the gradient/ slope of the straight line. (P)	01								01
				M -08 - B - 25 Determine the y - intercept of a straight line (C)	01						01
Total Frequency	05		04		08		05		03		25
Measurements											

				M-08- C-01 State the Pythagoras theorem and use it to solve right angled triangles. (P)	01							01
				M-08- C-02 Calculate the arc length and the area of the sector of a circle (P)	01							01
						M-08- C-03 Solve real life word problems using Pythagoras theorem. (P)	01					01
				M-08- C-04 Calculate the surface area and volume of the pyramid, sphere, hemisphere, and cone. (P)	01							01
						M-08- C-05 Solve real life word	01					01

						problems involving the surface area and volume pyramid, sphere, hemisphere, and cone. (P)					
	0		0		3		2		0		5
Total Frequency											
Geometry											
		M-08- D-01 Rotate an object and find the centre of rotation by construction (P)	01								01
						M-08- D-02 Enlarge a figure (with the given scale factor) and find the centre and scale factor of enlargement. (P)	01				01

<p>M-08- D-03 Describe chord, arcs, major and minor arc, semi-circle, segment of a circle, sector, central angle, secant, tangent and concentric circles. (C)</p>									<p>01</p>
			<p>M -08 - D - 04 Construct a triangle when: -three sides (SSS) - two sides and included angle (SAS) -two angles and included side - a right - angled triangle when hypotenuse and one side (HS) are given (P)</p>	<p>01</p>					<p>01</p>

				M -08 - D - 05 Construct different types of quadrilaterals (square, rectangle, parallelogram, trapezium, rhombus, and kite). (P)	01							01
				M -08 - D - 06 Draw angle and line bisectors to divide angles and sides of triangles and quadrilaterals. (P)	01							01
						M -08 - D - 07 Identify congruent and similar figures (in your surroundings), apply properties of two figures to be	01					01

						congruent or similar and apply postulates for congruence between triangles. (P)						
Total Frequency	01		01		03		02		0			07
Statistics & Probability												
							M-08- E-01 Select and justify the most appropriate graph(s) for a given data set and draw simple conclusions based on the shape of the graph (P)	01				01
M -08 - E - 02 Recognise the difference between discrete,	01											01

continuous, grouped, and ungrouped data. (C)													
						M -08 - E - 03 Calculate range, variance and standard deviation for ungrouped data and solve related real -world problems. (P)	01						01
						M-08- E-04 Construct frequency distribution tables, histograms (of equal widths) and frequency polygons and solve related real-world problems. (P)	01						01

						M-08- E-05 Explain and compute the probability of; mutually exclusive, independent, simple combined and equally likely events. (Including real-world word problems) (P)	01					01
				M -08 - E - 06 Perform probability experiments (for example tossing a coin, rolling a die, spinning a spinner etc. for certain number of times) to estimate probability of a simple event (P)	01							01

		M -08 - E -07 Compare experimental and theoretical probability in simple events (P)	01										01
Total Frequency	01		01		01		03		01				07
Overall Total	09		09		24		20		06				68

PSYCHOMOTOR DOMAIN

From Low Order Taxonomies to High Order Taxonomies														
Perception	No of Times	Set	No of Times	Guided Response	No of Times	Mechanism	No of Times	Complex Overt Response	No of Times	Adaptation	No of Times	Origination	No of Times	Total
Geometry														
				M-08- D-01 Rotate an object and find the centre of rotation	01									1

				by constructi on										
				M-08- D- 02 Enlarge a figure (with the given scale factor) and find the centre and scale factor of enlargeme nt.	01									01
				M -08 - D -04 Construct a triangle when: - three sides (SSS) - two sides and included angle (SAS) - two angles and	01									01

				included side - a right - angled triangle when hypotenuse and one side (HS) are given										
				M -08 - D -05 Construct different types of quadrilaterals (square, rectangle, parallelogram, trapezium, rhombus, and kite).	01									01
				M -08 - D -06 Draw angle and line bisectors to divide	01									01

				the angles and sides of triangles and quadrilaterals .												
Total Frequency					05											05
Statistics & Probability																
		M -08 - E -06	1	M-08-E-04	1											02
		Perform probability experiments (for example tossing a coin, rolling a die, spinning a spinner etc. for certain number		Construct frequency distribution tables, histograms (of equal widths) and frequency polygons and solve related real-												

		of times) to estimate probabil ity of a simple event		world problems .										
Total Freque ncy			01		01									02
Overall Total			01		06									07