NASA 2019
Assessment Framework for Grade Ten in Mathematics, Nepali, Science and English

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Goverment of Nepal

Ministry of Education

Education Review Office

Sanothimi, Bhaktapur

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NASA 2019: Assessment Framework for Grade Ten in Mathematics, Nepali, Science and English

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Preface

This framework for National Assessment of Student Achievement (NASA) 2018 has been prepared to provide guidelines for the assessment of Grade 10 students' learning achievement in Mathematics, Nepali, Science and English. The framework identifies and defines the domains and constructs to be assessed; specifies the criteria and standards; describes item development process; explains sampling and methodological processes; outlines the structure of contextual questionnaires; and presents the data analysis process. The first chapter of the framework focuses on conceptual discussion on large-scale assessment, norm and criterion-referenced assessment, and assessment framework. Chapters 2, 3, 4 and 5 present the assessment framework for Mathematics, Nepali, Science and English of Grade 10, respectively. These four chapters identify the domains to be tested; present the criteria and standards of both subjects; and outline the test specification. Chapters 6 and 7 include the assessment design and framework for contextual variables, respectively.

ERO, for the first time, had prepared a NASA framework for Grade 8 students in 2016, and the NASA framework for grade 5 students in 2017. This document has been prepared by reviewing some international as well as national practices of NASA studies. Several aspects of assessment frameworks for Grade 8 and grade 5, developed in 2016and 2017, have been adopted with a necessary revision and elaboration in this framework. Recent international practices such as assessment framework for PISA, TIMSS, PIRLS and PCAP have been reviewed extensively and relevant practices have been adopted in this framework. In addition, subject experts and teachers, and assessment experts have contributed in developing the criteria and standards and in identifying the level of cognitive domain proposed in this framework.

ERO had provided a draft matrix of criteria and standards of each subject, prepared through the workshops of subject teachers and experts together, and a tentative structure of the framework, to the experts who worked in preparing this framework on behalf of Centre for Educational Research and Social Development (CERSOD), the consultancy firm contracted for the work. By reviewing national and international documents and practices as well as organising several meetings and discussions with ERO officials and the other relevant experts, the authors prepared and submitted the draft assessment framework to ERO. The draft then was reviewed by the experts and revised accordingly. The revised draft of the framework of each subject was presented to the respective subject committees that endorsed the framework document for NASA 2019 in Grade 10.

Although the draft of this document has been prepared by the experts, this document is a product through collaborative efforts of a number of persons and agencies. I acknowledge all of them for their contributions and support in the preparation of this framework. Particularly, I would like to thank Dr. Peshal Khanal and Dr. Prem Phyak for preparing the draft and finalising the document considering the suggestions and comments provided by the experts and the editor. Similarly, I acknowledge the support from subject teachers and experts who drafted a table of criteria and standards for Mathematics and Nepali. My sincere appreciation to Professor Hari Prasad Upaddhyaya, Professor Min Bahadur Shrestha, Professor Parasmani Bhandari, professor Rajani Rajbhandary and Dr Binod Luitel for their reviews and feedback

to improve the draft framework. I am also grateful to the members of Mathematics, Nepali, Science and English subject committees and the subject coordinators from ERO; Shyam Prasad Acharya, Deviram Acharya and Lava Dev Bhatta and Anish Yadav, who have worked hard to coordinate the entire process for the accomplishment of the task of developing this assessment framework.

As the editor of this framework document, I have not only read the final draft but also participated in several discussions with the authors; workshops with teachers and experts; and meetings with subject committees and the reviewers of this document. Moreover, I have reviewed most of the conceptual and theoretical literatures as well as national and international practices on large-scale assessments, referenced in this document, during the process of editing. I also worked in framing this document; discussing with the authors for the depth and breadth of contents and for ensuring consistency in the document; and identifying and justifying the proposed content, methodology and contextual framework.

ERO will design and conduct NASA 2019 for Grade 10 by considering the framework suggested in this document. However, ERO considers that this is a flexible and living document which can be updated and revised as per the need.

Finally, ERO welcomes constructive feedback and suggestions to further improve the entire assessment process and methods.

Dr. Lekha Nath Poudel

Joint Secretary

Education Review Office

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We would like to thank ERO for providing an opportunity to prepapre the assessment framework for Grade 10 Mathematics, Nepali, English and Science subjects. We are particularly grateful to Dr. Lekha Nath Poudel for his regular support and insightful feedback in the process of writing this framework.

We are equally grateful to the members of Mathematics, Nepali, Science and English subject committees and test item writers who worked hard to develop subject-wise assessment frameworks. Without their support, we could not be able to prepare this framework.

We are hopeful that this framework will be helpful to carry out national assessment of Grade 10 stduents in Mathematics, Nepali, Science and English.

Dr. Peshal Khanal
Dr. Prem Phyak

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Abbreviations

BPEP	Basic Primary Education Project
CDC	Curriculum Development Centre
CR	Constructed-response
CRT	Criterion-Referenced Test
DEO	District Education Officer
EDSC	Education and Development Service Centre
ERO	Education Review Office
ICT	Information and communication technology
IRT	Item Response Theory
MOE	Ministry of Education
NASA	National Assessment of Student Achievement
NCF	National Curriculum Framework
OMR	Optical Mark Reading
OECD	Organisation for Economic Co-operation and Development
PIRLS	Progress in International Literacy Study
PISA	Program for International Student Assessment
SMC	School Management Committee
SR	Selected-response
PTA	Parent-Teacher Association
TIMSS	Trends in International Mathematics and Science Study

Chapter 1: Introduction

National assessment, popularly known as National Assessment of Student Achievement (NASA), is "designed to describe the achievement of students in a curriculum area aggregated to provide an estimate of the achievement level in the education system as a whole at a particular age or grade level" (Greaney & Kellaghan, 2008, p. 7). As part of global educational discourse of 'quality education', national assessments have been carried out to provide the Ministry of Education, globally, with critical insights into evaluating overall effectiveness of educational policies and practices in terms of student achievement. By providing large-scale data on student achievement, national assessments support the Ministry of Education in the process of assessing its educational policies and provide a direction towards reforms.

This assessment framework for Mathematics, Nepali, Science and English subjects in Grade 10 has been prepared to provide Education Review Office (ERO) with an overall guideline to conduct national assessments of student achievement to be conducted in 2019 in these subjects. This framework includes seven chapters. The first chapter deals with the rationale and practices of national assessment; introduction of criteria and standard-referenced tests; development of criteria and standards; assessment framework; and the methods/processes of developing this framework. The second to fifth chapters present the assessment frameworks for Mathematics, Nepali, Science and English, respectively. Similarly, Chapter 6 discusses methodology that will be adopted to carry out NASA for Grade 10 Nepali, Mathematics, Science and English. Finally, Chapter 7 presents the framework for assessing contextual factors influencing the achievement of students, based on the review of national and international studies. This chapter begins with a brief discussion on the rationale for national assessments.

1.1 Rationale for national assessment

The major goal of national assessments is to provide database for "a type of national education audit carried out to inform policy makers about key aspects of the system" (Greaney & Kellaghan, 2008, p. 7). By focusing on the outcome aspect of education system, national assessments are conducted to address the following general questions:

- To what extent are students learning in different subject areas?

- How well are students from particular groups (e.g., gender, ethnicity, geography and language backgrounds) learning?
- What are the strengths and weaknesses in the existing level of student achievement?
- What are the factors affecting student achievement?
- What resources are available to meet the standard of the government in terms of student achievement?
- Does the level of student achievement change over the span of time? What factors influence that change? (Poudel, 2017, based on Greaney & Kellaghan, 2008)

In addressing these questions, national assessments not only provide information on the status of student achievements, but also offer significant ideas towards the improvement of learning outcome. Put it differently, national assessments are conducted for both backward and forward-looking purposes. The backward-looking purpose is concerned mainly with building a database to analyse both the strengths and weaknesses of educational policies and practices that affect students' learning achievement. On the one hand, national assessments provide information that helps policy makers understand the change on students' learning achievement over the time. On the other hand, they supply data related to the factors affecting learning achievement which become a basis for policy makers to revise the existing policies and guide them to reformulate new ones to strengthen quality of education (Poudel, 2017).

Moreover, national assessments contribute to ensuring equality and access of all children to education. As they provide desegregated data on learning achievement in terms of gender, ethnicity, language background and geographic region, national assessments help policy makers to understand which groups are performing better and which groups are not performing satisfactorily. This understanding eventually offers significant insights into creating new policies to ensure equality in education (see Poudel, 2016). Murphy, Greaney, Marlaine and Rojas (1996) claim, national assessments provide "systematic, regular measures of learning achievement in a country that are designed to assist policymaking" (p. 2). Studies from around the globe have also shown that national assessments have been instrumental in policy reforms addressing quality, equity and access in education (Greaney & Kellaghan, 2008).

1.2 Practice of national assessment

National assessments have been conducted globally to inform governments about what reforms are necessary to improve quality of students' learning from diverse social groups. In Nepal, national assessments of student achievement began in 1995. Before the establishment of Education Review Office (ERO) in 2010, BPEP and Department of Education commissioned assessments to the agencies such as EDSC, CERID, CERSOD and Fulbright at various grades. Since 2011, ERO has completed national assessments of students' achievement at Grade 8 in Nepali and Mathematics in 2011, 2013 and 2017, in Social studies in 2011 and in Science in 2013 and 2017 (ERO, 2011, 2013, 2017); and at Grades 3 and 5 in Nepali and Mathematics in 2012 and 2015, in English in 2012 (ERO, 2012, 2015). Following a systematic and standard process of assessment, these large-scale assessments inform learning achievement of students from diverse ecological regions and analyse data based on different indicators such as gender, ethnicity and geographical regions.

Nepal follows globally accepted practices of conducting national assessments. Although the context of each country is different, some major practices are common to national assessments in all countries. Building on a comprehensive review of national assessments from various countries, Greaney and Kellaghan (2008) draw the following common elements of national assessments:

- The Ministry of Education (MOE) selects an implementing agency from either within the MOE system itself or an independent external consulting organization. In the case of Nepal, Education Review Office (ERO) within the MOE system is solely responsible for the national assessments.
- The MOE develops policies and frameworks for the assessment in consultation with and participation of key stakeholders such as subject experts, teachers and policy makers.
- The MOE identifies the Grade level and determines the area (e.g., literacy or numeracy) to be assessed.
- The implementing agency (here ERO) defines and describes the area of achievement in terms of both content and cognitive skills and develops test items along with supporting questionnaires and manuals for test administration.
- The implementing agency pilot-tests the test with the support of the external experts, reviews its validity, appropriateness and sensitivity in terms of geography, gender, ethnicity and culture.
- The implementing agency ensures that the assessment instruments are reliable and valid.

- The implementing agency samples the schools; arranges for printing the test and other relevant materials; and communicates with the schools and teachers for test administration.
- The implementing agency provides training to test administrators (e.g., focal personal head teachers and teachers) and administers the test and other survey questionnaires in the selected schools.
- The implementing agency collects test scores and other necessary information, cleans the data and analyses them.
- The implementing agency prepares draft reports, which will be reviewed by relevant committee and external experts.
- The implementing agency prepares and disseminates final reports through various means such as publication and the mass media.
- The MOE, implementing agency and relevant stakeholders analyse the reports and identify the major areas for policy reforms.

Embracing the above-mentioned global practices, ERO will conduct NASA at Grade 10 in Nepali, Mathematics, Science and English. For this purpose, ERO develops assessment frameworks and sampling designs. After that, working with experts and teachers, ERO analyses the curriculum and develops criteria and performance standards in each subject. Then, ERO works with the subject committees and the test developers to prepare test items for assessing students' achievement. At the same time, working with experts and practitioners, ERO prepares background questionnaires for students, teachers and head teachers. The test items developed by the subject experts will be pre-tested for checking their quality, reliability and validity. Following this, the test items will be revised and finalized by incorporating ideas from the analyses of pre-test results. And the test will be administered in the selected schools, which is followed by marking, data entry and data cleaning. For standards based assessment, standards will be set at this point.Then the data will be analysed and test scores will be equated using IRT modelling. Finally, the reports will beprepared for the MOE and disseminated among the relevant stakeholders for necessary feedback.Figure 1.1 illustrates the NASA cycles with major tasks of NASA 2019 to be conducted at grade 10.

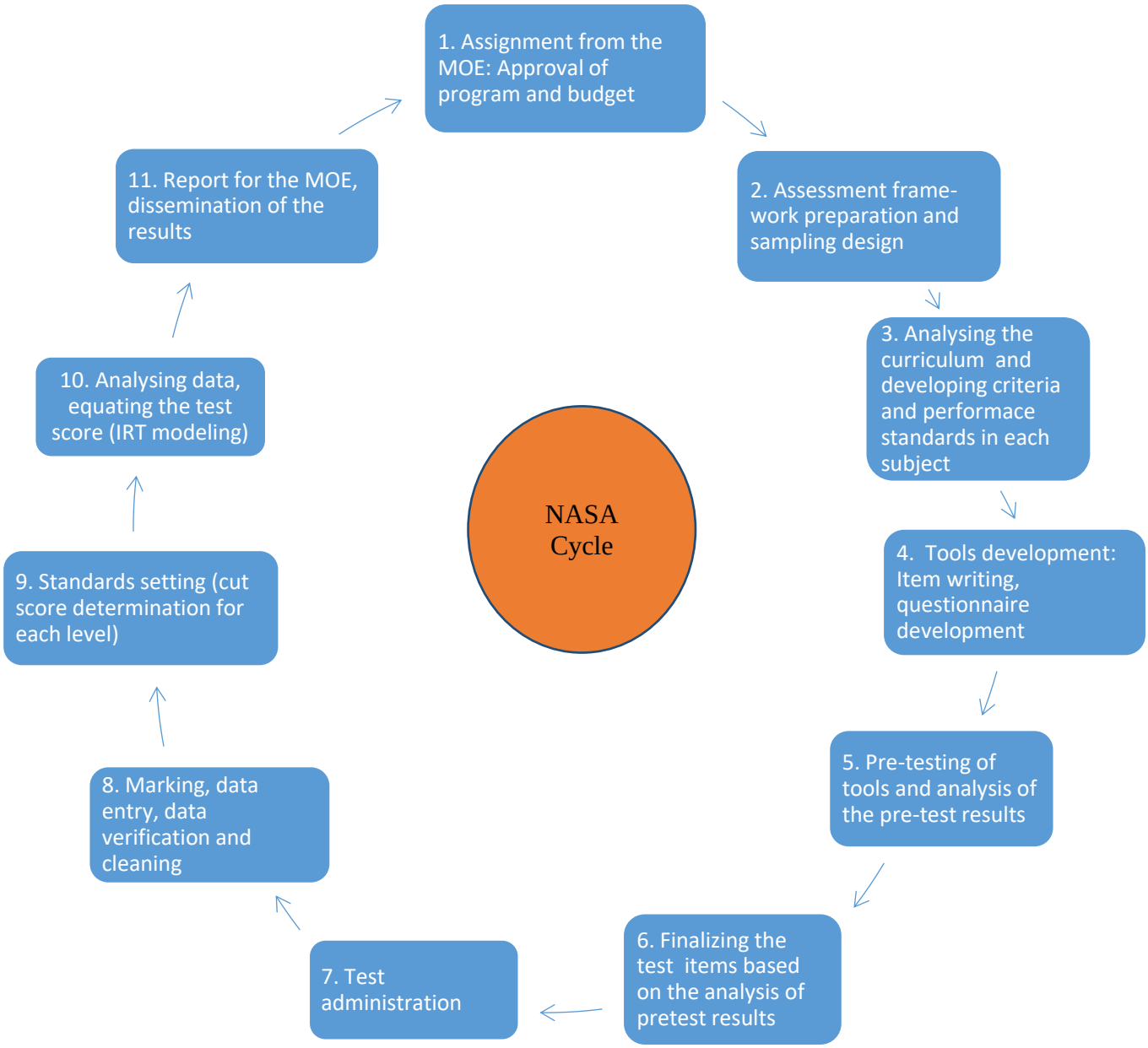


Figure 1.1: NASA Cycle (Based on ERO, 2015)

1.3 Criteria and standard referenced Assessment

The upcoming NASA for Grade 10 Mathematics, Nepali, Science and Englishwill adopt a criterion-referenced test (CRT) approach. CRT is a popular approach to assess students' achievement on specific content areas and skills. Rather than comparing students' average score, CRT provides information on how individuals or groups are progressing in specific subject areas (Kubiszyn & Borich, 2007). In other words, CRT assesses whether or not individuals have achieved or failed to achieve specific instructional objectives. The purpose of CRT is to diagnose students' existing learning achievement and identify what progress

they have made over a span of time. CRT also helps policy makers to identify what students have not learned yet and what they are expected to learn (Bond, 1996).

In CRT, students are assessed against a predetermined set of 'criteria' and expected to obtain specific marks that define their 'standard'. Criteria, in CRT, are characteristics by which the quality of students' achievement is judged. Such criteria are determined on the basis of learning objectives from specific courses that students are expected to learn. For each criterion, standards are developed that work as a benchmark to identify the level of student achievement. Standards can be labelled as 'excellent', 'proficient', 'fail', among other options, based on the marks students' achieve. Other commons terms to label standards are 'grades' (numbers), 'letters', 'bands' and 'marks'.

Table 1.1: Popular terms to label standards

1. Marks	32	50	80	100
2. Letters	D	C	B	A
3. % Bands	0-39%	40-59%	60-89%	80-100%
4. Labels	Fail/poor	Competent/average	Advanced/good	Excellent

Although standards vary for different subject areas, they should be in consistent with criteria that are developed to assess students' achievement. More importantly, each standard should be clearly described in terms of expected quality of achievement. Yet, standards should not be so hard that students cannot succeed nor should they be so low that all students succeed at the highest level. In addition, each standard should be described clearly and concisely so that all students can understand the test and what are they expected to perform. For the national assessment of Grade 10 Mathematics, Nepali, Science and English, a group of subject experts develop both criteria and standards in each subject. The standards adopted in NASA 2017 for grade 8 are useful reference to develop the standards for NASA 2019. In NASA 2017 for Grade 8, there are three broad standards—basic, proficient, and advanced—that are divided into six sub-standards—1,2,3,4,5 and 6—based on students competency on different levels of test items in terms of complexity (see Pant, Singh & Poudel, 2016). These criteria and standards are informed by both global and national theories and practicesas well as national curricular framework (see Chapters 2 and 3).

1.4 Developing criteria and standards for an assessment

Developing criteria and standards is one of the major components of NASA. In order to make NASA valid and reliable, the criteria for the assessment are developed with the support from experts in specific subject areas. For this, ERO has formed subject committees, which comprise subject teachers and experts from universities. These committees and experts review national curricula, international literature, and past test-items and develop test items against specific criteria. At the centre of this process remains the national curriculum framework in that the MOE specifies learning goals for each subject.

While developing criteria, a number factors are considered. First, national, social and educational contexts are given importance. As NASA is conducted to provide the MOE with feedback on the policy reforms, national context becomes the base of assessment. Without considering national context, NASA cannot provide realistic information about students' achievement. For this, the context and backgrounds of school, classroom, students and teachers are also important.

The development of test items in CRT, first, requires a specification of competencies from the learning goals of curriculum. Each learning goal should be specified into related competencies, which can be presented as criteria against which students' learning achievement is assessed. The competencies should be measurable, clear, specific and relevant to students. Second, standards for each competency should be determined; standards could be letters, marks and bands. After this, test items should be written in line with the competencies and their standards. Such test items should be valid, reliable and fair.

1.5 Assessment framework

Although Nepal follows its own NASA framework, it draws on international theories and practices of assessing students' learning achievement to ensure that the entire assessment process becomes theoretically valid and reliable. Figure 1.2 presents a summary of the overall guidelines for NASA framework.

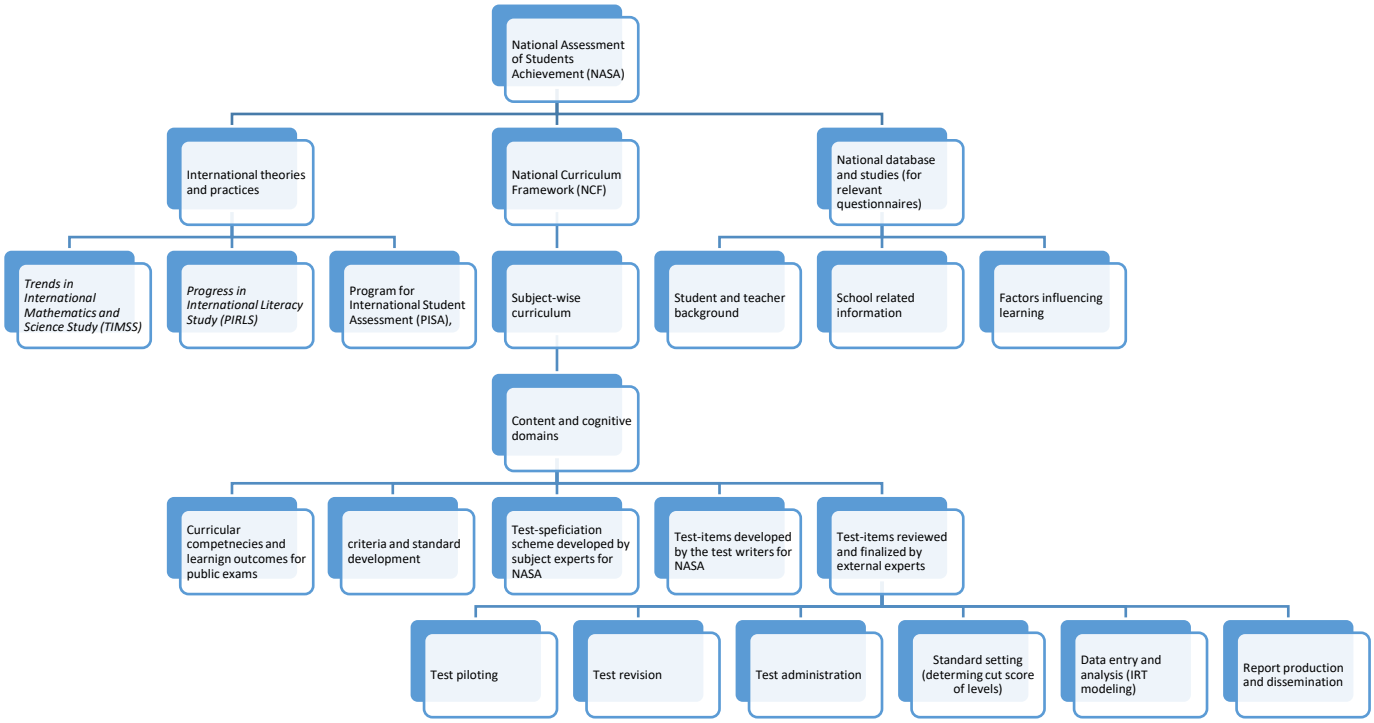


Figure 1.2: Assessment framework (Source: Authors)

As presented in Figure 1.2, NASA draws information mainly from three sources to support its theoretical framework; develop and administer test items; produce reports; and discuss factors influencing learning achievements. The major source of information is the national curriculum framework (NCF) which guides overall NASA framework. NCF, prepared by the MOE/CDC,serves as base for identifying learning goals for different subjects. The content and cognitive domains that are used for the test construction are identified from the curricula of specific subjects. Although NASA prepares test items based on the specific scheme prepared by experts, it also draws on insights from the learning outcomes and goals from the national curriculum framework. Based on those learning outcomes, subject experts develop test-items, which will be reviewed and finalized by external reviewers. The final test-items will be pretested, revised and administered. After that, Item Response Theory (IRT) will be used to analyse the items and data. At the end, reports are produced and disseminated among the relevant stakeholders.

Another important source of information includes the national census reports. NASA draws on data related to different social categories such as gender, ethnicity, language, age, and geographical regions from the census reports to develop questionnaire related to background information of students, teachers and schools. International practices and theories on the assessment of student achievement also provide insights into shaping NASA framework in Nepal. Although Nepal has its own constraints (both financial and human-resource), Khanal et al.'s (2016) study indicates that adapting international frameworks can help Nepal to make its NASA framework more rigorous, valid, and reliable in terms of identifying actual quality

of student learning. For this, they also suggest that instead of participating to some international assessments at this point Nepal may use some linking items from these tests and compare the results using IRT. As shown in Figure 1.2, some popular international practices include *Trends in International Mathematics and Science Study (TIMSS)*, *Progress in International Literacy Study (PIRLS)*and *Program for International Student Assessment (PISA)*. In addition to providing ideas for specifying content and cognitive domains, these international assessment practices also focus on contextual factors influencing learning achievement. In Nepal's context, factors related to peer group, students themselves, home, demographic, teacher, economic status, physical conditions and leadership are considered as key factors influencing students' learning achievement.

1.6 Method and process used to develop assessment framework

We have adopted a collaborative approach to develop this assessment framework. For this purpose, we discussed, in a series of meetings, with ERO officials what information is needed to make the framework comprehensive and clear. Following their suggestions, we reviewed the previous NASA studies from Nepal and other countries. We went through several literatures on assessment of students' learning achievement to understand better both the theories and practices of achievement assessment. For the subject-specific framework, we worked closely with the subject experts and subject committees. The initial draft of criteria and standards for each subject prepared in the workshops of subject teachers and experts has been updated and revised with the inputs from the experts and subject committees.

Chapter 2: Assessment Framework for Mathematics (Grade 10)

2.1 Introduction

National Assessment of Student Achievement (NASA) for Grade 10 is designed to assess the curricular competencies of the approved curriculum of respective subjects in Nepal. In addition to this, there is a provision of optional Mathematics as an elective subject. Mathematics is one of the compulsory subjects throughout the school curriculum from grade 1 to 10. In order to define curricular competencies and expected performance of the students after completion of the study, there is a need of analysing the curriculum approved by the government of Nepal for Grade 10 in Mathematics. While analysing the curriculum of Grade 10 in Mathematics and defining domain and contents to be assessed, vertical sequence and performance levels at least from Grade 8 up to the Grade 10 has been analysed, particularly the competencies of grade 9 and 10 in Mathematics have been taken into consideration. It indicates that this assessment of grade 10 students is not confined with only the objectives and content of grade 10 curriculum rather suggest to assess the overall mathematics competencies of grade 10 completed students looking at the overall School Mathematics programme of Nepal. As a compulsory subject, Mathematics in Grade 10 has been taught for 5 periods out of 40 periods total in a week, i. e, 12.5 per cent of time has been allocated for mathematics.

After analysing the curriculum, this chapter identifies domain and construct to be assessed in Mathematics so that the assessment will be designed to measure students' performance against the curricular competencies. Based on the analysis of curriculum as well as domain and contents, it defines the criteria and six standards in each criterion in a hierarchical order of complexity of competencies. Finally, it discusses various levels of cognitive domain to be assessed and suggest a test blue print that is, a table of specification for item construction.

The definition of mathematics literacy given by OECD (2016) in PISA assessment framework for 2015 states that " (a) n individuals capacity to formulate, employ and interpret mathematics in a variety of contexts. It includes reasoning mathematically and using mathematical concepts, procedures, facts and tools to describe, explain and predict phenomena" (p. 13). It further explains that " (i)t (Mathematics) assists individuals to recognise the role that mathematics plays in the world and to make the well-founded judgments and decisions needed by constructive, engaged and reflective citizens" (ibid.). Along with curricular contents, consideration of this definition of mathematical literacy could be useful while developing assessment standards and developing items for national assessment.

2.2 Defining the Content Domain

Overall objectives of teaching Mathematics in school are to develop basic knowledge and understanding in the use of number and in mathematical operations, equip with the basic mathematical and numeracy skills required for solving daily life problems, and lay foundations for studying higher and technical education in various fields (CDC, 2013). Besides, Mathematics helps for critical analysis of problems and situation, enhance creativity and problem solving skills of the students.

As define by PISA (OECD, 2014, 28), mathematical literacy is "(a) n individuals' capacity to formulate, employ, and interpret mathematics in a variety of contexts. It includes reasoning mathematically and using mathematical concepts, procedures, facts and tools to describe, explain and predict phenomena. It assists individuals in recognising the role that mathematics plays in the world and to make the well-founded judgements and decisions needed by constructive, engaged and reflective citizens" (OECD, 2014, p. 28). As in some of other education system (e.g. Canada, see CMEC, 2016), Mathematics in Nepali school aims at providing a comprehensive foundation for all students to reason and communicate mathematically and use mathematical knowledge and skills effectively in postsecondary education, the workplace and daily life.

Mathematics for school education is an important part of literacy in which mathematics literacy generally includes basic mathematics contents and skills including numeracy, arithmetic, geometric shapes and measurement, algebra, sets and data handling; real life contexts; solution of familiar and unfamiliar problems; and decision making and communication skills. Similarly, School Mathematics is also an essential for vertical (higher study) as well as horizontal (study of other subject) educational success. In doing so, eight content domains of grade 9 and 10 curriculum has considered as the content domain for the assessment. The eight content domains are Sets, Arithmetic, Mensuration, Algebra, Geometry, Trigonometry, Statistics and probability.

The general competencies of mathematics at grade 9 and 10 are as follows (CDC, 2072BS):

1. Acquire basic mathematical concepts, structure, skills and process;
2. Solve daily problems using acquired basic mathematical knowledge and skills;
3. Use creatively mathematical concepts, principles and problem solving skills in mathematics as well as other discipline;
4. Enhance the capacity of analysing the physical and social activities using mathematical methods;

5. Develop motivation for the readiness of continue study of mathematics with realising the importance of sequencing and reasoning of mathematics; and
6. Acquire multi-literacy skills and proficiencies for mathematical communication.

These curricular competencies are general in nature. To make them more specific and workable competencies and learning objectives of each content domain for each of the grades 9 and 10, competencies have been identified in the curriculum of mathematics for grade 9 and 10. The following are the competencies set by the curriculum for Grade 9 and 10 in Mathematics (CDC, 2072BS).

Table 2.1: Content domain and competencies for grade 9 and 10 in Mathematic

Content Domain	**Expected competency for grade 9**	**Expected competency for grade 10**
1. Set	Identify and describe the relation between sets, and solve the related problems using set relations.	Same as grade 9
2. Arithmetic	Solve the daily life problems on simple arithmetic, household arithmetic and commercial arithmetic using related rules and formulas.	Solve the daily life problems related to arithmetic using mathematical structure and reasoning.
3. Mensuration	Using the mathematical concepts and skills on surface area, volume and capacity of plane figures and solid objects, draw, measure and find the relevant quantity and solve the problems of determining the cost of industry, occupation and household work.	Solve the problems related to surface area and volume of regular solids (Prism, Pyramid, Cylinder, Hemisphere and Cone)
4. Algebra	Solve the daily problems on algebraic structure (expression and equation).	Simplify algebraic expressions; and investigate and present equations and solve the problems using equations.
5. Geometry	Prove the properties of plane figures (triangle, circle, quadrilateral) using reasoning (deductive) or practical (experimental and inductive) method.	Provewith reasoning andverify experimentally the properties of area of triangle and quadrilateral, and chord and angle of a circle, and also prove their interrelations with reasoning.
6. Trigonometry	Identify the relations of angles and sides of right angled triangle using trigonometric ratios and solve the related problems.	Solve the simple problems on area, height and distances using trigonometric ratios.
7. Statistics	Solve the problems with collecting,graphically representing and analysing the statistical data.	Collection, processing, presentation, analysing and problem solving using the data related to various social and economic conditions.
8. Probability	Identify and present probability related to daily life in a mathematical structure and solve the problems related problems.	Use probability in daily life and to solve daily problems.

The content domains and competencies of grade 9 and 10 curriculum are presented in the above table. Looking at these competencies, most of the competencies are still not specific at the required level. Therefore, these competencies needs to be elaborated and made more specific in order to make these achievable and measurable. The following contents in each domain will help specify the above competencies. Along with taking contents in each

content domain from the grade 10 learning objectives and contents, some of the contents not covered by grade 10, which are key competencies, have adopted from grade 9 contents.

1. Content Domain: Set

1. Identification and solution of verbal problems involving the cardinality of two sets using set relations and set operations (including Venn diagram).
2. Solution of verbal problems on cardinality of set using Venn diagram and solution of daily problems using relation between the properties of sets (up to 3 sets).

2. Content Domain: Arithmetic

1. Solution of problems including Profit and Loss, Commission, Tax (including VAT) and Bonus
2. Solution of problems on simple interest
3. Calculation of compound interest and solution problems involving compound interest
4. Calculation of depreciation and population growth and solution of problems involving depreciation and population growth
5. Calculation of the cost of household bills including electricity, water, telephone, taxi fare with VAT, Service fees, discount/rebate, late fee/fine, and money exchange

Content Domain: Mensuration

1. Solution of the problems on Area and cost (carpeting, painting, gardening)
2. Solution of problems on surface area (including cross section) and volume of solids (cube, cuboid, prism, pyramid, cylinder, sphere, hemisphere, cone)

Content Domain: Algebra

1. HCF and LCM of algebraic expressions using factorisation method
2. Simplification of fractional algebraic expressions
3. Simplification of exponential expressions
4. Solution of equations: Liner equations in two variables (simultaneous equation), quadratic equation and solving verbal problems related to both type of equations.
5. Solution of problems involving four simple mathematical rules on radicals and surds.

Content Domain: Geometry

1. Solution of routine and new problems using the properties of triangles and their relations.
2. Construction of square, rectangle, rhombus, parallelogram and trapezium and describe their relations and differences.
3. Solution of problems using the properties of various types of quadrilaterals

4. Construction of similar polygons to the given polygon
5. Solution of the problems using the properties on chord
6. Construction of quadrilateral and triangle having the equal areas
7. Proving deductively or verifying the properties of the area of triangle and quadrilateral, and solution of problems using the properties
8. Proving deductively or verifying the properties of the arc and the corresponding angles, and solution of problems using the properties

Content Domain: Trigonometry

1. Defining trigonometric rations in a right angled triangle
2. Deriving trigonometric values of angles 30°, 45°, 60° and 90° using trigonometric ratios proving simple identities
3. Finding the missing parts of a triangle using trigonometric ratios
4. Finding the areas of triangle using trigonometric formulas
5. Solution of simple problems on height and distance using trigonometric ratios

Content Domain: Statistics

1. Preparation of line graph and pie chart from the collected data, and solution of related problems
2. Construction of histogram and ogive
3. Solution of problems using ungrouped data related to mean, median mode and Quadrants
4. Drawing conclusions by calculating statistical results on collected data

Content Domain: Probability

1. Solution of daily life related problems on probability using mathematical structure with random sample
2. Solution of problems of mutually exclusive events using additive and multiplicative theories
3. Solution of problems on dependent and independent events

Analysing the curriculum of grade 9 and 10 the following table is prepared the weightage of each content domain. Further, some content domain having the weightage percentage less than 10% have been combined to facilitate for the comparison. With this, 8 content domains have been grouped in to six, which is presented in the following table.

Table 2.2: Content domains and their weightage for Mathematics in Grade 10

Content Domain		Percentage of weightage	
Arithmetic			12
Mensuration			14
Algebra			23
Geometry			26
Sets and trigonometry	Sets	5	11
	Trigonometry	6	
Data and probability	Data (statistics)	9	14
	Probability	5	
		Total	100

2.3 Criterion and Standards

For NASA 2018 of Grade, 24 criteria and 6 standards in each criterion are defined. Criterion generally tells what should be the expected competencies, but it does not tell how well the students demonstrate the competencies. The standards in each criterion describe different level of competencies and therefore standards tell how well the students demonstrate the competencies. As per the curriculum 24 criteria have been identified for assessing the students' performance of Mathematics in Grade 10 for which in each criterion six standards have been defined according as the depth of knowledge and skills as well as complexity of related concepts. The following table presents the standards and general description of standards of Mathematics in Grade 10. Three standards Basic, Proficient and Advance are categorised first and then these three standards are further categorised into six levels of standard: levels 1 and 2 for basic; levels 3, 4 and 5 for proficient; and level 6 for advance.

General Standards

Three to six or more than six standards have been defines by different assessment agencies as well as assessment related literatures. Three standards: basic, proficient and advance or four standards: below basic, basic, proficient and advance have widely been used. We have also identified three standards: Basic, proficient and advance and then these three categories are further categorised into six levels: levels 1 and 2 for basic, levels 3, 4 and 5 for proficient; and level 6 for advance. The idea of general standards of six levels has been developed studying several practices and works on standards based assessments for example, the University of the state of New York's four levels of performance standards for grade 8 mathematics: level 1, 2, 3 and 4 (The University of the state of New York, 2014); PARCC's five levels: does not meets expectations, partially meets expectations, approaches expectations, meets expectations, exceeds expectations (See, PARCC, 2016, http://parccinc.org/); PISA's six levels of mathematics performances (See, OECD, 2016);

three standards are discussed by several testing agencies and literatures (e.g., CMEC, 2016; IEA, 2015).

Table 2.3: General Standards and their Descriptors for Grade 10 in Mathematics

Standard	Levels of Standards	General Descriptors	General Descriptors for Mathematics
Basic Students demonstrate partial mastery of prerequisite knowledge and skills that are essential for proficient work at the grade.	Level 1 (Basic 1)	Students demonstrate **basic pre-requisite** knowledge and skills needed for grade 10 curriculum.	• Write different sets using listing method and Identify uniqueness of set membership and relationships among different sets. • Read simple bills, convert currencies and units of measurements, calculate percentage and profit/ loss and find simple interest. • Identify/ classify and factorize algebraic expressions (simple factorization) and find their HCF and LCM; simplify simple algebraic fractions and expressions involving index number and solve linear equation in one variable. • Classify and construct plane geometrical shapes(including classification of triangles and quadrilaterals) and simple and regular solids • Identify the parts of circle and their relationships, such as, equality of radius/diameter and the equality of arc lengths subtended by equality of central angles. • Write trigonometric ratios for sine, cosine and tangent by labelling a right triangle and list trigonometric ratios of some standard acute angles. • Read simple graphs and charts, draw simple graphs such as line graph, bar graph and picto-graph and calculate mean, median and mode for individual data. • Differentiate between certain events and probable events, examine different degree of possibility of happening events and calculate simple events.
	Level 2 (Basic 2)	Students demonstrate **limited basic** understanding of knowledge and skills set forth in the curriculum.	• Identify equivalent/non-equivalent sets, perform set operations (union, intersection, difference and complement) and present them in Venn diagram. • Read simple bills, convert currencies and units of measurements, solve simple problems of profit & loss and compound interest and calculate area and volume of regular solids. • Factorise binomial and trinomial algebraic expressions; simplify simple algebraic fractions and fractions involving indices; and solve linear equations in one and two variables and use them in solving problems. • Classify geometric figures (e.g., quadrilaterals) on the basis of their speciality/selected attribute and explain them in terms of definitions and their properties. • Identify the parts of circle and their relationships as in 1.5 above and experimentally verify them and solve simple problems on them. • Define trigonometric ratios and find trigonometric ratios of some standard acute angles and use them to find the lengths of the legs. • Read simple graphs and charts, draw simple graphs and calculate mean, median and mode for individual

			and discrete data. • Identify/enumerate all the possible events in an experiment, distinguish types of events (e. g., independent/mutually exclusive) and find probability of simple events.
Proficient Students demonstrate competency over subject matter, including subject-matter knowledge, application of such knowledge to real-world situations, and analytical skills appropriate to the subject matter.	Level 3 (Proficient 1)	Students demonstrate **adequate** understanding of knowledge and skills set forth in the curriculum and demonstrate **partial proficiency** in applying such knowledge and skills.	• Find cardinal number of union, intersection, difference and complement sets and use them in solving routine verbal problems. • Solve simple problems on profit and loss and money exchange; calculate the cost with discount and tax in the bill; and find out compound interest, area and volume of regular solids, projected population and depreciated value. • Find the HCF and LCM of two trinomials; simplify fractional algebraic expressions with two terms and with radicals/surds; and solve exponential equation (reducible to quadratic equation), linear equation (in two variables) and quadratic equation with their verbal problems. • Construct triangle and quadrilateral with the given specification, make informal deduction of geometric relations on the basis of experimental verification and use deductive thinking to prove some known geometrical propositions. • Establish the relationships between arc lengths and central angles subtending the arcs and follow reasoning involved in proofs of some simple theorems on circle. • Define trigonometric ratios and develop detail steps to derive trig metrical ratios of some standard acute angles and use them to find the length of any unknown side of right triangle. • Calculate mean, median, and quartiles of grouped distribution and describe them by using Ogive and histogram. • Define probability, distinguish between independent and mutually exclusive events and calculate their probability.
	Level 4 (Proficient 2)	Students demonstrate **adequate proficiency** in understanding of and ability to apply knowledge and skills set forth in the curriculum	• Find cardinal number of union, intersection, difference and complement sets (consisting of two and more sets) and apply them in solving routine and also some non-routine verbal problems. • Solve the problems on profit and loss (with discount, VAT or commission), compound interest, population growth and money exchange; estimate the cost of bill with commission and rebate; and solve routine as well as some non-routine problems on area and volume of sphere, cylinder and cone. • Find HCF and LCM of three trinomials; simplify fractional algebraic expressions with three terms and with radicals; and solve the exponential equation (one variable), simultaneous linear equations (two variable), quadratic equation and apply them in solving verbal problems of some unfamiliar type. • Construct triangles/quadrilaterals, construct rectangle and parallelogram equal in area, construct triangles equal in area and half of rectangle/parallelogram and follow the reasoning of the given proofs and use

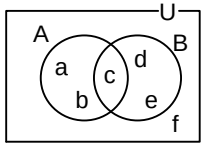
			them in routine problems. • State the relationships between arc lengths and central angles subtending the arcs in form of statement and its converse and develop reasoning involved in proving some simple propositions on circle. • Define trigonometric ratios and develop detail steps to derive trigonometric ratios of some standard acute angles and use them to find the length of any unknown side of right triangle. • Define mean, median and quartiles and calculate them by using formulae for both ungrouped and grouped distributions and interpret them. Define mode as a most repeated value for ungrouped data. • Define probability, distinguish between additive and multiplicative features of events and calculate their probability.
	Level 5 (Proficient 3)	Students demonstrate **thorough proficiency** in understanding of and ability to apply knowledge and skills set forth in the curriculum including the combining more than on relations together for solving the problem.	• Identify different situations for the cardinality of union, intersection, difference and complement sets and apply them in solving routine and non-routine verbal problems. • Solve the problems of familiar and unfamiliar types on profit and loss, money exchange, compound interest, population growth, compound depreciation; area and volume and cost estimation. • Simplify fractional expressions having more than three terms (involving variable and constant terms) and solve new and unfamiliar problems and non-routine types on liner and quadratic equations. • Make construction as mentioned in level 4.4 and explain why such methods work well in any such constructions together with following the reasoning of the given proofs as well as proof of some unfamiliar propositions in geometry. • State the relationships between arc lengths and central angles in form of statement and its converse and develop reasoning involved in proving both routine and non-routine problems on circle. • Define and derive trigonometric ratios, explain its importance in the solution of any triangles and use it to find the area of triangle and to solve problems on height and distance. • Examine the role of mean, median, mode as different as well as related measures and use such interpretation in calculating and using them in ungrouped and grouped distributions. • Distinguish between additive and multiplicative features of events in an experiment (Such as in throwing a pairs of dice) and find probability of the events consisting of both the cases.

Advance Students demonstrate outstanding performance with adequate level of abstraction	Level 6 (Advance)	Students demonstrate **advance** ability to apply knowledge and skills set forth in the curriculum in a new and unfamiliar situation, and ability to combine and use various relations and components of knowledge and skills in order to solve the problems and develop a new relation.	• Reduce unfamiliar situations to familiar one for the cardinality of union, intersection, difference and complement sets and apply them in developing and solving non-routine problems of complex types. • Solve non-routine problems using the concepts and relations of sets and cardinality of sets, profit and loss with discount and tax, compound interest, area and volume, depreciation and population growth and to develop new/general relations. • Simplify fractional expressions involving variable and constant terms, interrelate/generalize the rule of simplification on all types of fractions, and develop and solve new and unfamiliar problems of non-routine types on linear and quadratic equations. • Examine adequacy/ inadequacy of information for constructions, interrelate methods of construction so as to find out basic working rules and conjecture and test/prove new and unfamiliar propositions. • Analyse the relationship between measure of an angle at the centre and the length of subtended arc as directly proportional and develop proof of unfamiliar problems/propositions requiring new construction/application. • Analyse the importance of trigonometric ratios in spite of Pythagorean relation, show the existence of only six ratios (of which three are more fundamental) and apply them in solving unfamiliar and complex problems requiring more relations. • Examine inadequacy of each of the measure of mean or median in finding the central values of the distributions and solve problems on them requiring application to unfamiliar situations. • Deduce some basic sense of probabilistic creatures, such as, the positivity of measure (0-1 scale), the additive and multiplicative rule and their application in solving non routine and complex problems.

Content area, criteria and standards

As mentioned earlier, three standards Basic, Proficient and Advance have been categorised further into six levels of standards: level 1, 2, 3, 4, 5 and 6 in a hierarchy of depth or complexity of knowledge, skills and application in each of the 24 criteria for Mathematics in grade 10. The similar types of six categories of proficiencies have also been used in PISA (see, OECD, 2015). The following table shows the content areas, criteria and standards to each criteria for Grade 10 in Mathematics in which the items for NASA 2018 to be developed using these criteria and standards.

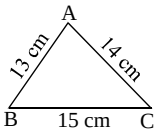
Table 2.4: **Content domain, criteria and standards of Mathematics in Grade 10**

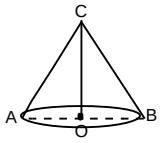
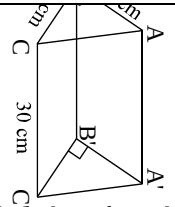
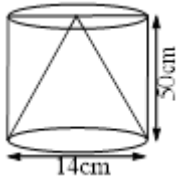
Content Domain	Criteria	Standards					
		Pre-basic	**Basic**	**Proficient 1**	**Proficient 2**	**Proficient 3**	**Advance**
Sets	1. Solution of the daily life problems related to cardinality of sets using relation between 2 or 3 sets.	Identify the cardinality of a set. **Example:** If V = {a, e, i, o, u}, what is the cardinality of set V?	Identify the cardinality of intersect, union, complement or difference of sets by observing the Venn-diagram. **Example :**  Write the cardinality of set (A – B).	Find the cardinality of union, intersection, complement or difference of two sets if cardinalities of required two sets are given. - Using Venn-diagram - Using Formula **Example:** If A and B are overlapping sets such that n(U) = 30, n (A) = 10 and n(B) = 16, find the cardinality of $n(A \cup B)^c$	Solve the problems involving cardinality of union and intersection of two sets (using Venn-diagram and/or using formula) if the cardinality of the sets are given. **Example:** In a class of 100 students, 70 students like cricket, 50 students like football. Find the number of students who like both of the games. Assuming that each student like at least one game)	Solve the problems involving cardinality of union, intersection, complement and difference of three sets if the cardinalities of three sets are given. **Example:** In a survey of 1000 people, 600 like milk, 480 like curd and 400 like tea. Among them, 320 like milk and curd, 220 like milk and tea, 200 like tea and curd, and 50 like all the three things. Use the Venn-diagram and find, how many people like none of them?	Use the concept of set operation and cardinality in new situation, interpret and give reason of the steps chosen. Use mathematical concepts learnt in other content area in solving the problems related to set operation. **Example:** In a survey it was found that the ratio of the people who liked modern songs and folk songs is 8:9. Out of which 50 people liked both songs, 40 liked folk songs only and 80 liked none of the songs. Find the number of people who participated in the survey. Represent the data in the Venn-diagram.
Arithmetic	2. Solution of daily life problems related to profit and loss with VAT and discount	Describe the concept of profit and Loss, Marked price, VAT with discount. **Example:** • If (SP > CP) then what is the result? • If (SP < CP) then what is	• State the formula of profit and loss, and calculate the profit and loss. **Example:** a. When 5% discount is allowed, Shanta should pay Rs 190 to buy a book. What is the cost of the book if the discount is not allowed? b. Dev buys lemons at Rs	Solve the simple problems on profit and loss. **Example:** • An article bought for Rs 450 is sold at a profit of 30%. What is the selling price? • A person bought a car at Rs 550000 and sold it with a loss of Rs 16500. Find his loss percent.	• Solve the problems on profit and loss involving Discount, VAT and commission (Including single condition) **Example:** • The marked price of an article is Rs 550. After allowing 10% discount on it, what will be its actual selling price?	• Solve the problems on profit and loss involving Discount, VAT and Commission (Including two conditions) **Example:** • A radio costs Rs 3200 without VAT and Rs 3600 with VAT. Find the VAT amount and the VAT percent. • An item was sold at a loss of 25%, if it had been sold for Rs 2100 more, then the profit	Solve the problems when profit/loss and discount/VAT are given but not the cost price/ selling price/ marked price (including two variables) **Example:** • A shopkeeper selling an article at a discount of 20% loses Rs 200. If he allows 10% discount he gains Rs 150. Find the marked price and the cost price of the

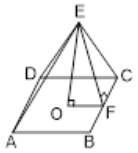
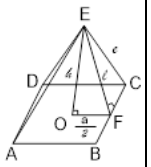
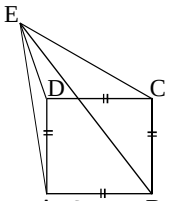
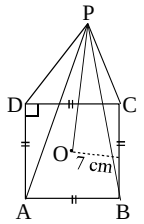
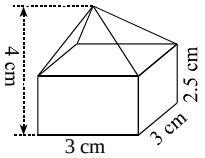
Content Domain	Criteria	Standards					
		Pre-basic	**Basic**	**Proficient 1**	**Proficient 2**	**Proficient 3**	**Advance**
		the result? • What is the VAT amount when 13% VAT is levied on total sales of Rs. 26000.	50 per dozen and sells them at Rs 5 each. Find his profit or loss percent. • Write down the formula of selling price when marked price and discount is given.		• The marked price of a cell phone is Rs 5000. If Rs 450 is discounted and 13% VAT was levied, find the VAT amount.	would have been 10%. What is the cost price of the item?	article. • A person buys an article at a discount of 13% and pays 16% VAT. If he pays Rs 261 for VAT, find the marked price of the article and also the amount paid by him to buy the article.
	3. Calculation for the payment of various bills including electricity, water supply, telephone, meter taxi.	Compare of the bills, and restate the information given in the bills. **Example:** Study the bill and write the tax and discount amount.	• Calculate the VATand other Taxes, total amount etc from the given bills of domestic consumption **Example:** From the given bill, if 13% tax is applied in the total amount, find the bill amount to be paid.	• Calculate the cost after discount and applying tax in the bill **Example:** Calculate the total bill amount to be paid if starting rate, rate after certain distance or unit is different.	• Predict/estimate the cost if bill was paid before the deadline and find the total bill amount (bills without discount is presented) **Example:** A bill is presented. If bill was paid before the deadline, he/she would get 10% discount. What would be the bill amount to be paid.	• Compare two rates of taxi or any bill if two conditions are given. **Example:** Two taxi charge their rate at different rate. For example, First taxi charges Rs. 35 at the beginning and then Rs. 30 in every one kilometre. But, second taxi charges only Rs. 10 at the starting and then Rs. 35 in every one kilometre. Which taxi is better to use to travel 5 kilometer distance?	• Prepare bills with varieties of conditions and compare benefits and loss. **Example:** Prepare bill in the following conditions: - Telephone bill for first 200 calls is Rs. 180. - Each minutes call after 200 calls charges Rs. 1.25 - Calculate the bill amount if 100 calls are used during a month. - 15% service charge and 13% VAT is applied to the used bill.
	4. Solution of daily life problems related to money exchange	Explain the terms used for money and exchange: Buying and selling rates, devaluation of currency, common currency, and money changer. **Example:**	Convert the given money into the required currency. **Example:** Using the rate of Rs 107 for 1 US dollar, calculate the US of Rs. 4280. If 4 US dollar can be exchanged with Rs 420, find the value of 33 dollar in rupees.	Solve the problems related to money exchange (using two variables). **Example:** If 1 Canadian dollar = Rs. 76.19 and 10 Japanize yen = Rs. 8.77 what is the value of 35 Canadian dollar in Japanize yen?	Solve the problems related to money exchange (using more than two variables). **Example:** 1 $ = x ¥ 1¥ = y € 1 € = z NRs What is the equivalent amount of 1 $ in NRs?	Solve the problems related to money exchange (using commission with changed rate). **Example:** At present 1 Euro can be bought at Rs. 110. If Nepali currency is devaluated by 3%, what is the cost of 74 Euro?	Solve the problems related to money exchange that required multiple conversion including commission. **Example:** The cost for two ways air tickets from San Francisco to Kathmandu in US dollar 1400, whereas it costs Rs. 160500 for a two ways air tickets from Kathmandu to San Francisco. Which air ticket is cheaper and by how much rupees if both the transaction are done in USD

Content Domain	Criteria	Standards					
		Pre-basic	**Basic**	**Proficient 1**	**Proficient 2**	**Proficient 3**	**Advance**
		Find the today's exchange rate of Nepali currency and Japanese yen. (from the news paper) Figure: (Buying and selling rates)					(use USD 1 = Rs. 108)
	5. Solution of simple problems involving compound interest (Note: start with simple interest)	Calculate simple interest and amount for more than one year. **Example:** a. Find the amount of two years on Rs. 5000 if the rates of interest for first and second years are 10% and 15% respectively.	• State and explain the formula for calculating Simple Interest, Compound Interest, Simple Amount and Compound Amount (annually, half yearly with different rate and time). • Calculate compound amount for 2 years of a sum of money. **Example:** • State the formula of Compound interest (yearly). • Write down the formula of Compound Amount (half yearly). • Write down the relation among Principal, Time, Rate and Compound Interest and amount.	Compute the compound interest and compound amount when principal, time (1 or 2 years) and rate is given. **Example:** • Calculate the compound interest on Rs 2000 at the rate of 5% for 2 yearscompounded annually.	• Find the compound interest and compound amount (annually and half yearly up to 3 years) • Find the principal, rate or time when the interest and any two from principal, rate and time are given. **Example:** • A person deposited Rs 15200 in the fixed deposits account of the bank for 2 years at the rate of 12% per annum. The interest is compounded semi-annually. How much the amount and compound interest at the end of two years? • In how many years will be Rs. 5000 amounts to Rs 6050 at the rate of 10% per annum compound interest?	• Find the principal and rate of interest when interest or amount for two periods of time are given. • Find the Compound Interest and Compound Amount when time is given in year and half year. **Example:** • If the amount of a sum of money becomes Rs 12100 at the end of 2 years and Rs 13310 at the end of 3 years at the rate of interest compounded yearly, find the rate of compound interest and the sum.	• Solve the verbal problem of compound interest including different rate in different time • Solve the mixed problems based on different rate and criteria (annually, half yearly, Simple Interest, Compound Interest etc.) **Example:** • How much will Rs 5,000 amount to in 2 years at compound interest if the rates for the successive years be 7% and 10% per years? • Bishal deposits Rs 10000 in 'A' bank and Rs 10000 in 'B' bank at the same rate of 6% p.a. 'A' bank pays interest compounded half yearly whereas 'B' bank pays interest compounded yearly. Calculate the interest which bank had paid more and how much at the end of 2 years.)

Content Domain	Criteria	Standards					
		Pre-basic	**Basic**	**Proficient 1**	**Proficient 2**	**Proficient 3**	**Advance**
							• If the difference between the compound interest compounded half yearly and yearly on a sum of money for 2 years at the rate of 20% per year is Rs 289.20. Find the sum.
	6. Solution of the simple problems related to population growth and compound depreciation	Identify the base year population, projected year population, population growth, initial price, price after t years and compound depreciation. **Example:** • Identify the given problem is either compound deprecation or population growth (If the cost is depreciated at the rate of 10% p.a the cost of a motorcycle after 3 years	State and explain the formula of calculating population growth and compound depreciation. **Example:** • Write down the formula of population growth and compound depreciation • Which formula is used to solve the given problem? (In how many years will be population of a town be 26901 from 24400 at growth of 5% p.a?)	Calculate the projected years' population and depreciated value. **Example:** • 2 years ago, population of a village was 16000. The rate of population growth of that village is 5%. What is the present population? • The present price of a motorcycle is Rs 140000. It is depreciated at 7% per year. Then find the price after 2 years.	Find the initial population and initial value of article if later years' value is given. **Example:** • The present population of a city is 1, 05,840. If the population increase every year by 5%, find what was the population of city of before 2 years? • If the cost is depreciated at the rate of 10% per year the cost of a motorcycle after 3 years becomes Rs 92,583 calculate the original price of the motorcycle.	Find the time or rate from population growth and compound depreciation **Example:** • If the population of any town of Gorkha district increase by 2 times in a period of 2 years due to industrial development. Find the population growth rate. • The value of a factory is Rs 204800. If it depreciates at 12 $\frac{1}{2}$ % annually. When will it value become Rs. 137200?	• Solve the verbal problem of population growth and compound depreciation including different rate in different time • Solve the mixed problems based on different rate and criteria **Example:** • The population of Bhimsen Gaunpalika is 42,366. If it had increased by 3%, 2.5% and 5% respectively in the last 3 years, find the population of that place in 3 years ago. • There were 1000 students in Prabhat High school in 2072 B.S. If each group of 10 students brought a new student for admission to increase the number of students in each academic session, find the number of students in 2074 B.S.

Content Domain	Criteria	Standards					
		Pre-basic	**Basic**	**Proficient 1**	**Proficient 2**	**Proficient 3**	**Advance**
		becomes Rs 92,583 calculate the original price of the motorcycle.)					
	7. Solution of the problems on Area and cost (carpeting, painting, gardening)	• Estimate the cost if rate and the area are given. **Example:** A wall is 15 m long and 10 m wide. Find the cost of painting the wall at the rate of Rs. 50 per square meter.	• Estimate the number of bricks or tiles required to pave/build walls, road, etc. **Example:** A garden has is 15 m long and 5 m wide road. How many bricks of 10c m × 5 cm are required to pave the ground?	• Estimate the cost if dimensions of area and unit blocks as well as cost of unit block are given. **Example:** A garden has is 15 m long and 5 m wide road. How many bricks of 10cm × 5 cm are required to pave the ground? Find the total cost of the bricks to pave the road.	Omitting the doors or windows estimate the cost if dimensions of area and unit blocks as well as cost of unit block are given. **Example:**A wall of 15m × 10 m has to be painted. In the wall, there is a door of 1.5m by 2m at the middle. If the wall is to be paved by the tiles of 1ft × 0.5 ft costing Rs. 100 each, find the total cost to pave the tiles.	• Omitting the doors or windows estimate the cost if dimensions of area and unit/blocks as well as cost of unit block involving four walls, window, door, ceiling, etc are given **Example:** A square shaped room has to be painted in four walls and carpeting on the floor. The cost of painting the walls is Rs. 50 per square fit and cost of carpeting is Rs. 25 per square fit, find the total cost to make a room of 12 ft length.	• Use the relation of area and volume to estimate the cost of unit or cost of total volume/area. **Example:** A wall has 1ft × 10ft × 3ft dimension. In the wall, 1ft×.5ft × .25ft size bricks are used. Find the total cost of bricks to be used and the cost of colouring one side of the wall if the cost of each brick is Rs. 15 and cost of one square fit painting is Rs. 50.
	8. Calculation of the area and volume of solid object; triangular prism, cylinder, sphere, hemisphere and cone.	• Draw the figures of triangular prism, pyramid, sphere, hemisphere, and cone. Locate the base area and surface areas of the solids. **Example:** • Draw the figure of cylinder and colour the	• State and explain formulas of Lateral Surface Area (Curve Surface Area), Total Surface Area and volume of solid objects (triangular prism, sphere, hemisphere, and cone). **Example:** • Write down the formula to calculate the Total Surface Area of cylinder. • State the formula to calculate the volume of hemisphere.	• Find the area of triangle when the sides are given. • Find the area and volume of (cylinder, sphere, hemisphere, and cone). **Example:**  • Find the area of given triangle • Find the	• Calculate the Curve Surface Area, Total Surface Area and volume of (Cylinder, Sphere, Hemisphere and cone). • Find the length of any dimension from the given area and volume of solid objects. **Example:** There are two solid hemispherical objects made of earth having the same shape and size. If the total surface area of one hemisphere object is 462	• Find the area and volume of triangular prism. • Find the radius or vertical height or slant height of a solid object when the area or volume is given. • Solve the problems related to combined object. **Example:** • Find the total surface area of given prism	• Solve the problems related to day to day life practice (required clothes for tent, dress and so on, required materials to make an object, melding the one materials and make another) **Example:** • From a cylindrical log having height 50m and diameter 14m, a cone of equal diameter and equal height is removed out. Find the total surface area of remaining part.

Content Domain	Criteria	Standards					
		Pre-basic	**Basic**	**Proficient 1**	**Proficient 2**	**Proficient 3**	**Advance**
		area of base. • In the given figure locate slant height, radius and vertical height also mention their relation. 	• Established the formula of Curve Surface Area of cone.	Volume of cylinder if its height is 20 cm and radius of base is 7 cm. • Obtain the total surface area of a hemisphere having the diameter 21 cm.	square cm, find the total surface area of the sphere which is formed by attaching those two hemispherical objects.	 • The radius of circular base and the height of a cylinder are in the ratio 5: 7. If the volume of the cylinder is 550 cubic cm, find the radius of the base of the cylinder. • The total height of the pencil shaped solid object given in the figure is 24 cm & the diameter of the cylinder is 14 cm. If the heights of cone and cylinder are in the ratio of 3:5 find the total volume of the solid object. 	 • If the total surface area of cylinder of radius 6 cm and height 21 cm is equal to the surface area of sphere, find the volume of sphere.
	9. Solution of the problems of area and volume of pyram	Identify the dimension of solids (length of base, length of vertical height, length of slant height, length of edge) and their relation. **Example:**	Describe the formula of Lateral Surface Area, Total Surface Area and volume of square base pyramid. **Example:** • What is the formula of Lateral Surface Area of square base pyramid? • Write down the	Solve the direct problems using Lateral Surface Area, Total Surface Area and volume of square base pyramid (length of side, slant height, and vertical height are directly given). **Example:** A pyramid has a squared base of side 18 cm and height 12 cm. Calculate the	Solve the problem related to Lateral Surface Area, Total Surface Area, and volume of square base pyramid as a single condition **Example:**	• Solve the problems related to Area and volume with unknown dimension and with more than one condition • **Example:**	• Find the volume and Area of square based Pyramids (mixed problem) • Find volume and Area of combined solid (Pyramid and prism or Pyramid and cone) • Problems based on required material to make the solid object, tent and cost estimation of geometrical

Content Domain	Criteria	Standards					
		Pre-basic	**Basic**	**Proficient 1**	**Proficient 2**	**Proficient 3**	**Advance**
	id and combined object.	• Write down the name of vertical height, slant height, base and edge of the given pyramid.  Mention the relation of vertical height, slant height, base and edge from the given figure.  	formula to calculate the volume of square base pyramid	total surface area.	 • In the figure the total surface area of the given square based pyramid is 96 cm^2 and the side of the square base is 6 cm, find the slant height of the pyramid.	 In the given square based pyramid, volume of the pyramid is 1568 cm^3 and half of the length of the side of the base (OM) = 7 cm. Calculate the area of triangular faces of the pyramid.	bodies. **Example:** • Find the volume of the solid objects given below.  • The vertical height and length of base of a squared based pyramid are in the ratio of 2: 3. If the total surface area of the pyramid is 384 cm^2, find the slant height of the pyramid.

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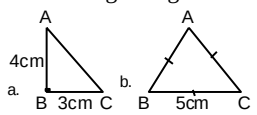
	10. Construction of triangle and quadrilateral having equal area and investigation of relationship between them.	• Recognize and differentiate various plane geometrical shapes especially triangle and quadrilateral (rectangle, square, trapezium, parallelogram, rhombus, and irregular quadrilateral) by their appearances . **Example:** What type of shapes are the given figures?	• -Recognize and state the properties of various types of triangles and quadrilaterals and distinguish them on the basis of their properties. • Calculate area of triangle and quadrilateral using formula. **Example:** • What are the properties of square? In what ways a square is different from rectangle? • -Calculate the area of following triangle:  	• -Construct triangles and quadrilateral separately with the given specified measurements. **Example:** Construct the quadrilateral ABCD when AB = 5cm, BC = 4cm, AC = 6cm, AD = 3cm, ∠DAB = 90°.	• Construct a triangle having the area equal to the area of given specified quadrilateral when: - length of all sides and a diagonal are given -length of four sides and measure of an angle are given. • Construct quadrilateral having the area equal to the area of given specified triangle. • Construct triangle with the area equal to the area of given triangle. • **Example**: • Construct a quadrilateral PQRS in which PQ= QR= 5cm, RS= PS= 6cm and angle ∠QPS = 90° and construct a triangle PST having the area equal to the area of quadrilateral PQRS. • Construct a quadrilateral	• Construct a triangle having the area equal to the given parallelogram/rhombus/rectangle/square where the lengths of diagonals of parallelogram/rhombus are given and the angle between diagonals is given. • Construct rectangle with area equal to the given triangle. **Example:** Construct a rectangle ABCD with AC= 6cm, BD= 7cm and angle between them is 60 degree. Also construct a triangle whose area is equal to the area of rectangle ABCD- • Construct a triangle ABC having sides AB= 4 cm, BC= 6.8 cm, CA= 6.5 cm, then construct a rectangle equal in area. .	• Establish the relationship of area of different polygons (triangle and quadrilateral) by making joint construction with justification. **Example**: Justify PAQB and PQRS have same area after constructing a rectangle PQRS in which PQ = 6 cm, QR= 4cm a parallelogram PAQB having the area equal to the area of rectangle PQRS.

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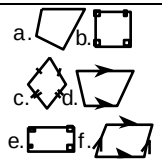
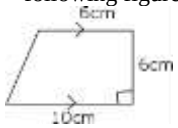
		 • Draw and measure geometrical figures using compass, rural, protector, set square etc. • . Draw a triangle with one angle 75° (using compass).			equal in area to the triangle ABC with AB =2.8 cm, BC= 3.6 cm, and CA= 3cm. • Construct a triangle ABC having a side a= 6.4 cm, b= 6cm, and c= 5.6 cm. Also construct another triangle equal in area to the triangle ABC having one e 7cm.		
s	11. Examination of the relationship between area of triangle and quadrilateral having same base and between same	• Identify whether the pair of parallel lines using the properties of parallel lines. • Identify the base and height of triangle and quadrilateral . • Identify	• Calculate the area of different types of triangles and quadrilateral using formula. • State and apply congruency axioms of triangles **Example:** • Calculate area of following figure:  . • Verify following pairs	• -Represent the given verbal geometrical proposition with figures and verify the statement. **Example**: Draw necessary figure representing following statement: Triangles on the same base and between the same parallels are equal in area. -	• Prove with arguments linked together with chain of logical reasoning in proper order to reach up to conclusion of familiar theorem. **Example**: Prove that: Triangles on the same base and between the same parallels are equal in area.	• Solve simple problem (in which the use of one or two theorem/argument is needed) by using the concept on relationship between area of triangle and quadrilateral having the same base and parallel lines.	• Solve complex problems (in which the connection/use of more than two theorem/argument is needed) by using the concept on relationship between area of triangle and quadrilateral having same base and parallel lines is needed) :**Example:** Prove that Area of triangle PQM=area of triangle PSM

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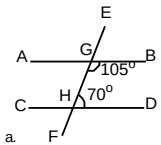
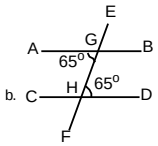
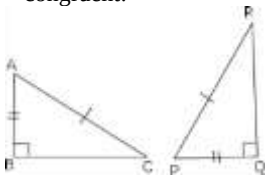
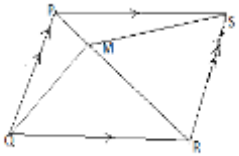
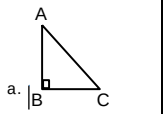
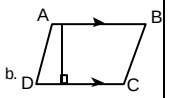
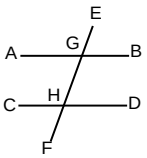
	parallel lines.	different pairs of congruent triangles, alternate angles, corresponding angles, co-interior by angles figure. • **Example:** Which of the following is a pair of parallel lines? Give reasons.  a.  b. • Name the base and height in the following figures:	of triangles are congruent:  				 :

Content Domain	Criteria	Standards					
		Pre-basic	**Basic**	**Proficient 1**	**Proficient 2**	**Proficient 3**	**Advance**
		  • Name all possible pair of congruent, corresponding, and co-interior angles from following figure: 					
	12. Verification of the relation between the angles at the centre and circumf	• Identify different parts of a circle. **Example**: Identify centre, radius, circumference, tangent from following circle:	• Define and illustrate the different parts of circle including radius, chord, diameter, sector, central angle, subtended angle, arc, and tangent, cyclic quadrilateral in word and in figure. **Example:** What is a tangent of a circle? Illustrate with figure.	• Construct figure to represent given verbal statement related to the relation between angles of a circle. **Example:** Draw figure to show the following statements and explain the relation. -The angle at the centre of the circle is double the angle at the circumference	-Verify experimentally of the theorems on circle related to arc and angles. Example: Verify experimentally: Angle in a semi-circle is right angle. Can use relation of radius of circle and tangent to solve numerical problems.	- Prove the theorem geometrically with statement and reason. Example: Prove that: The angle at the centre of the circle is double the angle at the circumference standing on the same arc.	-Use the verified relation to solve the related problems. Example: In the figure A, B,C and D are concyclic points. If arc(AB) = arc (BC), then prove that ∠BDC = ∠AEC.

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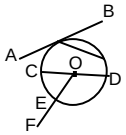
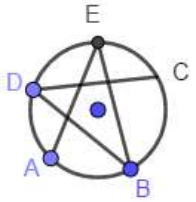
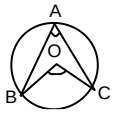
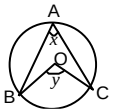
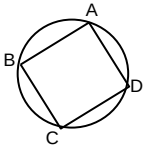
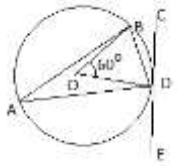
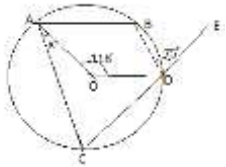
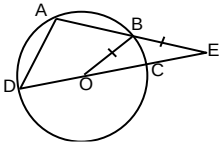
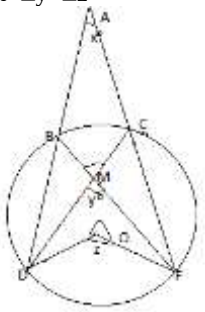
	erence of a circle.			standing on the same arc. -Express the given parts and part to be proved in words or in symbol(relevant to figure) e -Angle in a semi-circle is right angle.			
	13. Establishment of the arc angle relationship of the circles and solution of related problems.	Identify the central angle, inscribed angle, arc etc. Example: name the central angle, inscribed angle and arc subtended of them. 	- Identify and use the theorems on arc, angle, tangent and cyclic quadrilateral to show he relationship. Example: 1. What is the value x when value of y is 130°  2. Find the value of ∠BCD if ∠BAD is 85°.  3. In the figure, what is the value of ∠ACO if AB is tangent at C?	- Make use of assumptions and theorems on arc/angle and tangent of circle to solve simple geometrical problem (requiring the implementation/connection of one or two theorems or assumptions) Eg. In the given figure, O is the center of the circle and . CDE is the tangent at D .Find the value of ∠BSC 	- Can prove the theories of circle and arc relationship and cyclic quadrilateral when construction is not required. Example: 1. Prove that sum of opposite angles of a cyclic quadrilateral is 180°. - Solve the medium level problem on arc angle relationsip of circle(requiring the connection of three or four concepts of assumption .) eg. In the given figure find the value of x: 	-Provide appropriate organization of set of statements and their arguments to reach up to the conclusion of complex (requiring the connection of more than four theorems or assumptions) on familiar problem. e.g. In the given figure, O is the centre of the circle. Prove that Arc BC= $\frac{1}{3}$ Arc AD  2. Can prove any theorem of circle related to arc-angle relationship requiring construction. **Example:** Prove that inscribed angles are half of the angle at the centre when they stand at same arc. (without using arc-angle relationship)	Provide appropriate organization of set of statements and their arguments to reach up to the conclusion of complex (requiring the connection of more than four theorems or assumptions) on unfamiliar problem e.g. .In the given figure O is the centre of the circle with informations provided in figure . Then prove that: ∠x+∠y=∠z 

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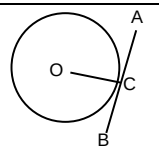
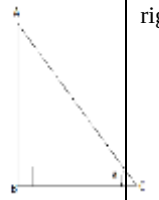
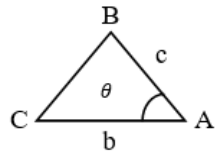
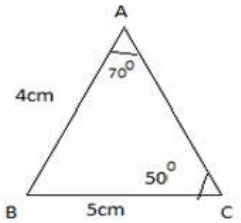
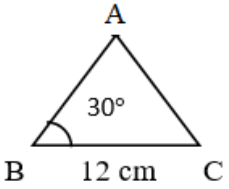
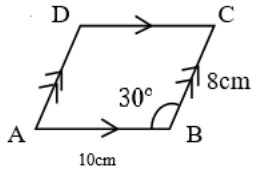
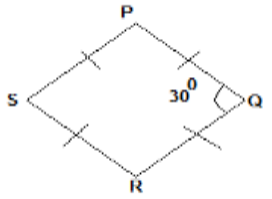
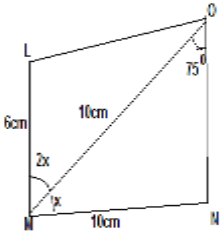
							
	14. Calculations of the area of triangles and quadrilaterals using trigonometric formula	1. Identify the different parts of a right angle triangle. 2. Apply Pythagoras theorem to find the length of unknown side in a right angle triangle. 3. **Example:** **(1)** Write down the perpendicular, base, and hypotenuses of the given right angle triangle.  (2) In the following figure find the values of x.	1. Define trigonometric ratios and find the values of trigonometric ratios of the standard angles. $(0°, 30°, 45°, 60°, 90°)$ 2. Use three basic trigonometric relations and reciprocal relations to simplify trigonometric expressions and proving simple trigonometric identities. **Example:** (1)From the given figure, define the trigonometric ratio of sin of angle a (2) Find the values trigonometric ratios of sin and cosine of angles 30 and 45 degrees using a right angled triangle.	1. Calculate the area of a triangle using trigonometric relation of Sine of an angle. **Example :** Find the area of triangles from the following figures (i)  (ii) 	Find the missing sides or angle of a triangle if the area of triangle is given. **Examples** : (1) In the given Δ ABC, if< ABC=30°, $BC = 12cm$ and the area of triangle ABC is 27 cm^2 Find the measure of AB  (2) In the given ΔABC if AB=6cm, BC=8cm and the area of ΔABC is $12\sqrt{3}$ cm^2 Find the value of < ABC.	Calculate the area of quadrilaterals (parallelogram, Rhombus and kite) using trigonometric formula for the area of triangle. **Examples**: (1) In the given figure AB = 10cm, BC = 8cm, $< B = 30°$, find the area of the figureABCD.  (2)In the given figure, PQRS is a Rhombus if the area of the rhombus PQRS=16cm^2 and < PQR=30° . Find the measurement of SR. 	1. Apply the trigonometric rule/formula to find the area of combined region of more than one shape. **Example:** In the given quadrilateral, $< LMO = 2 < 0MN, OM = MN = 10cm\ LM = 6cm,$ $< MON = 75°$. What is area of quadrilateral LMNO? 

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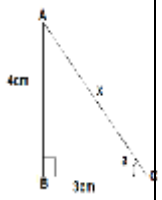
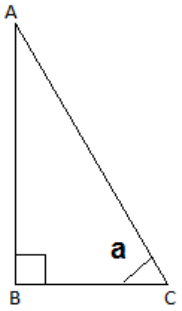
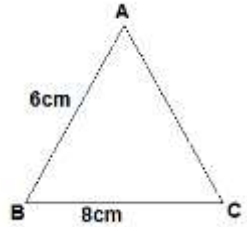
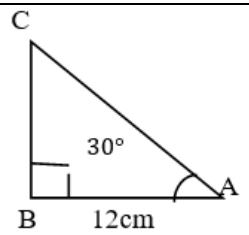
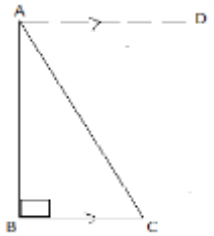
		 (3)What is the area of the right angled triangle given in question (2)?	 ((3) Prove the identity using trigonometric relations:				
	15. Solution of the problems related to height and distance using trigonometric ratio	. .	Find the remaining angle and sides in a right angled triangle using trigonometric ratio and Pythagoras theorem. **Example** : In ΔABC right angled at B, AB = 12cm and < A=30° find the length of BC	Draw figure to illustrate the objects/situation with height and distance, and describe the terms like line of sight, angle of elevation and angle of depression with example. **Example:** (1) Name the angle formed in given situation: (a) From the top of a house, you look down to a car on the road. (b) From a point O, you look up at the object P, placed above the level of your eyes.	Solve the straight forward verbal problems on height and distance involving angle of elevation and depression. **Example:** (1) A tower on the bank of a river is of 40 meters height and the angle of elevation of top of the tower from the opposite bank is 60° Find the breadth of the river. (2) An eagle flying exactly above a tree observes a fish in a pond at a distance of 275m from the tree. If the angle of depression is 60° find the height of the eagle from the Ground level.	Calculate the required angle (angle of elevation or depression) by using the concept of trigonometric ratios. **Example:** A girl 1.54 m tall is 30m away from a tower whose height is 53.5m. What is the angle of elevation of the top of the tower from his eyes?	Apply knowledge and skills of trigonometric ratios to find the height and distance from combined conditions. **Example:** A man 1.6m tall and the length of his shadow is 60cm. Find the length of the shadow of a building 40m tall at same time of a day.

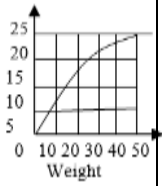
Content Domain	Criteria	Standards					
		Pre-basic	**Basic**	**Proficient 1**	**Proficient 2**	**Proficient 3**	**Advance**
				 (2)What is the relation of < CAD and <ACB in the figure?  (3) Draw the figure of the question given below: A 25 ft long ladder resting on a wall makes an angle of 30° with the ground. Find the height of the wall reached by the ladder.			

<table>
<tr><th rowspan="2">Content Domain</th><th rowspan="2">Criteria</th><th colspan="6">Standards</th></tr>
<tr><th>Pre-basic</th><th>Basic</th><th>Proficient 1</th><th>Proficient 2</th><th>Proficient 3</th><th>Advance</th></tr>
<tr>
<td></td>
<td>16. Finding mean, median and quartiles of grouped data (Continuous series) by using the formula</td>
<td>1. Identify the types of data and construct a frequency table.
2. Compute the value of mean, median and quartiles of the individual data.

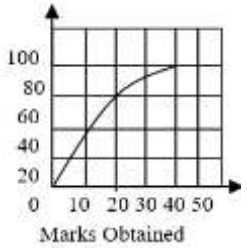
Example:
1. Construct the frequency table taking a suitable class interval of the following data.
18,7,11,23,25,28,9,13,26,29,20,9,14,24,21,16,29,5,6,33
2. Runs scored by a cricketer in 5 matches are 70,90,80,64 and 46 Find the average score.</td>
<td>1. Find the mean median and quartiles from the discrete series2. State and explain the formula of mean, median and quartiles of continuous series.
Example:
-Find the value of Q_1.
<table>
<tr><td>x</td><td>10</td><td>20</td><td>30</td><td>40</td><td>50</td></tr>
<tr><td>f</td><td>2</td><td>4</td><td>6</td><td>8</td><td>10</td></tr>
</table>
-In a continuous series, what is the formula to calculate the value of Q_3 ?</td>
<td>Calculate the value of arithmetic mean of grouped data by using formula

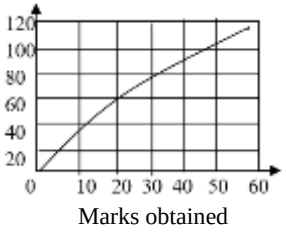
Example: Compute the value of arithmetic mean from the following data.
<table>
<tr><td>x</td><td>10-20</td><td>20-30</td><td>30-40</td><td>40-50</td><td>50-60</td></tr>
<tr><td>F</td><td>4</td><td>6</td><td>10</td><td>15</td><td>5</td></tr>
</table></td>
<td>Calculate the median and quartiles in the grouped data using formula
.
Example: Compute first quartile (Q_1) from the given data.
<table>
<tr><td>x</td><td>0-5</td><td>5-10</td><td>10-15</td><td>15-20</td><td>20-25</td></tr>
<tr><td>f</td><td>2</td><td>6</td><td>4</td><td>5</td><td>2</td></tr>
</table></td>
<td>Use the concept of mean, median and quartiles to find the missing frequencies in a grouped data Example :

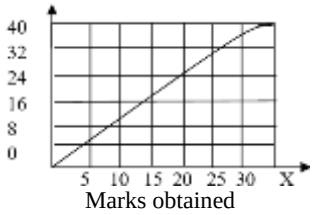
The median of given data is 24. Find the value of k.
<table>
<tr><td>Class</td><td>0-10</td><td>10-20</td><td>20-30</td><td>30-40</td><td>40-50</td></tr>
<tr><td>f</td><td>9</td><td>21</td><td>k</td><td>15</td><td>10</td></tr>
</table></td>
<td>Find the value of mean, median and quartiles from the unfamiliar situation.
Example (1): Calculate the value of Q_3 from the given data.
<table>
<tr><td>Class</td><td>10 -19</td><td>20 - 29</td><td>30-39</td><td>40-49</td><td>50-59</td></tr>
<tr><td>f</td><td>8</td><td>10</td><td>15</td><td>12</td><td>5</td></tr>
</table>
(2) The mean of 200 items was 50. Later on, it was discovered that the two items were misread as 92 and 8 instead of 192 and 88. Find out the correct mean.</td>
</tr>
</table>

<table>
<tr><th rowspan="2">Content Domain</th><th rowspan="2">Criteria</th><th colspan="6">Standards</th></tr>
<tr><th>Pre-basic</th><th>Basic</th><th>Proficient 1</th><th>Proficient 2</th><th>Proficient 3</th><th>Advance</th></tr>
<tr>
<td></td>
<td>17. Analysis of data using central values (First Quartile, median and third quartile of grouped data from ogive)</td>
<td>Read Cumulative frequency curve (ogive) and draw information .
Example:
Answer the following questions by looking the given ogive graph.
a. What is the total number of students in the graph?
b. Write the lower limit and upper limit of class interval 30-40.
 
</td>
<td>Illustrate the grouped data into ogive curve.

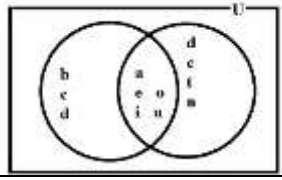
Example: Draw an ogive for the following data.
<table><tr><td>X</td><td>10-20</td><td>20-30</td><td>30-40</td><td>40-50</td></tr><tr><td>F</td><td>4</td><td>6</td><td>10</td><td>15</td></tr></table></td>
<td>Read and compare the data from the ogive graph to find out the class interval of median, first quartile and third quartile.

Example: Find the median class from the given graph.
 
</td>
<td>Obtain the values of median, Q_1 and Q_3 by calculating and over serving the ogive graph.

Example: Find the Q_3 value from the graph given below.
 
</td>
<td>Find the frequency of the median class, Q_1 Class and Q_3 class by observing the ogive graph.

Example: Find the first quartile class and its frequency from the following cumulative frequency curve.
 
</td>
<td>Interpret the data by locating the median and quartiles with the help of cumulative frequency curve "ogive" and draw its conclusion.

Example: From the given data below draw an ogive and find out the values of median and quartiles from the graph.
<table><tr><td>x</td><td>0-5</td><td>5-10</td><td>10-15</td><td>15-20</td><td>20-25</td></tr><tr><td>f</td><td>2</td><td>6</td><td>4</td><td>5</td><td>2</td></tr></table></td>
</tr>
</table>

Content Domain	Criteria	Standards					
		Pre-basic	**Basic**	**Proficient 1**	**Proficient 2**	**Proficient 3**	**Advance**
Algebra	18. Finding the H.C.F. and L.C.M. of algebraic expressions by factorization method (at most trinomial expression)	• Find the H.C.F. of monomial expression. **Example:** Find the H.C.F. of $5x^3y$ and $25x^4$.	• Find the L.C.M. of monomial expression. **Example:** Find the L.C.M. of $15x^3y$ and $25x^2y^3$	• Find the H.C.F. of binomial expression of the form $a^2- b^2$, $a^3 – b^3$, $a^3 + b^3$ • Find the H.C.F. of trinomial expression of the form $ax^2 + bx + c$. **Example:** Find the H.C.F. of i) $a^3+ b^3$, $a^2 – b^2$ and $(a+b)^2$. ii) $x^2 – 6x + 5$ and $x^2-2x + 1$	• Find the L.C.M. of binomial expression of the form $a^2- b^2$, $a^3 – b^3$, $a^3 + b^3$ (two expressions only) • Find the H.C.F. of the trinomial expressions of the form $a^4 + a^2b^2 + b^4$. **Example:** 1. Find the L.C.M. of $a^3 + b^3$, $a^2 – b^2$ and $(a+b)^2$. 2. .Find the H.C.F. of $8a^3 + b^3$, $8a^3 –b^3$ and $16a^4 +4a^2b^2 + b^4$	Find the L.C.M. of trinomial algebraic expressions by factorization method. (up to three expressions only) **Example:** Find the L.C.M. of $8a^3 + b^3$, $8a^3 –b^3$ and $16a^4 +4a^2b^2 + b^4$	Use the concept of H.C.F. and L.C.M. to solve the related problems in algebraic expressions. **Example:** 1. Find the lowest degree of expression, which is divisible by the expressions $2x^2 + 7x + 1$ and $24x^4 + 3x$. 2. In the given Venn diagram, shadow the part, which represent HCF and LCM and how? Give reason. 
	19. Solution of the problems related to simple radical surds including four basic operations of mathem	Identify the surds. **Example:** Which one is	• Simplify the radical surds of degree 2 including + and – sign, (without variables) • Simplify the radical surds of same degree including signs (÷ and ×) • Solve the linear equation of one variable. **Example:** 1. Simplify: $\sqrt{45} + \sqrt{20} - \sqrt{80}$	• Rationalize the denominator of surds up to two terms. • Solve the equations involving radical sign of degree 2. (having only one root) **Example:** 1. Simplify:	• Simplify by rationalizing the denominator of surds up to two terms. • Solve equations involving quadratic surds. **Example:** 1. Simplify:	1. Rationalize the denominators of surds having three terms. 2. Solve the equation involving radical surds with four basic operations. **Example**: 1. Simplify:	Simplify the simple radical surds including four basic operations and interpret the result. **Example:** 1. Show that the value of x are 4 and $-\frac{4}{3}$ when solving the equation

Content Domain	Criteria	Standards					
		Pre-basic	**Basic**	**Proficient 1**	**Proficient 2**	**Proficient 3**	**Advance**
	atics	the Surds? a) $\sqrt{20}$ b) 3 c) $\sqrt{9}$ $\sqrt[3]{125}$	2. Simplify: $\sqrt[3]{8x^6y^{-8}} \div \sqrt[3]{x^9y^{-11}}$ 2. solve $5x + 9 = 12$	$\frac{3\sqrt{2}}{\sqrt{6}-\sqrt{3}}$ 2. Solve: $\sqrt{6y-5}+7=12$	$\frac{7\sqrt{3}}{\sqrt{10}+\sqrt{3}}-\frac{2\sqrt{5}}{\sqrt{5}+\sqrt{6}}$ $-\frac{3\sqrt{2}}{\sqrt{15}+3\sqrt{2}}$ 2. Solve: $2\sqrt{x}-\sqrt{4x-11}=1$	$\frac{7}{2-\sqrt{5}+\sqrt{3}}-\frac{2\sqrt{5}}{3-\sqrt{5}+\sqrt{12}}$ $-\frac{3\sqrt{2}}{7-\sqrt{15}+3\sqrt{2}}$ 2.Solve: $\frac{a+2x+\sqrt{a^2-4x^2}}{a+2x-\sqrt{a^2-4x^2}}=2$	$\sqrt{x^2-2x-4}-\sqrt{x^2-3x-3}=1$. Why $x=-\frac{4}{3}$ does not satisfy the equation? Give reason. 2. Represent the surd number $\sqrt{3}$ in number line.
	20. Simplification and solution of the algebraic expressions related to indices.	Describe the basic laws of indices. **Example:** What is the value of$x^a \times x^b$? a) x^{a-b} b)$x^{a/b}$ c)x^{a+b} d)x^{ab}	Simplify the simple problems involving two laws of indices $x^a \times x^b = x^{a+b}$ $x^a \div x^b = x^{a-b}$ **Example:** Simplify: $\frac{3^{x+2}-3^x}{8\times 3^x}$	Simplify the problems involving more than two laws of indices. **Example:** Simplify: $\left(\frac{x^a}{x^b}\right)^{a+b-c} \times \left(\frac{x^b}{x^c}\right)^{b+c-a} \times \left(\frac{x^c}{x^a}\right)^{c+a-b}$	Solve the linear exponential equation. **Example:** Solve: $3^{x+2}-3^x=48$	• Solve the quadratic exponential equation. • Solve the problems under given condition using laws of indices. **Example:** 1. Solve: $4.3^{x+1}=27+9^x$ 2. If p + q + r = 0, prove that $\frac{1}{1+a^p+a^{-q}}+\frac{1}{1+a^q+a^{-r}}+\frac{1}{1+a^r+a^{-p}}=$	Solve the unfamiliar problems using laws of indices and exponential equation. **Example:** If $a^m.a^n = (a^m)^n$, prove that $m(n-2) + n(m-2) = 0$
	21. Simplification of algebraic fraction	Simplify the two algebraic fractions with the same monomial denominators. **Example:** Simplify: $\frac{x}{ab}+\frac{3x}{ab}$	Simplify the two algebraic fractions with the same binomial denominators. **Example:** Simplify: $\frac{a}{ab-b^2}-\frac{b}{ab-b^2}$	Simplify the simple algebraic expressions having binomial or trinomial denominator and binomials having different denominators. **Example:** Simplify: $\frac{1}{x-y}+\frac{1}{x+y}+\frac{2y}{x^3-y^3}$	Simplify the two algebraic fractions with trinomials in denominators. **Example:** Simplify: $\frac{1}{x^2+9x+20}-\frac{1}{x^2+12x+35}$	Simplify the three algebraic fractions with trinomials denominators. **Example:** Simplify: $\frac{x-1}{x^2-3x+2}+\frac{x-2}{x^2-5x+6}+\frac{x-5}{x^2-8x+15}$	Simplify the unfamiliar problems of algebraic fraction. **Example:** Simplify: $\left(\sqrt{\frac{a+x}{x}}-\sqrt{\frac{x}{a+x}}\right)^2\left(\sqrt{\frac{x}{a}}-\sqrt{\frac{a}{x}}\right)^2+\frac{a(x-a)^2}{x^2(a+x)}$

Content Domain	Criteria	Standards					
		Pre-basic	**Basic**	**Proficient 1**	**Proficient 2**	**Proficient 3**	**Advance**
	22. Solution of the verbal problems on simultaneous linear equations and quadratic equation	Solve the single variable linear equation **Example:** Solve: 1. $8x = x + 15$ 2. The sum of 4 and twice of a number is 32, find the number	Solve the simultaneous linear equation having two variables. **Example:** **1. Solve: $x + 5 = 5$, $x - y = 1$**	• Express in mathematical form for verbal problems on simultaneous linear equations • Express in mathematical form for verbal problems of quadratic equation. **Example:** 1. Ram is 4 years elder than Sita and the sum of their ages is 44 years. Write the equations for given condition. 2. The present age of father and his son is 42 years and 16 years respectively. In x years ago the product of their age was 272. Write the equation for it.	• Solve the verbal problems of simultaneous linear equation. • Solve the simple verbal problems on quadratic equation. **Example:** 1. A number consists of two digits whose sum is equal to 10. If 36 is subtracted from the number, the digits are reversed. Find the number. 2. If 7 is added to the square of a positive number, the sum is 88, find the number.	Solve the verbal problems of quadratic equation **Example :** 1. The present age of father and his son is 42 years and 16 years respectively. Find how many years ago the product of their age was 272? 2. The product of ages (in year) of twins brothers is 64 then find their present year.	Solve the verbal problems on simultaneous linear equation and quadratic equation related to daily life problems. **Example:** A sum of money was divided equally among a certain number of persons. There had been 6 more people, each would have received a Re 1 less, and there had been 4 people less, each would have received a rupee more. Find the number of persons and the sum each received.
Probability	23. Finding the probability of mutually exclusive events using addition and multiplication laws 24. Solution of the	1. Identify the experiment, events and sample space of single unbiased experiment, and find the probability of an event. **Example:** 1. Write down the sample space when a cubical dice is thrown. 2. What is the	1. Find the probability by using $P(A) = n(A)/n(S)$ 2. Define dependent and independent events. **Example:** 1. Find the probability of getting even numbers when a cubical dice is thrown. **2.** Which of the following is an independent event? a) H and T of coin in a single toss. b) H of coin and 6 of dice. c) Jack and Red d) Prime and odd number of dice when a dice is	1. Find the probability of mutually exclusive events by using concept of $P(AUB) = P(A) + P(B)$. 2. Solve the problems using $P(A \cap B)=P(A) \times P(B)$ and $P(A \cap B \cap C) = P(A) \times P(B) \times P(C)$ **Example:** 1. A bag consists of 30 balls of same shape and size written from 1 to 30. Find the probability of getting the ball written multiples of 5 or 7. 2. Find the probability of getting a head on coin and 6	Find the probability of mutually inclusive events by using concept of $P(AU B)= P(A) + P(B) – P(A \cap B)$ where $P(A \cap B) \neq 0$, **Example:** In a deck of 52 well shuffled cards, a card is chosen randomly. Calculate the probability of getting an ace or a black.	Find the probability by using tree diagram for dependent events **Example:** In a deck of 52 well shuffled cards, 3 cards are drawn randomly one after another without replacement. Represent the experiment in probability tree diagram.	Solve the problems of probability by using probability scale, addition, multiplication laws and $P(\bar{A})$. (Three events). **Example:** A problem is given to solve it to A, B and C candidates. The probability of solving the problem are respectively 1/3, 1/4 and 1/5. What is the probability that (a) either of them can solve the problem (b) None of them can solve the problem.

Content Domain	Criteria	Standards					
		Pre-basic	**Basic**	**Proficient 1**	**Proficient 2**	**Proficient 3**	**Advance**
	problems related to probability of dependent and independent events	probability of getting a 5 in a dice when it is drawn once?	thrown once.	on dice when a dice is rolled and a coin is tossed simultaneously.			

2.4 Specification of Items

The following specification table presents content domain, criteria, weightage percentage, number and types of items, allocation of marks and distribution items in each of the six standards.

Table 2.5: Table of specification for item selection

Content domain	**Criteria No.**	**Weightage (%)**	**Marks**	**Weightage for items of various standards**
Arithmetic		12	10	The weightage of items in each set should be around as follows: Level 1: 10%, Levels 2, 3, 4 and 5 each: 20%, and Level 6: 10%.
Mensuration		14	11	
Algebra		23	18	
Geometry		26	21	
Sets and trigonometry		11	9	
Data and probability		14	11	
Total		100%		

Note:

1. The total number of SR (selected response) items (MCQ), CR (constructed response) items carrying 1 mark each (very short answer question) carrying 1 mark each, CR items carrying 2 or 3 marks should be asked.
2. While selecting the items for each content domain it is necessary to select both SR and CR items with a reasonable ratio.

Note that the weightage for items of various standards as mentioned above are tentative as the actual weightage of each standard will be calculated and adjusted based on the students' actual score in the test. However, the above suggested weightage of each standard help for item selection. Questions should be both type: selected response (SR)–multiple choice questions (MCQ) and constructed response (CR)–very short caring 1 mark and partially creditable questions caring 2 or 3 marks each. If the contents areas having small number of items (weightages) have the difficulty in covering six levels of standards in one set of test booklet, such contents areas may be covered by three sets of questions, which are administered at a time to different student.

2.5 Cognitive Domain

While developing and selecting items various levels of Cognitive Domains should be taken into consideration. Items should be selected according as the six standards defined as above; however, we should check and ensure the representation of various cognitive domains in an

adequate level. Therefore, within the six levels of standard various levels of cognitive domain (as in table 2.6) should be included.

Along with content domain, the assessment items should represent various levels of cognitive domain, which are generally hierarchical in the sense of complexity and abstraction of knowledge and skills and their application. The levels of cognitive domain in this framework are adopted from revised Bloom's taxonomy for learning (see, Aderson & Karthwohl, 2001). Among six levels of taxonomy, first three Remembering, Understanding and Applying are considered separately and the last three analysing, evaluating and creating are combined as Reasoning. While setting cognitive domain, Solo Taxonomy of surface and deep learning as categorized into five levels: pre-structural, structural, multi-structural, relational and extended abstract (See, www.uq.edu.au/teach/assessment/docs/biggs-SOLO.pdf) has also been taken into consideration. TIMSS assessment framework 2015 for mathematics at grade 8 categorised cognitive domain into three categories: Knowing, Applying and Reasoning (see, IEA, 2016), which also an adoption from the revised Bloom's taxonomy of cognitive domain. We may compare these three cognitive domains for TIMSS 2015 with the proposed cognitive domain for NASA 2019 at grade 10 as follows: Knowing as Remembering and Understanding; Applying as Applying; and Reasoning as Reasoning.

As in the Bloom's definition remembering shows memory of previously learned material by recalling facts, terms, basic concepts, and answers. Understanding demonstrates understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas. Applying includes solving problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way (Aderson & Karthwohl, 2001). Reasoning is not limited to the solution of routine problems but also includes unfamiliar situations, complex contexts, and solving multi-step problems using more than one relations and contexts (IEA, 2015).

Table 2.6: Representation of various cognitive domains in the test

Cognitive Domain	**Weightage**
Remembering	10%
Understanding	35%
Applying	35%
Reasoning	20%
	100%

Chapter 3: कक्षा १०मा नेपाली भाषा सिकाइ परीक्षण ढाँचा

(Assessment Framework for Nepali at Grade 10)

३.१ परिचय(Introduction)

विद्यालयीय शिक्षामा नेपाली भाषाको महत्त्वपूर्ण स्थान छ । यो विषय विद्यालयतहको प्रारम्भिक कक्षादेखि कक्षा १० सम्म अनिवार्य रूपमा पठनपाठन हुने गर्दछ । नेपालमा पठन पाठन, सामाजिक तथा साँस्कृतिक व्यवहार, अन्तर भाषिक व्यवहार, सञ्चार, प्रशासन, प्रविधि तथा मौखिक र लिखित व्यवहारको प्रमुख माध्यम नेपाली भाषा रहिआएको छ । विश्वका विभिन्न देशमा छरिएर रहेका नेपाली तथा नेपाली मूलका भाषाभाषी पनि यही भाषा प्रयोग गर्दछन् । नेपाली भाषा सरकारी काम काजको भाषा हुनुको साथै विभिन्न भाषाभाषीका नेपालीबीचको सञ्चार र सम्पर्कको माध्यम भाषा (Lingua Franca) का रूपमा पनि स्थापित छ ।

नेपालमा विद्यालय शिक्षाको प्रारम्भिक तहदेखि नै नेपाली भाषा अनिवार्य विषयका रूपमा पठनपाठन हुँदै आएको छ । माध्यमिक शिक्षा पाठ्यक्रम २०७१ ले कक्षा १० मा नेपाली विषयको साप्ताहिक पाठ्यभार ५ र पूर्णाङ्क १०० निर्धारण गरेको छ । यो विषय अध्ययन अध्यापनको मुख्य उद्देश्य नेपाली भाषामा विद्यार्थीहरूको भाषिक सीप र सिर्जनात्मक क्षमता विकास गराउनु रहेको छ । तसर्थ भाषाका मुख्य सक्षमता– भाषिक सक्षमता र कार्यसम्पादन(Compentency and performance) लाई लक्ष्य बनाई भाषिक सीप विकासमा कक्षा १० को पाठ्यक्रम केन्द्रित रहेको छ । पाठ्यक्रममा नेपाली भाषाका अपेक्षित सक्षमता तथा कार्यसम्पादनलाई सुनाइ, बोलाइ, पढाइ र लेखाइ गरी चार भाषिक सीपमा विभाजन गरिएको छ ।

नेपाली विषयबाट विद्यार्थीहरूमा भाषिक सीपको विकास गराउने उद्देश्य राखिएको छ । माध्यमिक तहमा नेपाली विषय शिक्षणबाट विद्यार्थीमा भाषिक सक्षमता अभिवृद्धि गर्ने तथा अन्य विषयको ज्ञानमा समेत आवश्यक पर्ने पठनबोध तथा पठन अभिव्यक्ति क्षमताको विकासगर्नु रहेको छ । माध्यमिक तहको कक्षा १० का लागि निर्धारण गरिएका सिकाइ सक्षमता तथा कक्षा १० को कक्षागत सिकाइ उपलब्धिको आधारमा यो परीक्षण ढाँचा विकास गरिएको छ । यो परीक्षण ढाँचाले शैक्षिक गुणस्तर परीक्षण केन्द्रले सञ्चालन गर्ने कक्षा १० को सिकाइ उपलब्धि परीक्षणका लागि तयार गरिने प्रश्नहरू र त्यसबाट आएको नतिजालाई व्याख्या विश्लेषण गर्न आधार प्रदान गर्नेछ ।

कक्षा १० का विद्यार्थीमा नेपाली भाषामा हासिल हुनुपर्ने सिकाइ उपलब्धि कुन स्तरमा हासिल भएको छ भन्ने प्रमाणित आधार लिनका लागि सिकाइ उपलब्धि परीक्षण एक महत्त्वपूर्ण प्रक्रिया हो । यस कार्यलाई वस्तुगत तथा विश्वसनीय बनाउन र त्यसका आधारहरूलाई सकेसम्म वस्तुनिष्ठ बनाउनका लागि यो परीक्षण ढाँचाले सहयोग पुऱ्याउनेछ ।

यस परीक्षण ढाँचामा विद्यार्थीहरूमा हासिल हुने सिकाइस्तरलाई विभिन्न छ स्तरगत समूहमा विभाजित गरिएको छ । छ समूहमा विद्यार्थीको सिकाइस्तरको विभाजन आधारभूत (Basic) तह पहिलो र दोस्रो, प्रवीणता

(Proficiency)पहिलो, दोस्रो र तेस्रो तथा विशिष्ट तह (Advance)मा गरिएको छ । तहअनुसारको सिकाइस्तरलाई सम्भव भएसम्म वस्तुगत हुने किसिमले व्याख्या गरिएको छ । भाषिक सिकाइका चार सीपमध्ये लिखित परीक्षाका माध्यमबाट मापन गर्न सकिने लेखाइ र पढाइका सिकाइ उपलब्धिहरू मात्र यस परीक्षण ढाँचामा समावेश गरिएको छ । माध्यमिक तह (कक्षा ९ र १०, २०७१) को स्वीकृत पाठ्यक्रममा उल्लेख गरिएका सिकाइ उपलब्धिहरू र त्यसको विस्तृतीकरणका आधारमा यो परीक्षण ढाँचा विकास गरिएको हुनाले यसमा प्रयोग भएका स्तर तथा तह भन्नाले माध्यमिक तह तथा कक्षा १० लाई बुझाउनेछ ।

पाठ्यक्रमद्वारा निर्धारित उल्लिखित भाषिक सीपमा सक्षमता विकास गर्न कथा, कविता, जीवनी, प्रबन्ध, निबन्ध, रुपक/संवाद, चिठी जस्ता विधाका सामग्रीहरू पाठ्यवस्तुमा समावेश गरिएका छन् । पाठ्यवस्तुका रूपमा रहेका विधा शिक्षण सिकाइबाट पाठ्यक्रमद्वारा निर्धारित भाषिक सीपमा सक्षमता हासिल भए नभएको सुनिश्चित गर्न सिकाइ परीक्षण तथा मूल्याङ्कन खाकासमेत निर्धारित गरिएको छ । यसै खाकाअनुसार भाषिक सीपका विभिन्न क्षेत्र सुनाइ, बोलाइ, पढाइ, लेखाइ, व्याकरण र शब्द भण्डारका क्षेत्रहरू मा भाषिक सीपको परीक्षण तथा मूल्याङ्कन गर्न निर्देश गरिएको छ भने परीक्षणका साधनका रुपमा वस्तुगत, विषयगत तथा प्रयोगात्मक कार्यहरू निर्धारण गरिएको छ ।

यस ढाँचामा सिकाइ सक्षमताका छ स्तर निर्धारण गर्नु पूर्व कक्षा ९ र १० को नेपाली भाषाको पाठ्यक्रमको विश्लेषण गरी परीक्षणका क्षेत्र र विषयवस्तु निर्धारण गरिएको छ । सिकाइ सक्षमताका छ ओटा स्तरको खाका प्रस्तुती पछि सम्भाव्य संज्ञानात्मक क्षेत्रहरूको पहिचानका साथै प्रश्नपत्र तयार गर्नका लागि विशिष्टिकरण तालिका प्रस्तुत गरिएको छ । यो ढाँचा तयार गर्दा स्तर निर्धारण र संज्ञानात्मक क्षेत्रसम्बन्धी सिद्धान्त र अभ्यास, यससम्बन्धी पूर्व अनुभवलगायत शिक्षक र सम्बन्धित विशेषज्ञहरू को पृष्ठपोषणलाई समेत आधार मानिएको छ ।

३.२ कक्षा ९ र १० को नेपाली पाठ्यक्रम विश्लेषण तथा वियवस्तुका क्षेत्र पहिचान (Analysis of Grade 9 and 10 Curruculum of Nepali and Defining content domain)

यस खण्डमा कक्षा ९ र १० को नेपाली भाषा पाठ्यक्रमको विश्लेषण गरी पाठ्यक्रमद्वारा निर्धारित भाषिक सीपगत सक्षमताहरू , पाठ्यवस्तुका विधा, सिकाइ मूल्याङ्कनका लागि निर्धारित विषयवस्तुका क्षेत्र प्रस्तुत गरिएको छ ।

पाठ्यक्रमद्वारा निर्धारित भाषिक सक्षमताहरू (Language competencies determined by the curriculum)

कक्षा ९ र १० का विद्यार्थीहरूका लागि भाषाका सुनाइ, बोलाइ, पढाइ र लेखाइका सीपमा आधारित सक्षमताहरू निर्धारण गरिएका छन् । यिनै सीपगत सक्षमताअन्तर्गत नै शब्दभण्डार तथा कार्यमूलक व्याकरणसम्बन्धी सक्षमताहरूसमेत समावेश गरिएका छन् । यी कक्षाका विद्यार्थीहरूमा हासिल हुनुपर्ने भाषिक सक्षमताहरू निम्नानुसार निर्धारण गरिएका छन् :

१. मौखिक, लिखित एवम् सञ्चार माध्यमबाट प्रसारण हुने विषय वस्तुको सुनाइ र पढाइ ;
२. प्रचलित विधागत रचना, भाषिक पाठ तथा सूचनामूलक सामग्रीको सुनाइ र पढाइ ;
३. सिकेका विषयका बारेमा मौखिक र लिखित रूपमा प्रभावकारी अभिव्यक्ति ;

४. पाठको अर्थ बोध गर्दै साहित्यिक तथा साँस्कृतिक सामग्रीहरू पढ्ने बानीको विकास ;

५. कल्पनात्मक र सिर्जनात्मक किसिमले कुनै पनि विषयलाई आफ्नै शैलीमा अभिव्यक्त गर्ने क्षमताको विकास ;

६. नेपाली भाषा विषयबाहेकका अन्य विषय तथा तिनका विषयवस्तुको ग्रहण गर्ने गरी पढाइ ;

७. पढाइ क्षमताकालागि आवश्यक पर्ने पठन गतिसहित पढ्ने बानीको विकास ;

८. सामाजिक साँस्कृतिक तथा वैयक्तिक उद्देश्य पूरा गर्न र व्यवहारिक अभिव्यक्तिमा आधारित विभिन्न शैलीमा लेखाइ;

९. अन्तर भाषिक र साँस्कृतिक मूल्यप्रति सचेततापूर्ण भाषिक व्यवहार ;

१०. प्रवचन, तर्क तथा संवाद कौशलमा आत्मविश्वासका साथ उपयुक्त भाषाको प्रयोग ;

११. अन्तर्क्रिया, खोज, मूल्याङ्कन र परियोजना कार्यकालागि उपयुक्त धारणाको निर्माण र त्यसलाई प्रस्तुत गर्ने भाषिक सीपको विकास ;

१२. आफ्ना विचारहरूको स्पष्ट, विश्लेषणात्मक र संश्लेषणात्मक रूपमा अभिव्यक्ति ;

१३. व्यवहार कुशल सीपको निर्माणका लागि आवश्यकता र औचित्यका आधारमा भाषिक प्रस्तुति ;

१४ प्रयोजन र परिवेशअनुसारको भाषिक प्रयोग ;

१५. आलोचनात्मक सोच तथा उपयुक्त निर्णयसहितको भाषिक अभिव्यक्ति ;

१६. प्रभावकारी सिकाइ, रचनात्मक, सिर्जनात्मक तथा प्रत्यक्ष सम्पर्कबाट विचारहरूको निर्माण तथा समस्याको समाधान;

१७. भाषाका सीप तथा साहित्यिक विधाका पाठहरूका माध्यमबाट आलोचनात्मक सोचको विकास ।

पाठ्यवस्तुको निर्धारण(Determination of contents)

पाठ्ययक्रममा निर्धारण गरिएअनुरुप कक्षा १० पूरा गरेको विद्यार्थीले हासिल गर्नु पर्ने उल्लिखित सक्षमतामध्ये यस परीक्षणमा पढाइ र लेखाइ सीपको मात्र परीक्षण गरिने हुँदा निम्नलिखित सिकाइ उपलब्धिको आधारमा परीक्षण गर्नु पर्ने हुन्छ ।

पढाइ सीप

१. निश्चित समयमा लिखित सामग्रीको मौन पठन गरी सामग्रीको सन्दर्भ र भाव अभिव्यक्त गर्ने ;

२. साहित्यिक विधा, पाठ तथा तिनका विशिष्ट अंश पहिचान गरी व्याख्या र सप्रसङ्ग व्याख्या गर्न सक्ने गरी पढ्न ;

३. पाठको संरचना, उद्देश्य, सूचना तथा अनुमानित अभिप्रायको बोध गर्न सक्ने गरी पढ्न ;

४. विभिन्न प्रकारका भाषिक पाठहरूका उद्देश्य पहिचान गर्ने गरी पढ्न ;

५. पाठमा प्रयुक्त भाषाको प्राज्ञिक, प्राविधिक र तार्किक पक्षको पहिचान गरी पढ्न ;

६. प्रयोजनअनुसार प्रस्तुत भएका पाठ पढी शब्द भण्डार वृद्धि गर्न ;

७. लिखित सामग्रीको प्रयोजन ख्याल गरी पढ्न र ती सामग्रीको प्रयोजन सन्दर्भ पहिचान गर्न सक्ने गरी पढ्न ;

८. साहित्यिक विधाका पाठमा व्यक्त भएका सामाजिक साँस्कृतिक सन्दर्भका बारेमा प्रतिक्रिया दिन सक्ने गरी पढ्न ;

९. पूर्वानुमान, निष्कर्ष, सारांश, संश्लेषण, प्रयोजन व्यक्त गर्न सक्ने गरी पाठहरू पढ्न ;

१०. भाषाका पाठमा प्रस्तुत संरचनाका आधारमा मुख्य घटनालाई क्रम मिलाई अभिव्यक्त गर्न सक्ने गरी पढ्न ;

११. पाठमा प्रयुक्त विशिष्ट प्रकारका गणितीय, सङ्ख्यापरक तथा तिथि–मितिसहित सूचना पत्ता लगाई तिनको तालिकीकरण गर्न सक्ने गरी पढ्न ;

१२. आलोचनात्मक सोचको निर्माण गर्ने गरी विभिन्न प्रकारका लिखित सामग्री पढ्न ।

लेखाइ सीप

१. वर्ण विन्यास, हिज्जे र लेख्य चिह्नहरू मिलाई सफा, शुद्ध र स्पष्टसँग लेख्न ;

२. विभिन्न प्रकारका सूचना सङ्कलन गरी तिनको संश्लेषण गरी लेख्न ;

३. लेखिएका सामग्रीको सम्पादन र परिष्कार तथा पुनःसम्पादन र पुनःपरिष्कार गरी लेख्न ;

४. कुनै पनि विषय शीर्षकमा अर्थपूर्ण, क्रमबद्ध तथा प्रभावकारी रूपमा अनुच्छेद रचना गर्न;

५. आफूले देखे–सुनेका, अनुभव गरेका घटना र पढेका विषय वस्तुका बारेमा सिलसिला मिलाएर लिखित वर्णन गर्न ;

६. उद्देश्यमूलक सूचना र विषय वस्तुका बारेमा प्रतिक्रिया व्यक्त गर्न, अभिलेख राख्न,वर्णन गर्न, विश्लेषण गर्न ;

७. पढेका विषयका मुख्य मुख्य बुँदा टिपोट गर्न र सारांश लेख्न ;

८. साहित्यिक विधा र पाठहरूको विश्लेषण गर्न र विशिष्ट अंशहरूको व्याख्या र सप्रसङ्ग व्याख्या गर्न ;

९. दैनिक व्यवहारमा उपयोगी हुने निवेदन, निमन्त्रणा र शुभ कामना पत्रहरूको रचना गर्न ;

१०. उपयुक्त शैली र ढाँचामा संवाद र वादविवाद लेख्न ;

११. विभिन्न प्रयोजनपरक क्षेत्रका शब्द तथा प्रचलित उखान टुक्काहरूको सन्दर्भअनुसार अर्थ स्पष्ट हुने गरी वाक्यमा प्रयोग गर्न ;

१२. लिखित अभिव्यक्तिका क्रममा व्याकरणका आधारभूत नियम पालना गरी लेख्न;

१३. विभिन्न विधा तथा भाषिक पाठमा आधारित भई लिखित रूपमा स्वतन्त्र, मौलिक र सिर्जनात्मक अभिव्यक्ति प्रकट गर्न ;

१४. विभिन्न विषयमा विवरणात्मक, वर्णनात्मक, तार्किक, विश्लेषणात्मक अभिव्यक्ति प्रस्तुत गर्न ;

१५ . कुनै निश्चित विषयमा आलोचनात्मक सोच निर्माण गरी लेख्न ।

उल्लिखित सीपगत सक्षमता विकास गर्न यस कक्षामा १) कथा २) कविता ३) जीवनी ४) निबन्ध ५) रुपक ६६) चिठी विधाका पाठ्यवस्तु निर्धारण गरिएको छ । यिनै विधा शिक्षणका माध्यमद्वारा कार्यमूलक व्याकरण र शब्दभण्डारका सक्षमताहरूसहित भाषिक सक्षमता विकास गराउनु पर्नेछ ।

३.३ सिकाइ मूल्याङ्कनका लागि विषयवस्तुका क्षेत्र निर्धारण(Content domain for assessing learning)

विद्यार्थीहरूका भाषिक सक्षमता परीक्षणकालागि निम्नानुसारका सीपगत क्षेत्रहरू निर्धारण गरिएको छ । परीक्षण साधन र प्रश्नहरूले ती सबै क्षेत्र समेटेको हुनुपर्दछ ।

Table 3.1:** कक्षा ९ र १० को नेपाली विषयको विषयवस्तुको क्षेत्र र भार **(Content domain and weightage of Nepali subject at Grade 9 and 10)

सीप (Skill)	क्षेत्र (Domain)	विधा (Area)	अङ्क भार (Weightage %)
पढाइ र लेखाइ(Reading and writing)	शब्दभण्डार	शब्दार्थ शब्द पहिचान शब्दको वाक्यमा प्रयोग	८
	वर्णविन्यास	शुद्धीकरण	४
	व्याकरण	पहिचान र प्रयोग	२०
	पठन बोध	विभिन्न विधाका गद्य सामग्री	१३
	बुँदा टिपोट र सारांश लेखन	गद्य विधा	७
	निर्देशित रचना	कथा/जीवनी वा संवाद/वाद विवाद/चिठी	५
	भाव विस्तार/व्याख्या	कथा/कविता/निबन्ध/जीवनी	५
	पाठगत प्रश्नोत्तर (बोध तथा सन्दर्भमा आधारित सङ्क्षिप्त उत्तर)	कथा, कविता, प्रबन्ध/निबन्ध, जीवनी तार्किक शिल्प/ समस्या समाधान	१६
	पाठगत बोध (सन्दर्भमा आधारित लामो उत्तरात्मक) विवेचना	कथा, कविता, प्रबन्ध/निबन्ध, जीवनी	११
	स्वतन्त्र रचना	प्रबन्ध, निबन्ध	११

३.४ सिकाइको स्तर निर्धारण(Determination of Standards of Learning)

उल्लिखित भाषिक सक्षमताका स्तरका आधारमा पाठ्यक्रमद्वारा निर्दिष्ट विषय तथा पाठ्यवस्तु क्षेत्र र भाषिक सीपगत सिकाइस्तरको विस्तृत खाका तलको तालिकामा प्रस्तुत गरिएको छ । यस उपलब्धि परीक्षणमा पढाइ र लेखाइका सीपहरू मात्र परीक्षण गरिने भएकाले यसमा सुनाइ र बोलाइका सीपसम्बन्धी क्षेत्र तथा स्तरहरू समावेश गरिएको छैन । यस विद्यार्थी सिकाइ उपलब्धि परीक्षण प्रयोजनका लागि पढाइ र लेखाइका क्षेत्रहरूबाट परीक्षा साधन निर्माण

गरी सिकाइ उपलब्धि परीक्षण गर्ने गरी स्तर निर्धारण तथा व्याख्या गरिएको छ । यसमा शब्द भण्डार, व्याकरण तथा वर्ण विन्यासलाई पढाइ र लेखाइका क्षेत्रमै समावेश गरिएको छ ।

समग्र तहहरू (General Standards)

नेपाली भाषाअन्तर्गत कक्षा १० कालागि सिकाइ स्तरका समग्र तहहरू (General Standards) लाई तीन तहमा विभाजन गरी यी तीनओटा तह प्रत्येकलाई फेरि जम्मा छ चरणमा विभाजन गरिएको छ । नेपाली भाषाअन्तर्गत कक्षा १० कालागि सिकाइ स्तरका समग्र छ तहहरू (General Standards) तय गरिएको छ ।

उल्लिखित भाषिक सक्षमताका स्तरका आधारमा पाठ्यक्रमद्वारा निर्दिष्ट विषय तथा पाठ्यवस्तु क्षेत्र र भाषिक सीपगत सिकाइस्तरको विस्तृत खाका तलको तालिकामा प्रस्तुत गरिएको छ । यस उपलब्धि परीक्षणमा पढाइ र लेखाइका सीपहरू मात्र परीक्षण गरिने भएकाले यसमा सुनाइ र बोलाइका सीपसम्बन्धी क्षेत्र तथा स्तरहरू समावेश गरिएको छैन । यसमा विद्यार्थीको सिकाइ उपलब्धि परीक्षण प्रयोजनका लागि पढाइ र लेखाइका क्षेत्रहरूबाट परीक्षा साधन निर्माण गरी सिकाइ उपलब्धि परीक्षण गर्ने गरी स्तर निर्धारण तथा व्याख्या गरिएको छ ।

शब्द भण्डार, व्याकरण तथा वर्ण विन्यासलाई अलग्गै विषयवस्तुका रूपमा समावेश नगरी पढाइ र लेखाइका क्षेत्रमै समावेश गरिएको छ । यसो गर्नाले शब्द भण्डार, व्याकरण तथा वर्ण विन्यासलाई विद्यार्थीले कार्यमूलक रुपमा उपयोग गर्न सके नसकेको परीक्षण गर्न सकिन्छ ।

नेपाली भाषाअन्तर्गत कक्षा ९ र १० कालागि सिकाइस्तरका समग्र तहहरू (General Standards) लाई छ तहमा विभाजन गरिएको छ । नेपाली भाषाअन्तर्गत कक्षा ९ र १० कालागि सिकाइस्तरका समग्र तहहरू (General Standards) निम्नानुसार तय गरिएको छ :

Table 3.3: कक्षा ९ र १० को नेपाली विषयको समग्र सिकाइ स्तर (General standards for Nepali subject at Grade 9 and 10)

सक्षमताका तह		सक्षमताको सामान्य व्याख्या	नेपाली विषयमा कक्षा १० पूरा गरेका विद्यार्थीको सामान्य सक्षमता	
			पढाइ	लेखाइ
आधारभूत (Basic): विद्यार्थीहरू ले सम्बन्धित कक्षामा प्रवीणताका लागि आवश्यक पूर्व तयारीका साथै सम्बन्धिततहको आंशिक ज्ञान र सीपमा सक्षम हुन्छन् ।	१ (आधारभूत तह १)	विद्यार्थीहरू सम्बन्धित कक्षाको पाठ्यक्रमकालागि आवश्यक हुने आधारभूत पूर्व (Basic pre-requisite) ज्ञान र सीप प्रदर्शन गर्न सक्षम हुन्छन् ।	दिइएका विभिन्न प्रकारका अनुच्छेद पढी के, कहाँ र को जस्ता साधारण सूचना बोध, पर्यायवाची, विपरीतार्थी, अनेकार्थी शब्दको सामान्य अर्थबोध,घटनाको आंशिक पहिचान र क्रम मिलान, विषयवस्तुको आंशिक विश्लेषण,चित्र तथा नक्साको सामान्य सन्देश बोध र विषयवस्तुमा आंशिक प्रतिक्रिया दिन ।	शुद्धाशुद्धि मिलाउँदै दिइएका बुँदालाई क्रियापदले मात्र जोडी आंशिक रूपमा कथा/जीवनी लेख्न, सिलासिलारहित र संरचनाविहीन शुभकामना पत्र, निमन्त्रणा पत्र, सामान्य विवरण प्रस्तुत गर्न । प्रत्यक्ष संवाद तयार पार्न, वादविवादको सामान्य विषयवस्तु पहिचान, साधारण बुँदा टिपोट गरी साराशं लेखन, विशिष्ट अंशको पहिचान गरी अर्थ स्पष्ट नहुने गरी शब्द, उखान/टुक्कालाई वाक्यमा प्रयोग गर्न । समग्रमा न्यून स्तरको अभिव्यक्ति क्षमता ।
	२ (आधारभूत तह २)	विद्यार्थीहरू पाठ्यक्रमले निर्धारण गरेका ज्ञान र सीपमा सीमित (Limited basic understanding) आधारभूत बुझाइ प्रदर्शन गर्न सक्षम हुन्छन् ।	दिइएका विभिन्न प्रकारका अनुच्छेद पढी किन र कसरी जस्ता सूचना बोध, पर्यायवाची, विपरीतार्थी र अनेकार्थी शब्दको अर्थबोध, खासखास घटनाको पहिचान गरी क्रम मिलान, विषयवस्तुको उद्देश्यको सीमित बोध र सामान्य आशय व्यक्त, सूचनाको सामान्य विश्लेषण र आंशिक रुपमा संश्लेषण, चित्र तथा नक्सामा प्रयुक्त सूचना तथा सन्देशको आंशिक बोध गरी सामान्य प्रतिक्रिया व्यक्त गर्न ।	शुद्धाशुद्धि र लेख्य चिह्नको सीमित प्रयोग गर्दै दिइएका बुँदालाई क्रियापदले मात्र वाक्य जोडी कथा/जीवनी लेखन, सामान्य सिलसिला मिलाई शुभकामना पत्र, निमन्त्रणा पत्रको संरचना तयार पार्न, आंशिक ढाँचामा सरल संवाद तयार गर्न, वादविवादका साधारण तर्क प्रस्तुत गर्न र विशिष्ट अंशको विस्तारित व्याख्या, भावको सामान्य पहिचान गरी अपरिष्कृत भाषामा आंशिक संरचनासहित विषयवस्तु संयोजन गर्न । अनुच्छेदका मुख्य वाक्यलाई बुँदाका रूपमा टिपोट गरी सामान्य सारांश लेख्न । उखान/टुक्काको साधारण अर्थ खुलाई वाक्यमा प्रयोग गर्न र समग्रमा सामान्य स्तरको अभिव्यक्ति क्षमता भएको ।
प्रवीणता (Proficient):विद्यार्थीहरू ले सम्बन्धित कक्षाको विष्यवस्तुमा सक्षमतम प्रदर्शन गर्दछन् जसअन्तर्गत विषयवस्तुको ज्ञान र ती ज्ञानको वास्तविक अवस्थामा प्रयोग तथा विषयवस्तुमा विश्लेषणात्मक क्षमता प्रदर्शन सक्षम हुन्छन् ।	३ (प्रवीणता तह १)	विद्यार्थीहरू पाठ्यक्रमले निर्धारण गरेका ज्ञान र सीपमा सीमित **आश्यक बुझाइ (adequate understanding)** प्रदर्शन गर्न सक्षम हुनाका साथै यस्ता ज्ञान र सीपको प्रयोगमा **आंशिक प्रवीणता**(Partical proficiency) प्रदर्शन गर्न सक्षम हुन्छन् ।	विभिन्न प्रकारका अनुच्छेदबाट त्यसमा प्रयुक्त सूचनाको आशय बोध गर्नुका साथै पर्यायवाची, विपरीतार्थी, अनेकार्थी र पारिभाषिक शब्दको अर्थ सहित उखान टुक्काको आंशिक बोध, घटनाको पहिचान गरी क्रम मिलान तथा अनुमान, उद्देश्यमूलक वाक्य पहिचान गरी सूचनाको पूर्ण विश्लेषण तथा संश्लेषण, चित्र, नक्सा, तालिका र चार्टको सन्देशपूर्ण बोध, सूचना र सङ्ख्याको पहिचानसहित आफ्नो प्रतिक्रिया व्यक्त गर्न ।	साधारण शुद्धाशुद्धि, लेख्य चिह्न र पदसङ्गति मिलाई कथा जीवनी तथा वर्णनात्मक अनुच्छेद भाषिक शिल्पसहित सिलसिलाबद्ध ढङ्गले कम्तीमा १०० शब्दसम्म लेख्न । शुभकामना पत्र, निमन्त्रणा पत्र संरचनागत तवरले तयार गर्न तथा साधारण निवेदन लेख्न । संरचनागत ढाँचामा संवाद तयार गर्न तथा वादविवादमा तर्कसहित खण्डन गर्न । अनुच्छेदका विशिष्ट अंशको पर्याप्त व्याख्या, सप्रसङ्ग व्याख्या र आंशिक भाव विस्तार गर्न । दिइएको विषयवस्तुको सामान्य स्तरको सम्पादन गर्न । विषयवस्तुका आधारमा बुँदाटिपोट र बुँदाका आधारमा साराशं लेख्न । उखान टुक्काको स्पष्ट अर्थ खुल्ने गरी वाक्यमा प्रयोग गर्न । समस्या समाधानका लागि साधारण तर्क पेस गर्न । समग्रमा मध्यम स्तरको अभिव्यक्ति क्षमता ।
	४ (प्रवीणता तह २)	विद्यार्थीहरू पाठ्यक्रमले निर्धारण गरेका ज्ञान र सीपको बुझाइ र तिनको प्रयोग गर्ने क्षमतामा **पर्याप्त**	अनुच्छेदमा प्रयुक्त विषयगत उद्देश्य पत्ता लगाई आशय बोध, शब्द र उखान टुक्काको अर्थ बोध, घटनाको पहिचान गरी क्रम मिलान, अनुमान लगाई जिज्ञासामूलक प्रश्न गर्न । सूचनाको संश्लेषण तथा तर्कसहित विश्लेषण, चित्र, तालिका, नक्सा, चार्टको	शुद्धाशुद्धि, लेख्य चिह्न, पदवर्ग र व्याकरणिक कोटि आंशिक रुपमा मिलाउँदै भाषिक शिल्प र उपयुक्त वाक्य संरचनासहित कथा जीवनी, व्यवहारिक र रुपक १२० शब्दसम्ममा लेख्न, विशिष्ट अंशको पर्याप्त व्याख्या एंवम् भाव विस्तारसहित सप्रसङ्ग व्याख्या गर्न । पूर्ण भाषिक परिष्कारसहित

		प्रवीणता (Adequate proficiency) प्रदर्शन गर्न सक्षम हुन्छन् ।	सन्देशमूलक आशय बोध,सूचना तथा सङ्ख्याको सामान्य तालिका निर्माण, समस्या पहिचान गरी सामान्य तहको विश्लेषणसहित आफ्नो प्रतिक्रिया दिन ।	विषयवस्तुको सम्पादन, मुख्य बुँदा टिपोट र साराशं लेखन, उखान टुक्काको स्पष्ट र मौलिक प्रयोग गर्दै सामान्य रूपमा तर्क र विश्लेषण गर्न । समग्रमा उत्तम स्तरको भाषिक अभिव्यक्ति तथा लेखनमा मौलिकता र सिर्जनात्मक सीपको प्रयोग ।
	५ (प्रवीणता तह ३)	विद्यार्थीहरू पाठ्यक्रमले निर्धारण गरेका समस्याज्ञान र सीपको बुझाइ र तिनको प्रयोग गर्ने क्षमतामा **स्पष्ट प्रवीणता (Thorough proficiency)** प्रदर्शन गर्न सक्षम हुन्छन् जसमा एक भन्दा बढी सम्बन्धहरू को संयोजन गरी समस्या समाधान गर्ने सक्षमता पनि समावेश हुन्छन् ।	अनुच्छेदमा प्रयुक्त मुख्य भाव र आशय बोध, शब्दको स्पष्ट अर्थ सहित उखान टुक्काको अर्थ बोध, घटना पहिचान, तार्किक अनुमान र जिज्ञासामूलक प्रश्न गर्न । अनुच्छेदबाट उद्देश्यसहितको निष्कर्ष र सूचनाको भाव समेत बुझी विश्लेषण र संश्लेषण गर्नुका साथै चित्र नक्सा, तालिका र चार्टको निष्कर्ष प्रस्तुत गरी सूचना तथा सङ्ख्यालाई तालिकामा प्रस्तुत गर्न, उदाहरणसहित तार्किक प्रतिक्रिया प्रस्तुत गरी समस्या समाधानका साधारण उपाय पत्ता लगाउन ।	वर्णविन्यास र भाषातत्त्वको उपयुक्त प्रयोग गरी भाषिक शिल्पको प्रयोग सहित विधागत संरचनामा कथा, जीवनी र स्वतन्त्र एंवम् व्यवहारिक लेखन, रुपक लेखनमा मौलिकता तथा सिर्जनात्मकताको प्रयोग गरी १४० शब्दसम्म लेख्न । अनुच्छेदका विशिष्ट अंशको पर्याप्त व्याख्या, भाव विस्तार र सप्रसङ्ग व्याख्या । विषयवस्तुको परिष्कार तथा सम्पादनका साथै मुख्य बुँदा टिपोट गर्न र शीर्षकसहितको साराशं लेखन र समस्या समाधानका लागि उदाहरणसहित सान्दर्भिक तर्क प्रस्तुत गर्न । समग्रमा विशिष्ट स्तरको भाषिक अभिव्यक्ति तथा लेखनमा मौलिकता, सिर्जनात्मकता तथा आलङ्कारिक भाषाशैलीको प्रयोग ।
उच्च (Advance): आवश्यक संश्लेषण र अमूर्तिकरण सहित विशिष्ट उपलब्धि	६ (विशिष्ट तह)	विद्यार्थीहरू पाठ्यक्रमले निर्धारण गरेका ज्ञान र सीपको प्रयोग गर्ने **उच्च क्षमता (Advance ability)** प्रदर्शन गर्न सक्षम हुन्छन् जसमा नयाँ र अपरिचित परिस्थितिमा समस्या समाधान गर्ने र विभिन्न सम्बन्धहरू र अङ्गहरू को संयोजन प्रयोग गरी समस्या समाधान गर्ने नयाँ सम्बन्ध विकास गर्ने सक्षमता समावेश हुन्छन् ।	अनुच्छेदबाट सूचना तथा सन्देशको विश्लेषण, समालोचना र मूल्याङ्कन, शब्दार्थ र उखान टुक्काको अर्थबोध गरी सान्दर्भिक प्रयोग, घटनाको प्रभाव र असरको स्पष्ट पहिचान, अनुमान र उदाहरणसहितको तार्किक जिज्ञासा राखी अनुमान गर्न, निहित उद्देश्यको मूल भाव र आशयको निष्कर्षसहित सिर्जनात्मक प्रस्तुति, चित्र, तालिका, नक्सा तथा चार्टहरूबाट त्यसको मुख्य आशय, भाव र सन्देश बोध, अनुच्छेदको आधारमा समस्या समाधानसहितको प्रतिक्रिया दिन । पढेका अनुच्छेदका आधारमा सिर्जनात्मक तथा मौलिक रूपमा त्यस्तै अनुच्छेदहरू सिर्जना गर्न ।	भाषातत्त्व र वर्णविन्यासको उपयुक्त प्रयोग गर्दै मौलिक र सीर्जनशिल भाषिक शिल्पसहित आलङ्कारिक ढाँचामा जीवनी कथा, निवन्ध लेख्न । व्यवहारिक लेखन, निर्देशित कथा, जीवनी, रूपकलाई आलङ्कारिक शैलीमा पाठकलाई आकर्षित गर्ने गरी १५० शब्दसम्ममा संरचनागत ढाँचामा प्रस्तुत गर्न । मौलिक र सिर्जनात्मक ढंगले विषयवस्तुको भाव विस्तार, पूर्ण भाषिक परिष्कारसहित आवश्यक वाक्य पुनर्गठन र संरचनागत सम्पादन, मुख्य बुँदा टिपोट गरी मौलिक शैलीमा उपयुक्त शीर्षकसहित सारांश लेखन तथा विशिष्ट उदाहरण दिँदै तार्किक शैलीमा विश्लेषण, समालोचना र पुष्ट्याईसहित मूल्याङ्कन गर्न । सगम्रमा अति विशिष्ट तहको अभिव्यक्ति क्षमता ।

विषयवस्तुको क्षेत्र, मापदण्ढ र स्तरहरू (Content area, criteria and standards)

उल्लिखित भाषिक सक्षमताका स्तरका आधारमा पाठ्यक्रमद्वारा निर्दिष्ट विषय तथा पाठ्यवस्तु क्षेत्र र भाषिक सीपगत सिकाइस्तरको विस्तृत खाका तलको तालिकामा प्रस्तुत गरिएको छ । यस उपलब्धि परीक्षणमा पढाइ र लेखाइका सीपहरू मात्र परीक्षण गरिने भएकाले यसमा सुनाइ र बोलाइका सीपसम्बन्धी क्षेत्र तथा स्तरहरू समावेश गरिएको छैन । यसमा विद्यार्थी सिकाइ उपलब्धि परीक्षण प्रयोजनका लागि पढाइ र लेखाइका क्षेत्रहरू बाट परीक्षा साधन निर्माण गरी सिकाइ उपलब्धि परीक्षण गर्ने गरी स्तर निर्धारण तथा व्याख्या गरिएको छ । शब्द भण्डार, व्याकरण तथा वर्ण विन्यासलाई अलग्गै विषयवस्तुका रुपमा समावेश नगरी पढाइ र लेखाइका क्षेत्रमै समावेश गरिएको छ । यसो गर्नाले शब्द भण्डार, व्याकरण तथा वर्ण विन्यासलाई विद्यार्थीले कार्यमूलक रुपमा उपयोग गर्न सके नसकेको परीक्षण गर्न सकिन्छ ।

Table 3.4:कक्षा १० को नेपाली विषयको विषय क्षेत्र, मापदण्ड र स्तर (Content domain, Criteria and standards for Nepali subject at 10)

पढाइ

सि. नं.	मायदण्ड तह (Criteria)	स्तरका तह(Levels od Standards)					
		आधारभूत तह (Basic Level)		प्रवीणता तह (Proficiency level)			उच्च तह (Advance Level
		तह १ (आधारभूत १)	तह २ (आधारभूत २)	तह ३ (प्रवीणता १)	तह ४ (प्रवीणता २)	तह ५ (प्रवीणता ३)	तह ६ (विशिष्ट)
१	विभिन्न प्रकारका अनुच्छेद पढी सरल सूचना तथा आशय बोध गर्न	अनुच्छेदबाट के र कहाँ भन्ने सूचना बोध गर्न	अनुच्छेदबाट किन र कसरी भन्ने सूचना बोध गर्न सक्ने	अनुच्छेदबाट प्रयुक्त भएको सूचनाको आशय बोध गर्न	अनुच्छेद पढी त्यसको उद्देश्य पत्ता लगाउन	अनुच्छेद पढी त्यसको मुख्य भाव, उद्देश्य र आशय बोध गर्न	अनुच्छेद पढी त्यसको विश्लेषण, समालोचना र मूल्याङ्कन गर्न
२	विभिन्न प्रकारका अनुच्छेद पढी शब्द भण्डार वृद्धि गर्न (उखान टुक्का समेत)	अनुच्छेदमा प्रयुक्त सरल शब्द (पर्यायवाची र विपरीतार्थी) को अर्थ बोध गर्न	अनुच्छेदमा प्रयुक्त शब्द (पर्यायवाची, विपरीतार्थी र अनेकार्थी) को अर्थ बोध गर्न	अनुच्छेदमा प्रयुक्त (पर्यायवाची, विपरीतार्थी, अनेकार्थी, पारिभाषिक) शब्दको अर्थ बोध गरी उखान टुक्काको आंशिक बोध गर्न	अनुच्छेदमा प्रयुक्त श्रुतिसमभिन्नार्थी लगायत सबै प्रकारका शब्दको अर्थ बोध गर्न तथा उखान टुक्काको अर्थ बोध गर्न	अनुच्छेदमा प्रयुक्त सबै प्रकारका शब्दको स्पष्ट अर्थ बोध गरी उखान टुक्काको अर्थ बोध गर्न	अनुच्छेदमा प्रयुक्त सबै प्रकारका शब्दको अर्थ तथा उखान टुक्काको व्यापक अर्थ बोध गरी त्यसको सान्दर्भिक प्रयोग गर्न
३	विभिन्न प्रकारका अनुच्छेदमा प्रयुक्त सूचनाका आधारमा घटनाक्रम मिलाउन, घटनाको अनुमान लगाउन र जिज्ञासामूलक प्रश्न गर्न	अनुच्छेदमा प्रयुक्त आंशिक घटनाहरू पहिचान गर्न	अनुच्छेदमा प्रयुक्त सूचनाका आधारमा खास खास घटनाहरू पहिचान गरी समान्य ढंगमा घटनाक्रम मिलाउन	अनुच्छेदमा प्रयुक्त सूचनाका आधारमा सबै घटना पहिचान गरी घटनाको अनुमान लगाउँदै क्रम मिलाउन ।	सबै घटना पहिचान गरी घटनाक्रम मिलाउन, अनुमान लगाउन, अनुच्छेदका घटनामाथि प्रश्न गर्न	अनुच्छेदका सबै घटना पहिचान गरी त्यसपछि हुन सक्ने घटनाहरूको तार्किक अनुमान र जिज्ञासामूलक प्रश्न गर्न	अनुच्छेदमा प्रयुक्त घटनाबाट त्यसका प्रभाव र असर स्पष्ट रूपमा पहिचान गरी थप घटनाको अनुमान लगाउन र तर्क उदाहरण सहित जिज्ञासा प्रस्तुत गर्न
४	विभिन्न प्रकारका अनुच्छेद पढी त्यसको उद्देश्य पत्ता लगाउन तथा मुख्य निष्कर्ष निकाल्न	अनुच्छेदको विषयवस्तु बोध गर्न	अनुच्छेदको सीमित उद्देश्यमा मात्र बोध गर्न	अनुच्छेदको उद्देश्यमूलक वाक्य पहिचान गरी बोध गर्न	अनुच्छेदको उद्देश्य संश्लेषण गरी बोध गर्न	अनुच्छेदबाट उद्देश्य पत्ता लगाई निष्कर्ष बोध गर्न	अनुच्छेदमा लुप्त उद्देश्य पहिचान गरी निष्कर्ष निकाल्न
५	विभिन्न प्रकारका अनुच्छेद पढी त्यसमा प्रयुक्त सूचनाको विश्लेषण र संश्लेषण गर्न	अनुच्छेदमा प्रयुक्त सूचनाको आंशिक विश्लेषण गर्न	अनुच्छेदमा प्रयुक्त सूचनाको विश्लेषण र आंशिक संश्लेषण गर्न	अनुच्छेदमा प्रयुक्त सूचनाको समग्र रुपमा विश्लेषण र संश्लेषण गर्न	अनुच्छेदमा प्रयुक्त सूचनाको तर्कसहित विश्लेषण र संश्लेषण गर्न	अनुच्छेदमा प्रयुक्त सूचनाको भाव र निष्कर्ष समेत पत्ता लगाई सो को	अनुच्छेदमा प्रयुक्त सूचनाको प्रभाव, उद्देश्यसमेत पहिचान गरी त्यसबाट निष्कर्षसहित

						आधारमा थप विश्लेषण र संश्लेषण	सिर्जनात्मक स्तरमा विश्लेषण र संश्लेषण गर्न
६	विभिन्न प्रकारका चित्र, नक्सा, तालिका तथा चार्टको सूचना/सन्देश बोध गर्न	दिइएका चित्र, नक्सा, तालिका तथा चार्टबाट सामान्य सूचना/सन्देश बोध गर्न	दिइएका चित्र, नक्सा, तालिका तथा चार्टको स्पष्ट सूचना/सन्देश तथा आशयको आंशिक बोध गर्न	दिइएका चित्र, नक्सा, तालिका चार्टको सूचना/सन्देश समग्र रुपमा बोध गर्न	दिइएका चित्र, नक्सा, तालिका चार्टको सूचना/सन्देश आशयपूर्ण बोध गर्न	दिइएका चित्र, नक्सा, तालिका चार्टको सूचना/सन्देशबाट निष्कर्ष प्रस्तुत गर्न	दिइएका चित्र, नक्सा, तालिका चार्टको सूचना/सन्देश बोध गरी मौलिक धारणासहित विचार व्यक्त गर्न
७	विभिन्न प्रकारका अनुच्छेद पढी त्यसमा प्रयुक्त सूचना, तथ्य/सङ्ख्याको आधारमा तालिका निर्माण गर्न	अनुच्छेदमा प्रयुक्त सूचना र सङ्ख्याको आंशिक बोध गर्न	अनुच्छेदमा प्रयुक्त सूचना र सङ्ख्याको बोध गर्न	अनुच्छेदमा प्रयुक्त सूचना तथ्य/सङ्ख्याको पहिचान गरी सामान्य क्रममा सूची बनाउन	अनुच्छेदमा प्रयुक्त सूचना तथ्य/सङ्ख्याको आधारमा सामान्य तालिका तयार गर्न	अनुच्छेदमा प्रयुक्त सूचना तथ्य/सङ्ख्याको आधारमा तालिकामा प्रस्तुत गर्न	अनुच्छेदमा प्रयुक्त सूचना तथ्य/सङ्ख्यालाई मौलिक र सिर्जनात्मक रूपमा तालिकामा प्रस्तुत गर्न
८	विभिन्न प्रकारका अनुच्छेद पढी त्यसका आधारमा प्रतिक्रिया व्यक्त गर्न र समस्या समाधान गर्न ।	अनुच्छेदमा प्रयुक्त विषयवस्तुसँग नमिल्दो प्रतिक्रिया व्यक्त गर्न	अनुच्छेद पढी प्रतिक्रिया व्यक्त गर्दा अनुच्छेदकै आधारमा आंशिक मात्र प्रतिक्रिया व्यक्त गर्न	अनुच्छेदका आधारमा आफ्नो प्रतिक्रिया स्पष्ट राख्न	अनुच्छेदका आधारमा आफ्नो प्रतिक्रिया सामान्य विश्लेषणात्मक रूपमा राखी समस्या पहिचान गर्न	अनुच्छेदका आधारमा उदाहरण र तर्कसहित प्रतिक्रिया राख्न तथा समस्या समाधानका उपाय सुझाउन	अनुच्छेदका आधारमा समालोचनात्मक रूपमा प्रतिक्रिया राख्न तथा मौलिक रूपमा समस्या समाधान गर्न

लेखाइ

सि.नं.	आधार तह (Criteria)	आधारभूत तह		प्रवीणता तह		विशिष्ट तह	
		तह १	तह २	तह १	तह २	तह १	तह २
१	उपयुक्त भाषातत्त्व र वर्णविन्यास प्रयोग गरी वाक्य निर्माण गर्न	दिइएको लिखित सामग्रीमा सामान्य शुद्धाशुद्धि मिलाउन	दिइएको लिखित सामग्रीमा शुद्धाशुद्धि र उपयुक्त लेख्य चिह्नको प्रयोग गर्न	दिइएको लिखित सामग्रीमा शुद्धाशुद्धि, लेख्य चिह्न र पदवर्ग छुट्ट्याउन	दिइएको लिखित सामग्रीमा शुद्धाशुद्धि, लेख्य चिह्न, पदवर्ग र व्याकरणिक कोटि मिलाउन	दिइएको लिखित सामग्रीमा शुद्धाशुद्धि, लेख्य चिह्न, पदवर्ग र व्याकरणिक कोटि, शब्दनिर्माण गर्न	दिइएको लिखित सामग्रीमा भाषातत्व, वर्णविन्यास र उपयुक्त लेख्य चिह्नको प्रयोग गर्न ।
२	निर्देशित रुपमा कथा र जीवनी लेख्न	दिइएका बुँदाका आधारमा क्रियापदले मात्र जोडी आंशिक रूपमा कथा/जीवनी लेख्न	दिइएका बुँदाका आधारमा क्रियापदले मात्र जोडी सरल कथा/जीवनी लेख्न	दिइएका बुँदाका आधारमा क्रियापदलाई परिवर्तन गरी विस्तारित कथा/जीवनी लेख्न	दिइएका बुँदाका आधारमा भाषिक शिल्प तथा वाक्य संरचनासहित कथा/जीवनी लेख्न	दिइएका बुँदाका आधारमा भाषिक शिल्प प्रयोग गरी उपर्युक्त शीर्षकमा कथाको संरचनागत ढाँचामा कथा/जीवनी लेख्न	दिइएका बुँदाका आधारमा भाषिक शिल्पको प्रयोग गरी मौलिकताका आधारमा सार्थक शीर्षकसहित कथा/जीवनी लेख्न
३	देखे सुनेका, अनुभव गरेका घटनाको सिलासिलाबद्ध वर्णन गरी अनुच्छेद लेख्न	वर्णनात्मक अनुच्छेदमा सिलसिलाबद्ध नभई प्रस्तुत भएको	वर्णनात्मक अनुच्छेदमा सामान्य सिलसिला मिलाई पाँच वाक्यसम्ममा लेख्न	वर्णनात्मक अनुच्छेद सिलसिलाबद्ध रूपमा भाषिक शिल्पसहित वाक्य संरचना मिलाई दस वाक्यसम्ममा लेख्न	वर्णनात्मक अनुच्छेद सिलसिलाबद्ध रूपमा भाषिक शिल्पसहित वाक्य संरचना र वर्णविर्न्यास मिलाई पन्ध्र वाक्यसम्ममा लेख्न	वर्णनात्मक अनुच्छेद सिलसिलाबद्ध रूपमा भाषिक शिल्पसहित वाक्य संरचना र वर्णविन्यास मिलाई बीस वाक्यसम्ममा लेख्न	वर्णनात्मक अनुच्छेद सिलसिलाबद्ध रूपमा भाषिक शिल्पसहित वाक्य संरचना र वर्णविन्यास मिलाई पच्चीस वाक्यसम्ममा मौलिकतासहित लेख्न
४	स्वतन्त्र व्यवहारिक रचना गर्न (शुभकामना पत्र, निमन्त्रणा पत्र, व्यवासायिक चिठी,	निर्देशनअनुसार असंरचित ढाँचामा शुभकामना पत्र	निर्देशनअनुसार संरचनामा शुभकामना पत्र र निमन्त्रणा पत्र	निर्देशनअनुसार शुभकामना पत्र, निमन्त्रणा पत्र र संरचना	निर्देशनअनुसार शुभकामना पत्र, निमन्त्रणा पत्र तथा संरचना	निर्देशनअनुसार शुभकामना पत्र, निमन्त्रणा पत्र तथा संरचना	निर्देशनअनुसा भाषिक शिल्प, मौलिकता र सिर्जनात्मकता

	निवेदन)	र निमन्त्रणा पत्र तयार गर्न	तयार गर्न	नमिलेको निवेदन लेख्न	मिलाई निवेदन लेख्न तथा व्यावसायिक चिठीको ढाँचा तयार गर्न	मिलाई निवेदन लेख्न तथा संरचनागत व्यावसायिक चिठी तयार गर्न	सहित संरचनागत रूपमा शुभकामना पत्र, निमन्त्रणा पत्र निवेदन र व्यावसायिक चिठी तयार गर्न
५	स्वतन्त्र रूपमा निबन्ध (वैज्ञानिक, व्यावसायिक, सामाजिक, पर्यावरणीय, साँस्कृतिक) लेख्न	विषयवस्तुको सामान्य विवरणमात्र प्रस्तुत गरिएको निबन्ध लेख्न	विषयवस्तुको आंशिक विस्तृतीकरण गरी सामान्य स्तरको संरचनामा प्रस्तुत गरिएको निबन्ध लेख्न	विषयवस्तुको पर्याप्त विस्तृतीकरण गरी संरचनागत ढाँचामा प्रस्तुत गरिएको निबन्ध लेख्न	विषयवस्तुको पर्याप्त र मौलिक विस्तृतीकरण सहित भाषिक शुद्धतामा ध्यान दिदै संरचनागत ढाँचामा प्रस्तुत गरिएको निबन्ध लेख्न	विषयवस्तुको विस्तृतिकरणमा मौलिकता, सिर्जनात्मकता तथा भाषिक शिल्प प्रयोग गरी संरचनागत ढाँचामा प्रस्तुत गरिएको निबन्ध लेख्न	विषयवस्तुको विस्तृतिकरणमा मौलिकता, सिर्जनात्मकता, विशिष्ट भाषिक शिल्पको प्रयोग सहित आलङ्कारिक शैलीमा पाठकलाई प्रभाव पार्ने गरी संरचनागत ढाँचामा प्रस्तुत गरिएको निबन्ध लेख्न
६	स्वतन्त्र रुपमा संवाद, वादविवाद, मनोवाद लेख्न	दिइएको विषयवस्तुमा प्रत्यक्ष संवाद तयार गर्न तथा वादविवादको विषयवस्तु पहिचान गरी मनोवाद लेख्न	दिइएको विषयवस्तुमा संरचनागत ढाँचामा संवाद तयार गर्न तथा वादविवादका साधारण तर्क प्रस्तुत गर्न	दिइएको विषयवस्तुमा संरचनागत ढाँचामा संवाद तयार गर्न तथा वादविवादमा तर्क प्रस्तुत गर्ने तथा खण्डन गर्ने	दिइएको विषयवस्तुमा संरचनागत ढाँचामा संवाद तयार गर्न कुशल वक्ताको रुपमा वादविवादमा तर्क प्रस्तुत गर्न तथा मनोवादको विषयवस्तु पहिचान गर्न	दिइएको विषयवस्तुमा संरचनागत ढाँचामा संवाद तयार गर्न कुशल वक्ताको रुपमा वादविवादका तर्क प्रस्तुत गर्न तथा संरचनागत ढाँचामा मनोवाद तयार गर्न	दिइएको विषयवस्तुमा संरचनागत ढाँचामा संवाद तयार गर्न कुशल वक्ताको रुपमा मौलिकता र सिर्जनात्मकता सहित भाषिक शिल्पको प्रयोग गर्दै वादविवादका तर्क प्रस्तुत गर्न तथा पाठकलाई आकर्षित गर्ने गरी मनोवाद तयार गर्न
७	विभिन्न गद्य वा पद्य विधामा प्रयुक्त विशिष्ट अंशको व्याख्या, भाव विस्तार र सप्रसङ्ग व्याख्या गरी लेख्न ।	दिइएको गद्यको विशिष्ट अंशको आंशिक व्याख्या, भाव विस्तार र सप्रङ्ग व्याख्या गर्न तथा पद्यको प्रयुक्त विषयवस्तु पहिचान गरी लेख्न ।	दिइएको गद्य तथा पद्यको विशिष्ट अंशको, व्याख्या, भाव विस्तार तथा व्याख्या तथा सामान्य भाव पहिचान गर्न ।	दिइएको गद्य वा पद्यको विशिष्ट अंशको पर्याप्त व्याख्या तथा आंशिक भाव विस्तार गरी सप्रसङ्ग व्याख्याको विषयवस्तुको पहिचान	दिइएको गद्य वा पद्यको विशिष्ट अंशको पर्याप्त व्याख्या तथा भाव विस्तार गरी सप्रसङ्ग व्याख्याको ढाँचा सहितको प्रस्तुति	दिइएको गद्य वा पद्यको विशिष्ट अंशको पर्याप्त व्याख्या स्पष्ट रुपमा भाव विस्तार गरी पूर्ण ढाँचासहतिको सप्रसङ्ग व्याख्या	दिइएको गद्य वा पद्यको व्याख्या, भाव विस्तार तथा सप्रसङ्ग व्याख्यामा भाषिक शिल्प, मौलिकता तथा वाक्य संरचनागत दृष्टिले उपयुक्त ढाँचामा तयार गरिएको व्याख्या
८	लेखिएका सामग्रीको सम्पादन गर्न	लेखिएको सामग्रीको आंशिक भाषिक परिष्कार	लेखिएका सामग्रीको भाषिक परिष्कार तथा आंशिक वाक्य संरचनाको सम्पदन गर्न	लेखिएका सामग्रीको भाषिक परिष्कार तथा वाक्य संरचनाको सम्पादन तथा विषयवस्तुको आंशिक सम्पादन गर्न	लेखिएका सामग्रीको पूर्ण भाषिक परिष्कार र वाक्यको सामान्य संरचनागत सम्पादन, तथा विषयवस्तुको सम्पादन गर्न	लेखिएका सामग्रीको पूर्ण भाषिक परिष्कार, आवश्यकता अनुसार वाक्य पुनर्गठन, विषयवस्तुको उपयुक्त संरचनागत सम्पादन र अनुच्छेदको आंशिक सम्पादन गर्न	लेखिएका सामग्रीको पूर्ण भाषिक परिष्कार, आवश्यकता अनुसार वाक्य पुनर्गठन, विषयवस्तुको विशिष्ट तथा अनुच्छेदको संरचनागत सम्पादन गर्न
९	पढेका विषयवस्तुबाट मुख्य बुँदा टिपोट गर्न र सारांश लेख्न	अनुच्छेदमा प्रयुक्त केही वाक्यलाई बुँदाका	अनुच्छेदमा प्रयुक्त केही मुख्य वाक्यलाई बुँदाको	अनुच्छेदमा प्रयुक्त विषयवस्तुका	अनुच्छेदको विषयवस्तु बोध गरी मुख्य बुँदा	अनुच्छेदको विषयवस्तु बोध गरी मुख्य बुँदा	अनुच्छेदको विषयवस्तु बोध गरी मुख्य बुँदा

		रुपमा टिपोट गरी वाक्य जोडेर सारांश लेख्न	रुपमा टिपोट गरी सामान्य स्तरको सारांश लेख्न	आधारमा बुँदा टिपोट गर्न र सोही बुँदाकै आधारमा मात्र सारांश लेख्न	टिपोट गर्न र सो को आधारमा सारांश लेख्न	टिपोट गर्न र अनुच्छेदको विषयवस्तुकै आधारमा शीर्षक सहित सारांश लेख्न	टिपोट गर्न र अनुच्छेदको विषयवस्तुलाई आधार बनाई मौलिकता तथा उपयुक्त शीर्षक सहित सारांश लेख्न
१०	विभिन्न शब्द तथा उखान टुक्काको अर्थ स्पष्ट हुने गरी वाक्यमा प्रयोग गर्न	शब्द तथा उखान टुक्काको अर्थ स्पष्ट नगरी वाक्य बनाउने	शब्द तथा उखान टुक्काको साधारण अर्थ खुल्ने गरी वाक्यम प्रयोग गर्न	शब्द तथा उखान टुक्काको स्पष्ट अर्थ खुल्ने गरी वाक्यमा प्रयोग गर्न	शब्द तथा उखान टुक्काको स्पष्ट अर्थ खुल्ने गरी मौलिक वाक्य सिर्जना गर्न		
११	विभिन्न विषयमा तार्किक शिल्प सहित विश्लेषण गर्न ।			दिइएको विषयवस्तुमा सामान्य स्तरका तर्क पेस गर्न	दिइएको विषयवस्तुमा आफ्नो तर्क पेस गर्न र सामान्य विश्लेषण गर्न	दिइएको विषयवस्तुमा सान्दर्भिक तर्क पेस गर्न र त्यसलाई उदाहरण तथा तर्कका आधारमा विश्लेषण गर्न	दिइएको विषयवस्तुमा तार्किक शैलीमा आधारित मौलिक र विशिष्ट उदाहरण सहित विश्लेषण गर्न
१२	विभिन्न विषयमा प्रस्तुत सूचनाका आधारमा समालोचना तथा मूल्याङ्कन गर्न ।			प्रस्तुत सूचनाको विषयवस्तुगत वर्णन गर्ने गरी सामान्य स्तरको मूल्याङ्कन	प्रस्तुत सूचनाको सामान्य आलोचना गरी आफ्नो विचारसहित मूल्याङ्कन गर्न	प्रस्तुत सूचनाको विषयवस्तुको आधारमा विषयवस्तुको समालोचना गरी यथार्थपरक मूल्याङ्कन गर्न	प्रस्तुत सूचनाको आधारमा तर्कसहित समालोचना र मूल्याङ्कन गरी उदाहरण समेत प्रस्तुत गरी पुष्ट्याई गर्न

द्रष्टव्य (क) अनुच्छेदमा प्रयोग भएका विभिन्न वर्णविन्यास, पदवर्ग/शब्दवर्ग (नौ), व्याकरणिक कोटि (लिङ्ग, वचन, पुरुष, आदर), शब्दनिर्माण (उपसर्ग, प्रत्यय, समास, द्वित्व) कारक र विभक्ति, वाक्यान्तरण (काल, पक्ष, भाव (अर्थ), वाच्य, वाक्य र वाक्य संश्लेषण विश्लेषण, करण, अकरण, क्रियाका धातु) का विषयलाई लेखाइका प्रश्नको रूपमा समावेश गर्ने ।

(ख) पढाइ सीपको परीक्षणकालागि तयार गरिने बोध अनुच्छेदहरू साहित्यिक, आर्थिक, सामाजिक, साँस्कृतिक, वातावरणीय, ऐतिहासिक, राजनीतिक कानूनी, खेलकुद तथा स्वास्थ्य विज्ञान/प्रविधिसँग सम्बन्धित हुनुपर्ने छ ।

(ग) लेखाइ सीपको परीक्षणमा उल्लेख गरिएका सिकाइका तहमा वर्णविन्यासका पक्षहरू समाहित हुनेछन् । आधारभूत तह र विशिष्ट तहमा सामान्यदेखि उच्च स्तरको वर्णविन्यासका पक्षहरूलाई हेर्नुपर्ने छ ।

३.५ संज्ञानात्मक क्षेत्र(Cognitive domain)

शिक्षण सिकाइको प्रकियाद्वारा विद्यार्थीहरूमा संज्ञानात्मक क्षेत्रका विभिन्न तहका क्षमताहरू विकास भए नभएको मापन गर्न परीक्षण साधन तथा प्रश्नहरूले संज्ञानात्मक क्षेत्रका सबै तहलाई समेटेको हुनुपर्दछ । ब्लुम (Bloom) ले संज्ञानात्मक क्षेत्रका सामर्थ्यहरूलाई ज्ञान, बोध, प्रयोग, विश्लेषण, संश्लेषण र मूल्याङ्कन गरी ६ तहमा वर्गीकरण गरेका थिए । शैक्षिक गुणस्तर परीक्षण केन्द्रले सञ्चालन गरेका विगतका विद्यार्थी सिकाइ उपलब्धि राष्ट्रिय परीक्षण (२०११, २०१२, २०१३ र २०१५) मा उल्लिखित ६ वर्गीकरणलाई आधार मानी ज्ञान, बोध र प्रयोग र विश्लेषण, संश्लेषण र मूल्याङ्कनलाई उच्च दक्षतामा राखी चार तहका प्रश्न निर्माण गरी नतिजा पनि तदनुरुप विश्लेषण गरिँदै आएको थियो । ब्लुमको परिमार्जित वर्गीकरणका ६ तहहरू : सम्झना, बुझाइ, प्रयोग, विश्लेषण, मूल्याङ्कन र सृजनात्मकतामध्ये (हे. Aderson & Karthwohl, 2001) सम्झना, बोध (बुझाइ), प्रयोग गरी तीन तहलाई यथावत समावेश गरी बाँकी तीन तहलाई तार्किक क्षमता (Reasoning) का रुपमा वर्गीकरण गर्ने र सोही ४ तहका परीक्षण साधन तथा प्रश्न निर्माण गर्ने गरी तयार गरिएको छ । यिनै वर्गीकरणलाई आधार

मानी सिकाइ उपलब्धिको राष्ट्रिय परीक्षणमा निम्नानुसार ४ तहका निम्नालिखित भार अनुसारका प्रश्नहरू उपयोग गरिनेछ ।

Table 3.5: *कक्षा १० को नेपालीमासंज्ञानात्मक क्षेत्रका अङ्कभार* **(*Cognitive domain and weightage of Nepali subject at Grade 10)***

संज्ञानको तह	**अङ्कभार**
सम्झना/प्राप्ति (Remembering/ Retrieving)	१० %
बोध/एकीकरण (Understanding/ Integrating)	३५ %
प्रयोग/व्याख्या (Applying/Interpreting)	३५ %
तार्किक क्षमता/प्रत्यावर्तन (Reasoning/ Reflecting)	२० %
जम्मा	**१०० %**

यहाँ उल्लेख गरिएका संज्ञानात्मक विकासका चार तह (सम्झना/प्राप्ति, बोध/एकीकरण, प्रयोग/व्याख्या र तार्किक क्षमता/प्रत्यावर्तन) लाई पिजा (PISA) २०१५ को परीक्षण ढाँचाअन्तर्गत (हे. OECD, 2016) पढाइ सीपका पाँच पक्षहरू (सूचना प्राप्ति, विस्तृत बुझाइको क्षमताको विकास, व्याख्या गर्ने क्षमताको विकास, लेखाइका विषयवस्तु र लेखाइलाई प्रत्यावर्तन र मूल्याङ्कन गर्ने) सँग तुलना गर्दा दुवैबीच समानता देखिन्छ । उदाहरणका लागि (सम्झना/प्राप्ति, बोध/एकीकरण र प्रयोग/व्याख्यालाई क्रमशः सूचना प्राप्ति, विस्तृत बुझाइको क्षमताको विकास र व्याख्या गर्ने क्षमताको विकाससँग सम्बन्धित देखिन्छन् भने तार्किक क्षमता/प्रत्यावर्तनलाई लेखाइका विषयवस्तु र लेखाइलाई प्रत्यावर्तन र मूल्याङ्कन गर्ने क्षमतासँग तुलना गर्न सकिने देखिन्छ ।

३.६ प्रश्नहरूको विशिष्टिकरण(Specification of Items)

तल दिइएको विशिष्टिकरण तालिकामा विषयवस्तुको क्षेत्र, मापदण्ड, भार प्रतिशत, प्रश्नका सङ्ख्या र प्रकार, अङ्कको विभाजन र विभिन्न ६ स्तरमा प्रश्नको विभाजन प्रस्तुत गरिएको छ ।

Table 3.6: प्रश्नको छनोटका लागिविशिष्टिकरण तालिका(Table of specification for item selection)

विषयवस्तुको क्षेत्र **(Content domain)**	मापदण्ड सङ्ख्या **(Criteria No.)**	भार **(Weightage)**	जम्मा पूर्णाङ्क**(Marks)**	विभिन्नस्तरमा अङ्क विभाजन**(Weightage for items of various standards)**
पढाइ (शब्द भण्डारसमेत)		60%	48	प्रत्येक स्तरको भार देहायको प्रतिशतको नजिक हुनेछ ।

लेखाइ (शब्द भण्डार तथा कार्यमूलक व्याकरण र वर्ण विन्याससमेत)		40%	32	Level 1: 10%,Levels 2: 20%, Level 3: 20% Level 4: 20%, Level 5: 20%, Level 6: 10 %
Total		100%	80	

द्रष्टव्य :

१. प्रति प्रश्न १ अङ्क आउने उत्तर छनोट गरिने (SR) बहुवैकल्पिक प्रश्नहरू १८ देखि २४ ओटा र प्रति प्रश्न १ अङ्क आउने उत्तर अति छोटो उत्तर आउने रचना गर्नुपर्ने प्रश्न (CR items) ६ देखि १२ ओटा हुनेछन् भने कूल अङ्क ८० हुनेगरी अङ्क भारअनुसार रचना गर्नुपर्ने (CR) २, ३ वा ४ अङ्क आउने प्रश्नहरूको सङ्ख्या १६ देखि २४ हुनेछन् ।

२. प्रत्येक क्षेत्रबाट प्रश्नहरू छनोट गर्दा उत्तर छनोट गरिने (SR) र रचना गर्नुपर्ने प्रश्न (CR items) दुवै खालका प्रश्नहरू समावेश गरिनु आवश्यक छ ।

यहाँ विचार पुऱ्याउनु पर्ने कुरा के छ भने तालिकामा दिइएको विभिन्न स्तरको भार प्रारम्भिक मात्र हो । वास्तविक भारको गणना विद्यार्थीको उत्तरसमेतलाई आधार मानी स्तर निर्धारणसम्बन्धी विधिहरूमध्ये कुनै एक विधि प्रयोग गरी प्रत्येक स्तरको न्यूनतम अङ्क (Cut score) निर्धारणबाट गर्नु पर्नेछ । माथि सुझाव गरिएको वर्गीकरण र भारले एकातिर प्रत्येक स्तरका लागि प्रश्नहरू छनोट गर्न सहयोग गर्दछ । प्रश्नपत्र विकास र छनौट गर्दा ६ ओटा स्तर (तालिका ३.४)का साथै संज्ञानात्मक क्षेत्र (तालिका ३.५)को समेत प्रतिनिधित्वहुनु आवश्यक छ ।

Chapter 4: Assessment Framework for Science (Grade 10)

4.1 Introduction

There are direct as well as indirect effect of scientific theories, principles and innovations in various aspects of human life (CDC, 2072). More over science has been considered as one of the bases developments; particularly the development of technology including information communication technology reinforces economic development. Viewing the importance of science in human life and development Science has been included as one of the core subjects in school curriculum in Nepal. There are four content domains in Science curriculum of grade 9 and 10. There are – Physics, Chemistry, Biology, and Geology and Astronomy.

National Assessment of Student Achievement (NASA) for Grade 10 is designed to assess the curricular competencies of the approved curriculum of respective subject for Nepali school. Science is one of the compulsory subjects throughout the school curriculum. This chapter presents the analysis of curriculum approved by the government of Nepal for Grade 10 in Science focusing on curricular competencies and expected performance of the students after completion of the study. While analysing the curriculum of Grade 10 in Science for defining domain and contents to be tested vertical sequence and performance level at least from Grade 8 up to the Grade 10 has been analysed, particularly the competencies of grade 9 and 10 in Science taken into consideration. It indicates that this assessment of grade 10 students is not confined with the only the objectives and contents of grade 10 curriculum rather suggest to assess the overall Science competencies of grade 10 completed students looking at the overall School Science programme of Nepal.

After analysing the curriculum, this chapter identifies domain and construct to be tested in Mathematics so that the assessment will be designed to measure students' performance against the curricular competencies. Based on the analysis and domain and contents it defines the criteria and six standards in each criteria in a hierarchical order of complexity of competencies. Finally, it discusses the various levels of cognitive domain to be performed by the students and suggest a test blue print that is, a table of specification for item construction.

4.2 Defining the Content Domain

Science subject has been included as a compulsory subject in Nepali schools. Overall objectives of teaching science is to develop the basic knowledge and understanding of scientific concepts, principles and laws so that these knowledge and understanding will be applied in daily life. It plays vital role in the development of scientific attitude, training on scientific method and creativity. Efforts of science are concentrated towards the development of science and technology literacy among all students. It imparts the skill of observation, inquiry and develops competence in enhancing knowledge and skill for the solution of problem in the daily life (CDC, 2012). Similarly, School Science is also is an essential for vertical (higher study) as well as horizontal (study of other subject) educational success. In doing so, four content domains of grade 9 and 10 curriculum has considered as the content domain for the assessment.

The general competencies in Science of grade 9 and 10 are as follows (CDC, 2072BS):

1. Understand the nature of science and develop positive attitude towards science;
2. Demonstrate the understanding of basic concepts, theories and principles of science through scientific investigation;
3. Demonstrate necessary skills, investigation capacity and scientific attitude for the study of science subject;
4. Identify the environmental substances and describe their characteristics using scientific knowledge and skills;
5. Demonstrate the understanding of and identify with the ways of minimising the effects on environment due to natural and human activities;
6. Describe the understanding of the relation between science and human life;
7. Demonstrate the capacity to classify, draw, level, describe and sequence the certain models in science;
8. Demonstrate the attitude towards the accepting any idea and facts with the scientific reasons;

9. Evaluate the effects of science and technology to individual, society and environment;

10. Demonstrate the habit to assess any evidence and information with certain criteria;

These level-wise curricular competencies are general in nature. To make them more specific and workable competencies, learning objectives of each content domain for each of the grades 9 and 10 has been identified in the curriculum of Science for grade 9 and 10. The content domains and learning outcomes of grade 9 and 10 curriculum are presented in the table 4.1 (CDC, 2072BS)., which will help specify the above competencies.

Table 4.1: Content Domain and learning outcomes of Grade 9 and 10 Science

Content Domain	**Area (sub-domain)**	**Learning outcomes (Grade 9)**	**Learning outcomes (Grade 10)**
1. Physics	**1.1 Measurement**	• Define fundamental and derived units and describe their interrelationship.	
	1.2 Force and motion	• Define and demonstrate inertia and momentum of an object in the state of rest and motion. • Explain and use Newton's law of motion. • Identify differences between balanced and imbalanced force. • Describe the relation of velocity, acceleration and distance of an object in the state of rest and motion, and solve the related simple mathematical problems.	• Explain Newton's law of gravitation. • Differentiate between gravity and gravitational force. • Differentiate between mass and weight. • Express the unit of weight and mass. • Measure the mass of different objects. • Explain the freefall and weightlessness of an object.
	1.3 Pressure		• Demonstrate liquid pressure. • Verify Pascal's law. • Explain the use of Archimede's principle in daily life with example. • Demonstrate the law of floatation. • Introduce and explain the use of atmospheric pressure
	1.4 Machine	• Explain the principles of momentum in lever with example. • Derive the formula of mechanical advantage, velocity ratio and efficiency of simple machine (lever, pulley, inclined plane, and	

		wheel and axle) and solve the related mathematical problems.	
	1.5 Work, Energy and Power	• Identify different types of energies (potential energy, kinetic energy etc.). • Explain interrelation of work, energy and power, and explain human power. • Solve the mathematical problems related to work, power and energy.	• Define and describe energy with examples. • Explain the sources of energy and their uses. • Explain sun as major source of energy. • Describe the ways of the solution of energy crisis with identifying the problems of energy crisis. • Explain the alternative sources of energy and use in daily life. • Explain the ways for conservation of energy with example.
	1.6 Heat and temperature		• Demonstrate the differences between heat and temperature. • Explain and use the thermometers. • Solve the mathematical problems related to heat.
	1.7 Light	• Demonstrate the refraction of light. • Explain the use of light waves (X-ray, ultraviolet ray) of different frequency.	• Introduce lens and explain its use in daily life. • Demonstrate propagation of light in lens and draw figures of it. • Introduce optical instruments and explain their uses.
	1.8 Sound	• Explain the nature of sound wave. • Identify the infra, audible and ultra sound wave and their sources. • Explain the reflection and refraction of sound with example and describe their effects in daily life. • Demonstrate the loudness and pitch of sound and determine the velocity of sound.	
	1.9 Electricity and Magnetism	• Express electricity units – ampere, volts, watt, Ohm and use them in measurement. • Demonstrate ohms law and relation of ampere, volts and ohm. • State the factors affecting the resistance of electric circuit. • Compare / Measure the conductivity of different	• Explain the effects of current electricity with example. • Introduce electrical and magnetic devices used in daily life and explain their uses. • Explain the safety measures during the use of electricity. • Solve simple numerical problems related to billing of electric consumption.

		objects. • Define and demonstrate magnetic field and magnetic line of force. • Explain the elements of terrestrial magnetism.	
2. Chemistry	**2.1 Classification of elements**	• Demonstrate and explain atomic structure and electronic configuration in element. • Define valeancy as combining capacity of elements. • Explain ion and radical with example. • Write molecular formula of the simple compounds.	• Explain the elements in periodic law and periodic table.
	2.2 Chemical reaction	• Describe the method of writing chemical equation and write chemical equation. • Explain chemical bonds with example.	• Classify different types of chemical reactions. • Write chemical change in the form of chemical equation. • Explain the factors of chemical change and catalyst.
	2.3 Solubility	• Prepare unsaturated and saturated solution. • Define super saturated solution. • Define solubility. • Explain the relation of solubility and temperature. • Explain the process of crystallization.	
	2.4 Acid, Base and Salt		• Define acid, base and salt with example. • Explain and demonstrate the general properties of acid, base and salt and use in daily life. • Write formula equation of neutralization reaction between acid and base and balancing it.
	2.5 Some gases	• Prepare Hydrogen, Oxygen and Nitrogen gases and explain their properties. • Explain the uses of Hydrogen, Oxygen and Nitrogen gases.	• Prepare carbon dioxide and ammonia gases and explain their properties.
	2.6 Metals	• Differentiate between metal and non-metal. • Explain the role of metal in organism (Zinc as enzyme, Importance of sodium and	• Explain important metals (Iron, Aluminium, Copper, Gold, Silver) found in the nature. • Identify the physical properties of these metal and explain them.

		potassium ions, negative effects of mercury and lead in body). • Explain general properties of metal.	• Explain the use of metals in daily life.
	2.7 Carbon and its compound	• Identify and demonstrate the presence of carbon in simple objects (wood, sugar, oil etc.). • Explain the physical and chemical properties of carbon. • Differentiate between organic and inorganic compounds.	• Introduce the form of some simple types of hydrocarbons and their compounds (Methane, Alcohol, Glycerol, Formaldehyde, and Sucrose) and explain their uses.
	2.8 Water	• Explain the sources, properties and use of water. • Explain the method of removing hardness of water with chemical equation.	
	2.9 Chemical used in daily life	• Explain the type of fertilizers containing Nitrogen, Phosphorous and Potassium containing fertilizers and their utility.	• Introduce cement, lead, fibre, ceramics, plastic, soap, detergent and insecticide and mention their uses. • Explain the role of compost fertilizer in agriculture. • Explain chemical pollution due to plastic, chemical fertilizer, fibre, colour and insecticides. • Analyse the effects of chemical fertilizers used in own context. • Identify degradable and non-degradable wastes, demonstrate and use them.
3. Biology	**3.1 Plant and animal**	• Classify plants (up to division) and animals (up to phylum) and explain their properties with suitable examples. • Explain life cycle of mosquito with figure. • List the negative impacts of mosquito bite to human being.	• Explain the body structure and life cycle of the silkworm and honey bee. • State the utilities of the silkworm and honey bee.
	3.2 Asexual and Sexual Reproduction		• Describe various methods of asexual and sexual reproduction that takes place in plants and animals with examples. • Explain the importance of asexual and sexual reproduction. Explain the artificial methods of vegetative reproduction in plants

	3.3 Chromosomes		• Describe chromosomes with their structure, types and functions. • Explain the method of sex-determination.
	3.4 Blood Circulatory System in Human Body		• Describe the composition and functions of blood. • Describe the circulatory system in the human body and various figures. • Introduction of blood pressure, blood sugar and uric acid.
	3.5 Adaptation of organisms	• Explain adaptation of plants and animals with example. • Introduce microorganisms (virus, bacteria, fungi and protozoa) and list the diseases caused by these microorganism.	
	3.6 System	• Explain the relation of cell, tissue and organ. • Explain the types of plant tissue and their location in plant. • Illustrate the functions of human skeleton. • List and classify the different bones in human skeleton. • Introduce respiratory system and excretory system and explain their importance.	
	3.7 Sense organs	• Explain the simple structure and function of sense organs in human body.	• Describe the structure and functions of the brain, nerves (sensory and motor) and their relationship in human body. • Describe the reflex action in human beings. • Introduce the endocrine system and explain its function in the human body.

	3.8 Evolution of life	• Explain in brief about history and theories of the evolution of life.	• State Mendel's laws and experiments with genetic charts. • Identify dominant and recessive traits. • Enlist the causative factors of inheritance and describe the process of inheritance of characteristics.
	3.9 Nature and environment	• Explain the biotic and abiotic factors (air, light, temperature, soil, water and living organism) affecting plants and animals, and list the adverse effects of climate change in plants and animals. • Explain the interrelationship between autotrophy and heterotrophy in plants and animals. • Explain the dependency of human beings on plants and other living beings to fulfil their fundamental needs (food, shelter, and clothes).	• Explain causes, effects and preventive measures of air pollution, water pollution and soil pollution and behave accordingly. • Explain the methods of conservation and management of forests and water resources.
4 Astronomy and Geology	**4.1 Natural disaster**	• Introduce natural andhuman-induced disaster and explain the process of disaster management. • Explain the causes, effects and preventive measures of natural disaster.	
	4.2 Green house	• Introduce green house and explain the effects of green house in natural environment, and explain the importance and utility of artificial green house. • Introduce climate change and describe cause and effects, and use the ways to reduce the impact of climate change in daily life.	
	4.3 Earth in the universe	• Explain annual and daily motion of the earth. • Explain the phases of moon. • Describe the relation of	• Describe the structure of the Solar System with diagram. • Describe comets and meteors found

		situation of moon, earth and sun • Explain the structure of umbra and penumbra with diagram. • Explain the causes of solar and lunar eclipse with figure	in the solar system. • Describe galaxies with diagrams. • Describe constellations with diagrams. • Evaluate the factors related to constellation scientifically. • Describe natural and artificial satellite.
	4.5 History of the Earth		• Explain the history of the Earth studying rocks and fossils. • Describe the evolution of living beings on the basis of the evidence of fossils. • Interpret the mechanism of fossilization and formation of fossil-fuel by identifying fossils. • Describe the importance of mineral fuel.
	4.6 Atmosphere and climate change		• Describe the different layers (with ozone layer) of the atmosphere. • Mention the national and international practices for mitigation and adaptation of climate change. • Describe the effect of chlorofluorocarbons on the ozone layer. • Interpret the adverse effect of some gases expelled by industries.

Analysing the curriculum of grade 9 and 10 the following table is prepared the weightage of each content domain. Further, some content domain having the weightage percentage less than 10% have been combined to facilitate for the comparison.

Table 4.2: Content domains and their weightage for science in Grade 10

Content Domain		**Weightage (%)**
Physics	Motion Pressure, and energy, Physical properties around us, Electricity and magnetism,	30
Chemistry	Structure and property of matter, Matters around us, Chemicals used in daily life	30
Biology	Living beings, evolution of life, Nature and environment	30
Geology and Astronomy	Geo and geographical activities, Universe	10
Total		100

4.3 Criterion and Standards

For NASA 2019, 23 criteria and 6 standards in each criterion are defined. Criteria generally tell what should be the expected competencies, but it does not tell how well the students demonstrate the competencies. The standards in each criterion describe different level of competencies and therefore standards tell how well the students demonstrate the competencies. As per the curriculum 23 criteria have been identified for assessing the students' performance of Science in Grade 10 for which in each criterion six standards have been defined according as the depth of knowledge and skills as well as complexity of related concepts. The following table presents the standards and general description of standards of Science in Grade 10. Three standards Basic, Proficient and Advance are categorised first and then these three standards are further categorised into six levels of standard: levels 1 and 2 for basic; levels 3, 4 and 5 for proficient; and level 6 for advance.

General Standards

Three to six or more than six standards have been defines by different assessment agencies as well as assessment related literatures. Three standards: basic, proficient and advance or four standards: below basic, basic, proficient and advance have widely been used. We have also identified three standards: Basic, proficient and advance and then these three categories are further categorised into six levels: levels 1 and 2 for basic, levels 3, 4 and 5 for proficient; and level 6 for advance. The idea of general standards of six levels has been developed studying several practices and works on standards based assessments for example, the University of the state of New York's four levels of performance standards for grade 8 : level 1, 2, 3 and 4 (The University of the state of New York, 2014); PARCC's five levels: does not meets expectations, partially meets expectations, approaches expectations, meets expectations, exceeds expectations (See, PARCC, 2016,http://parccinc.org/); PISA's six levels of Science performances (See, OECD, 2015); three standards are discussed by several testing agencies and literatures (eg, PCAP, 2016; IEA, 2015).

Table 4.3: General Standards and their Descriptors for Grade 10 in Science

Standard	Levels of Standards	General Descriptors	General Descriptors for Science	Remarks
Basic Students demonstrate partial	Level 1	Students demonstrate **basic pre-requisite** knowledge and skills needed for Grade 8	• Name the devices and unit to measure some physical quantities define force, pressure, up thrust, source of energy, refraction of light, electricity and its sources with example and	

mastery of prerequisite knowledge and skills that are essential for proficient work at the grade.		curriculum.	draw labeled diagram of electric circuit. • Introduce periodic table, chemical reaction and hydrocarbons with appropriate example. Define acid, base and salt, write molecular formula and molecular weight of carbon dioxide and ammonia gas. Similarly, identify the metals, nature of carbon and list the chemicals used in daily life with their purpose. • Mention stages of life cycle of insects, reproductive organs of human and flowering plants and components of environment. Identify the silk worm and the honey bee, position of the heart, placement of chromosome and define body system and environment. • Explain stimulus and response, characteristics and pumping of blood and similarities between offspring and their parents. • Introduce rock, fossils, evolution, atmosphere, green house, universe, planets and satellites.	
	Level 2	Students demonstrate **limited basic** understanding of knowledge and skills set forth in the curriculum.	• Identify causes of gravity, uses of thermometric liquid write the mathematical relation of weight and mass. Define gravity, gravitational acceleration, and liquid pressure, sources of energy, heat, temperature, lens & related terminologies. Similarly state laws related to pressure and introduce the effects of current electricity and different types of home appliances. • Identify the position of groups, periods, blocks, metal, non-metal, metalloids, inert gas, etc. in periodic table and write the molecular formula of compounds. • Classify the different chemicals into acid, base and salt and list the physical properties of carbon dioxide, ammonia gas and metals and write carbonic bond and raw materials used to manufacture cement, glass, fiber, ceramics, plastics, soap. • Introduce apiculture, sericulture and Mendel's study, define nervous system, glandular system, chromosome, reproduction, heredity variation and pollution. • Identify the composition of blood types of blood vessels, heart beat and function of chromosome. similarly, state type of asexual reproduction and explain the function of major parts of a flower and effects of human activities on environment • Define geological time scale, methods / tools to find the age of rocks, different layers of atmosphere and natural green house and identify stars, galaxy, comets, and constellations in the sky with appropriate examples.	

Proficient Students demonstrate competency over subject matter, including subject-matter knowledge, application of such knowledge to real-world situations, and analytical skills appropriate to the subject matter.	Level 3	Students demonstrate **adequate** understanding of knowledge and skills set forth in the curriculum and demonstrate **partial proficiency** in applying such knowledge and skills.	• Identify the nature of gravity, method of conservation of energy, define power of lens and electromagnetic Induction and differentiate between mass and weight, gravity and gravitation' renewable and non-renewable sources of energy, thermometers on the basis of thermometric liquids used (including their uses), heat and temperature, concave lens and convex lens. • State the Newton's law of gravitation, show the relation between densities of liquid and up thrust and describe the applications of laws of pressure and electrical home appliances. Similarly, explain the precautions to be taken while using electrical appliances in the daily life. • State the periodic law and differeciate between Mendeleev's and modern periodic table and carbon dioxide and ammonia gas. Write simple word equation of chemical reaction, name of ores of metals. • Describe the physical properties of acid, base and salt, list the general indicators the structure hydrocarbons and explain the application and effects of chemicals in the environment and uses of both carbon dioxide and NH_3 gas. • Write types, external morphology & scientific name of silk worm and honey bee, importance of cocoon and organization of the colony of honey bee, functions of nervous system and parts of the human brain, parts of heart, types and functions of chromosomes and sex determining factors, basic features of sexual reproduction, function of blood, differences between artery and veins, exocrine and endocrine gland and significance of asexual reproduction. • Draw the chart showing the components of nervous system involved in human body and define unisexual & bisexual organisms, types of variation, genetics, gene and reflex action, state the types of pollution and their sources and describe the methods of asexual reproduction, conservation of forest, water resources, different contrasting traits in pea plants studied by Mendel, dominant & recessive traits / genes. • Explain origin of the earth, comets, meteors and asteroids, differentiate between planet and star, meteor and meteorites and identify the effects of ozone layer depletion and greenhouse effect. • Prove the relation $F = G M_1M_2/d^{2,}$ explain and demonstrate freefall and verify laws of pressure and describe the sun and energy crisis. • Draw the ray diagram for images formed by lens and point out the natures of the	

			image,explain the use of lenses, types of defects of vision in the human eye, structure and application of generator and electric motor, different types of thermometers and the specific heat capacity. • Write the electronic configuration, group, period, block, and valeancy and explain the types of chemical reactions, uses of acid, base, and salt, nomenclature of simple hydrocarbon and role of compost manure. • Define catalyst and other factors affecting chemical reaction, demonstrate the use of indicator, write differences between base and alkali and describe lab preparation of gases, uses of metals, physical properties of hydrocarbons and pollution due to chemicals. • Mention the precautions used & importance of in Sericulture and types, secretions & functions of glands, the pulmonary and systemic circulation, the effects and economic importance of some insects. • Describe neuron, human brain, flower and sexual reproduction of animals, life cycle of some insects with appropriate figures, Mendel's experiment, gene, variation and different types of environmental pollutions. • Identify the structure and functions of every components of blood. Differentiate between artery, veins and capillaries according to their structure and placement, sexual & asexual reproduction, self & cross pollination, variation and mutation, similarly, define autosomes and sex chromosomes with structure, genotype and phenotype, state types of vegetative propagation with uses, explain the sex determination process and importance of water.	
	Level 4	Students demonstrate **adequate proficiency** in understanding of and ability to apply knowledge and skills set forth in the curriculum	• Identify the nature of gravity, method of conservation of energy, define power of lens and electromagnetic Induction and differentiate between mass and weight, gravity and gravitation' renewable and non-renewable sources of energy, thermometers on the basis of thermometric liquids used (including their uses), heat and temperature, concave lens and convex lens. • State the Newton's law of gravitation show the relation between densities of liquid and up thrust and describe the applications of laws of pressure and electrical home appliances. Similarly, explain the precautions to be taken while using electrical appliances in the daily life. • State the periodic law and differeciate between Mendeleev's and modern periodic table and carbon dioxide and ammonia gas. Write simple word equation of chemical reaction, name of ores of metals.	

			• Describe the physical properties of acid, base and salt, list the general indicators the structure hydrocarbons and explain the application and effects of chemicals in the environment and uses of both carbon dioxide and NH_3 gas. • Write types, external morphology & scientific name of silk worm and honey bee, importance of cocoon and organization of the colony of honey bee, functions of nervous system and parts of the human brain, parts of heart, types and functions of chromosomes and sex determining factors, basic features of sexual reproduction, function of blood, differences between artery and veins, exocrine and endocrine gland and significance of asexual reproduction. • Draw the chart showing the components of nervous system involved in human body and define unisexual & bisexual organisms, types of variation, genetics, gene and reflex action, state the types of pollution and their sources and describe the methods of asexual reproduction, conservation of forest, water resources, different contrasting traits in pea plants studied by Mendel, dominant & recessive traits / genes. • Explain origin of the earth, comets, meteors and asteroids, differentiate between planet and star, meteor and meteorites and identify the effects of ozone layer depletion and greenhouse effect. • Prove the relation $F = G M_1M_2/d^{2,}$ explain and demonstrate freefall and verify laws of pressure and describe the sun and energy crisis. • Draw the ray diagram for images formed by lens and point out the natures of the image,explain the use of lenses, types of defects of vision in the human eye, structure and application of generator and electric motor, different types of thermometers and the specific heat capacity. • Write the electronic configuration, group, period, block, and valeancy and explain the types of chemical reactions, uses of acid, base, and salt, nomenclature of simple hydrocarbon and role of compost manure. • Define catalyst and other factors affecting chemical reaction, demonstrate the use of indicator, write differences between base and alkali and describe lab preparation of gases, uses of metals, physical properties of hydrocarbons and pollution due to chemicals. • Mention the precautions used & importance of in Sericulture and types, secretions & functions of glands, the pulmonary and systemic circulation, the effects and economic importance of some insects.	

			• Describe neuron, human brain, flower and sexual reproduction of animals, life cycle of some insects with appropriate figures, Mendel's experiment, gene, variation and different types of environmental pollutions. • Identify the structure and functions of every components of blood. Differentiate between artery, veins and capillaries according to their structure and placement, sexual & asexual reproduction, self & cross pollination, variation and mutation, similarly, define autosomes and sex chromosomes with structure, genotype and phenotype, state types of vegetative propagation with uses, explain the sex determination process and importance of water. • Explain geological timescale, depletion of ozone layers and acid rain.	
Advance Outstanding performance with adequate level of abstraction.	Level 5	Students demonstrate **thorough proficiency** in understanding of and ability to apply knowledge and skills set forth in the curriculum including the combining more than on relations together for solving the problem.	• Prove the relation $g \propto 1/R^2$ and solve the numerical problems related to gravitational force, pressure, heat, light and electricity. • Explore the importance of atmospheric pressure in daily life and mention its application, causes and methods of reducing energy crisis, explain transformer and hydroelectricity in the context of Nepal. Similarly, derive heat equation and draw the ray diagram for vision of human eye. • Compare the reactivity of elements, write the chemical properties of acid, base and salt, lab preparation, chemical properties and uses of gases, uses of metals and hydrocarbons. • Describe the procedure of preparing cement, ceramics, glass, soap, compost manure and classify the glass, fiber, plastic, pesticides, fertilizer into different types • Define various syndromes, chromosome disorder, monohybrid cross, and dihybrid cross, describe artificial methods of vegetative propagation, pollination & fertilization, Mendel's laws of inheritance, human activities for pollution, and control measures of pollution and significance of Mendelism. • Describe evolution of life, ozone layer depletion, and atmosphere climate change with methods of conservations and solar system.	
	Level 6	Students demonstrate **advance** ability to apply knowledge and skills set forth in the curriculum in a new and unfamiliar situation, and ability to combine and use various relations and components of knowledge and skills in order to solve the problems and develop a new relation.	• Explore the application fields of Newton's law of gravitation, freefall and weightlessness, energy crisis and its challenges to solve it, application field of thermometric liquids and analyze the relation between the density of liquid and the atmospheric pressure. • Compare the metals used in different utensils with specific heat capacity, draw the ray diagrams for different optical instruments and demonstrate the electromagnetic induction and motor effect. • Write the electronic configuration of d and f-block elements, demonstrate some chemical reactions and show the effect of catalyst on	

			them, neutralization reaction with balanced chemical equation and apply it in daily life, lab preparation and application of CO_2 and NH_3 gas and the ways of managing waste materials according to their nature, arrange the given metals according to their reactivity and describe purification of metals. • Explain genetic problems, double fertilization, sex-linked diseases, Eco green city compare heredity character of own family members and trace out the dependency of human species in natural resources. • Draw the conclusion from history of the earth, analyze the effect of changing pattern of our life style on the environment and vice-versa and possibility of life in other planets and identify the possible constellations and major planets in the sky and compare their position.	

Content area, criteria and standards

As mentioned earlier, three standards Basic, Proficient and Advance have been categorised further into six levels of standards: level 1, 2, 3, 4, 5 and 6 in a hierarchy of depth or complexity of knowledge, skills and application in each of the 23 criteria for Science in grade 10. The similar types of six categories of proficiencies have also been used in PISA (see, OECD, 2015). The following table shows the content areas, criteria and standards to each criterion for Grade 10 in Science in which the items for NASA 2019 to be developed using these criteria and standards.

Table 4.4: Content domain, criteria and standards of Science in grade 10 for NASA, 2019

Physics

Criteria	**Standards**					
1.	**Basic**		**Proficient**			**Advance**
Explanation of Newton's law of gravitation, freefall and weightlessness.	**1**	**2**	**3**	**4**	**5**	**6**
	Name the devices, which are used to measure mass and weight in daily life. *Q: Which devices are used to measure the mass and weight of a body?*	• Identify the cause of falling every object towards the earth surface. • Mention the mathematical relation of weight and mass of an object with their units. • Define gravity and acceleration due to gravity. *Q: Write the factors on which gravity of planets depend?*	• Identify the nature of pulling force of earth. • Differentiate between mass and weight with suitable examples. • Differentiate between gravity and gravitation. • State the Newton's law of gravitation. *Q: Differentiate between mass and weight in two points.*	• Prove $F = G M_1M_2/d^2$ • Explain and demonstrate of freefall and weightlessness with suitable examples. *Q: Prove the relation between the gravitational force produced between any two objects and their masses?*	• Prove: $g \propto 1/R^2$ • Calculate the numerical problems related to gravitation, weight and acceleration of gravitation. *Q: Calculate the acceleration due to gravity of the earth. ($M= 6x10^{24}$ kg and R= 6400 km)*	• Explore the application fields of Newton's law of gravitation, freefall and weightlessness. Q*: Relate the Newton's law of gravitation with the tides occurred in the earth during a month.*
2. Explanation of Pascal's law, Archimedes principle, law of floatation and atmospheric pressure	- Define Force, Pressure and up thrust with units - Name the instrument used to measure pressure. *Q: What is pressure? Name an instrument to measure it.*	- Define liquid pressure - State Pascal's law, Archimedes's principle and Law of floatation. - *State Pascal's Law.*	- Show the relation between density of liquid and Up thrust - Describe the applications of Pascal's law, Archimedes's principle and law of floatation Q*: What are the applications of hydraulic press?*	-Demonstrate and verify Archimedes principle & law of floatation. -Differentiate between Archimedes's principle and law of floatation. Q: *Verify Archimedes principle with a*	- Explore the importance of atmospheric pressure in daily life and mention its application. - Solve numerical problems related to Pascal's law and Archimedes' principle Q: *The weight of a piece of stone when immersed in water is 16N and displaces 5N of water,*	- Analyse the relation between the density of liquid and the atmospheric pressure. Q*: Why the water pump can uplift easily the water up to the height of 8m but not up to 15m from the water level?*

				suitable labelled diagram.	-*What is the real weight of stone in air?* -*Calculate the mass of water displaced if 1kg is equal to 10N.*	
3. Explanation of different sources of energy and energy crisis.	-Define the source of energy. - List the sources of energy found in nature. Q: *What is meant by source of energy? Give an example.*	-Define different types of sources of energy with examples. Q: *Define alternative sources of energy with two examples.*	-Identify the method of conservation of energy. -Differentiate between renewable and non-renewable sources of energy. Q: *Write two differences between renewable and non-renewable sources of energy.*	- Describe the sun as an ultimate source of energy. -Clarify the concept of energy crisis. Q*: Hydropower is also the indirect product of solar energy, Justify.* .	- State the causes of energy crisis and show the methods to reduce the energy crisis. -Explain the hydro power as the best source of energy in the context of Nepal Q*: Write two ways to solve energy crisis in context of Nepal.*	-Explore the energy crisis as a major problem in today's world and its challenges to solve it. Q '*Industrialization and urbanization cause energy crisis' Justify this statement. Explain how such development activities have to be continued without putting stress in the non-renewable sources of energy.*

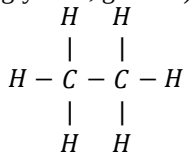
4. - Explanation & measurement of heat and temperature.	Name the devices used to measure heat and temperature. *Which devices are used to measure heat and temperature?*	- Define heat and temperature on the basis of molecular theory. - Identify the thermometric liquid with their use. *What are heat and temperature?*	Differentiate between thermometers on the basis of thermometric liquids used (including their uses). Differentiate between heat and temperature *Give any two differences between heat and temperature.*	Explain the specific heat capacity with units and examples Explain the structure & use of clinical thermometer, digital thermometer and maximum minimum thermometer. *Explain the structure of maxim-minimum thermometer with a well-labelled diagram.*	Derive heat equation. Solve the numerical problems related to heat equation. *Calculate the amount of heat required to increase the temperature of 1500 gm of water through 15^0C.* *(specific heat capacity of water 4200 J/kg^{0}C)*	Explore the application field of thermometric liquids. Compare the metals used in different utensils with Specific heat capacity. . *Why is copper laminated water pipe used in the solar water heaters rather than iron? Explain it on the basis of specific heat capacity.*
5. -Identification of lens and its uses in optical instruments.	Define and Demonstrate Refraction of Light. *What are the laws of refraction of light?*	-Define concave lens and convex lens & different terminologies related to lens. *What is focal length?*	-Differentiate between concave lens and convex lens. - Differentiate between focus of concave lens and convex lens. - Define power of lens. *Write any two differences between convex and concave lens.*	-Draw the ray diagram of images formed by the convex and concave lens placed at different positions before them and point out the natures of the image thus formed. -Explain the use of lenses according to their nature. - Explain the different types of defects of vision in the human eye. *Draw the ray*	- Draw the ray diagram of defective and corrected eyes. *Explain the causes and correction of short-sightedness with the help of suitable diagram.*	- Draw the ray diagrams for different optical instruments. *Explore the functions of lens used in microscope.*

				diagram of convex lens showing virtual and highly magnified image		
6. -Explanation of the current electricity, its uses, precautions and electric device based on electromagnetic induction.	Define Electricity and its sources. Draw the electric circuit and label it. Name different electrical devices. *Mention any three electrical devices used at your home* for various purposes.	List the effects of current electricity. Introduce the different types of home appliances . *Mention the effects of current electricity.*	-Describe the application of electrical home appliances. -Explain the precautions to be taken while using electrical appliances in the daily life. Define Electromagnetic Induction. *Write any two differences between fluorescent and filament lamp.*	-Explain the structure and application of generator and electric motor *Explain the working principle of generator and electric motor and show that these principles are reverse to each other.*	-Explain transformer with its types and explain its working principle. -Calculate the electric bill and solve the numerals related to transformer. *A transformer with 5500 input windings is connected to an AC source of 220 V to get 400V. Calculate the number of turns required in another coil.*	Demonstrate the electromagnetic induction and motor effect. Importance of transformers for the domestic supply *Why the transformer gets fused in the evening time? Explain*

Chemistry

Criteria	Standards					
7. Introduction of periodic laws and explaination of the position of different elements in the periodic table	**Basic**		**Proficient**		**Advance**	
	1	**2**	**3**	**4**	**5**	**6**
	– Introduce periodic table and mention its importance *Eg : What is periodic table?*	– Identify the position of groups, periods, blocks, etc. – Show the position of metal, non-metal, metalloids, inert gas, etc. *Eg : What is the position of d-block elements in the modern periodic table*	– Mention the periodic law of both modern and Mendeleev's periodic table – Show the differences between the characteristics of modern and Mendeleev's periodic table *Eg: Why is modern periodic table more scientific than Mendeleev's periodic table? Write any two reasons.*	– Write the electronic configuration of the basic 20 elements – Recognize the group, period, block, valency on the basis of electronic configuration of any atom *Eg : Write the electronic configuration of calcium (Ca) and mention the group, period of it in aperiodic table.*	– Compare the reactivity of elements having same period and group separately. *Eg: Which element is more reactive between sodium and potassium? Why?*	– To write the electronic configuration of d and f- block elements (Correct order of energy level) *Eg: Write the electronic configuration of copper (Cu). Why is it called transition metal?*
8. Classification of different types of chemical reaction and identification of the balanced chemical equation along with the factors affecting rate of chemical reaction.	– Introduce chemical change and chemical reaction with examples	– Calculate the valency, simple radicals – Write the molecular formula of the given compounds by using criss cross method	– Write simple word equation of chemical reaction	– Explain the types of chemical reactions with examples – Define catalyst and other factors that bring chemical change with example	– To write the balanced chemical equation of chemical change	– Demonstrate some chemical reactions and show the effect of catalyst on them
	Write two characteristics of	*Write the molecular formula of sodium*	*When lime stone is heated, it changes into*	*Give one example of displacement reaction*	*What happens when calcium carbonate is*	*How does green plant prepare their food?*

	chemical change.	*carbonate.*	*lime and carbon dioxide. Express it into word equation*		*treated with hydrochloric acid? Write with balanced chemical equation*	*Show it with balanced chemical equation*
9. Introduction of acid, base and salt with their properties and explanation of neutralization reaction.	– Define acid, base and salt *Mention one example of each acid, base and salt*	– Classify the different chemicals into acid, base and salt which are used in our daily life *Why is Lime called base?*	– Describe the physical properties of acid, base and salt. – List the general indicators used to identify acid, base and salt. *Illustrate any 2 physical properties of acid*	– Explain the uses of acid, base and salt – Demonstrate the method of separation of acid, base and salt by using indicators – Differentiate between base and alkali. *Write two difference between base and alkali.*	– Write the chemical properties of acid, base and salt with equation. – Explain with chemical equation, the process of formation of acid, base and salt *Describe any one method of preparing salt with chemical equation*	– To demonstrate the neutralization reaction with balanced chemical equation and apply it in our daily life. *Explain one neutralization reaction that occur in our daily life*
10. Explanation of the process of lab preparation and properties of carbon dioxide and ammonia gases along with their test and uses.	– To write the molecular formula and molecular weight of carbon dioxide and ammonia gas *Calculate the molecular weight of NH_3 gas.*	– List the physical properties of carbon dioxide and ammonia gas *Write any two physical properties of ammonia gas.*	– Differentiate between the carbon dioxide and ammonia gas on the basis of physical properties – Mention the uses of both carbon dioxide and NH_3 gas *Ammonia gas is not collected by downward displacement of water, Why?*	– Describe the process of lab preparation of both gas with figure *Draw a labelled figure to show the lab preparation of CO_2 gas in the laboratory*	– List the chemical properties of both CO_2 and NH_3 gas along with their test. – Write the balanced chemical equation for the lab preparation of NH_3 gas. *What happens when carbon dioxide gas is passed in lime water for a short time?*	– Demonstrate the lab preparation and application of CO_2 and NH_3 gas *How can you demonstrate lab preparation of ammonia gas?*

11. Explanation of major metals like iron, aluminium, copper, gold and silver with their physical properties and uses in our daily life	– Identify the metals obtained in the nature *List the name of metals used in our daily life.*	– List the physical properties (colour, density, b.p / m.p) of the metals (given) *Which metal has lowest density among iron, gold, silver, aluminium and copper*	– Write the name of ores of each given metals *Write two major ores of iron and silver.*	– Describe the uses of each metal in our daily life *Write any three uses of silver.*	– Explain the reason of using different metal for different purpose. *Why aluminium is used to make aeroplane?*	– Arrange the given metals according to their reactivity. – Describe the method of purification of these metals *Arrange the given metals according to their reactivity.*
12. Identification of the structure of some simple types of hydrocarbon and their compounds (methane, alcohol, glycerol, glucose) and explain their uses	– Identify the nature of carbon – Introduce hydrocarbon with example. *Write any two examples of hydrocarbon.*	– Describe the bond between carbon to hydrogen and carbon to carbon. *Write the type of bond formed in hydrocarbon.*	– Describe the structure of alkane, alkene and alkyne with example. *Write a difference between alkane and alkyne on the basis of bonding.*	– Explain the method of nomenclature of simple hydrocarbon (given) – Describe the physical properties of some hydrocarbons (methane, alcohol, glycerol, glucose)  *Write the name of the given hydrocarbons.*	– Explain the uses of some hydrocarbons used in our daily life (methane, alcohol, glycerol, glucose) *Write any two uses of glycerol in our daily life.*	– To write the structural formula of simple hydrocarbon (alkane, alkene, alcohol, glycerol) *Write the structural formula of the given* *i. Ethyl alcohol* *ii. Butane* *iii. Glucose*

13. Explanation of cement, glass, fibre, ceramic, plastic, soap, detergent and pesticides along with their uses and description of chemical pollution with its causes and effects in our environment.	– List the name of chemicals used in our daily life and mention their purpose *Write any five chemical used in your house.*	– Write the raw materials used to manufacture cement, glass, fibre, ceramics, plastics, soap. *What is the main raw material of glass?*	– Explain the application of the given chemicals. – Describe the effects of these chemicals in the environment *Why are plastics used widely than metal? Give two reasons.*	– Explain the role of compost manure in the agriculture – Describe the environmental pollution caused by the uses of these chemicals *Nowadays the use of compost manure is promoted instead of chemical fertilizer, Why? Give any two reasons.*	– Describe the procedure of preparing cement, ceramics, glass, soap, compost manure – Classify the glass, fibre, plastic, pesticides, fertilizer into different types *Describe in brief about the manufacture of preparing cement in the industry*	– To demonstrate the ways of managing waste materials according to their nature. (Reuse, reduce, recycle) *To solve the problem of waste management, which method can be applied? Explain in brief.*

Biology

Criteria	**Standards**					
14. • Explanation of life cycle & the utilities of the silkworm and honey bee	**Basic**		**Proficient**			**Advance**
	1	**2**	**3**	**4**	**5**	**6**
	• Mention the four stages of Life cycle of insects • Identify the silk worm and the honey bee	• Basic features of the Silk worm and the honey bee • Introduction of Sericulture and honey production	• Types, External Morphology & Scientific Name of Silk Worm and the honey bee • Importance of Cocoon in Sericulture • Organization of the colony of Honey bee	• Draw the labelled diagram of the stages of Life Cycle of Silk worm and Honey bee • Mention the precautions used & importance of in Sericulture • Economic value of Silkworm & honeybee	• Define every stage of Life Cycle of each insects with time frame • Swarming of honey bee • Define the function and duties of each type of Honey bee with their origin	• Define the various difficulties facing by the Sericulture industries of Nepal • Explain the Mating process in Honeybee & Silkworm
	From which insect	*What is*	*Classify the honey*	*Draw the neat and*	*What is the function of the*	*How does the queen*

	we can get silk?	*Sericulture?*	*bee with its two characters.*	*labelled figure of life cycle of Silk worm*	*worker bee of 18-20 days?*	*bee fertilize next time when the drone bee died after mating?*
15. • Introduction of Nervous and Glandular system in human body and their functions.	• Define body systems & Mention its types. • Explain Sensitivity & Response to stimuli	• Define Nervous & Glandular System • Introduce Nerve and glands and name them.	• Draw the chart showing the components of Nervous system involved in Human body • Functions of Nervous System • Name the Parts of the Human Brain • Define Reflex Action with examples • Difference between Exocrine and Endocrine glands	• Define the types and structure of Neuron • Describe the structure of different organs of the Human Brain • Draw the diagrammatic structure of Human Brain and Name them • Types, Secretions & Functions of glands in the human body	• Describe the functions of three components of nervous system & different organs of the Human Brain • Define Reflex Arc and Show the process of Reflex Action • State the effects and control measures after Hypo or Hyper secretion of Hormones	• Mention Rate of Impulses transmit and system of transmitters • Define Medical Aspects of Endocrinology
	Name two factors that stimulate our body.	*What is Nervous System?*	*Write two differences between exocrine and endocrine glands.*	*Draw and label the structure of Human Brain.*	*What happens when the Thyroxin is secreted in excess amount?*	*Which chemical Test is needed to ensure the proper functioning of Nervous System?*
16. • Explanation of Human Blood Circulatory System and its functions of each components	• Explain the colour, state and placement of Blood • Understand pumping of blood through blood vessels • Identify the position of the heart in our	• Identify the composition of blood • Identify the types of blood vessels • Identify the heart beat	• Mention the functions of blood • Differentiate between artery, veins and capillaries according to functions • Mention the parts of heart	• Identify the structure and functions of every components of Blood • Differentiate between artery, veins and capillaries according to their structure and placement • Draw and label the	• Mention the effects related to inadequate proportion of blood cells • Differentiate between artery and veins according to their blood pressure	• Describe the reason and effect of heart attack • Describe the altitude sickness, anaemia, blood cancer and other

	body			diagram of heart • Mention the pulmonary and systemic circulation	• Contraction and relaxation of heart • Differentiate the structure and function of Right and left parts of the heart • Demonstrate the parts of the heart of different animals	related problems • Describe Blood Grouping and RH factor
	What is the colour and state of blood?	*Name the blood vessels of human body.*	*Write four functions of the blood.*	*Give four differences between RBC and WBC?*	*Why is left ventricle larger and with thicker wall of muscle?*	*How many types of Blood Group are found in human body? Name them with RH factor.*
17. • Description of chromosomes & the process of sex-determination	• Identify the placement of Chromosome in the cell	• Define Chromosome • Relation of Chromosome as the vehicles of Heredity	• Mention Types and Functions of Chromosomes • Introduce Chromosome as Sex Determining Factor	• Define Autosomes and sex chromosomes with structure • Explain Sex Determination Process with Chart	• Define Chromosome Disorder and Mention its types • Define Various Syndromes	• Mention Genetic Problems related to Chromosome disorder. • Define Aneuploidy & Haemophilia
	In which organelles are chromosomes found in the cell?	*What is Chromosome?*	*Write two functions of Chromosomes.*	*How is male sex determined in the fertilization of Human? Draw the chart.*	*What is Genetic Disorder? Describe Down's syndrome?*	*Write two symptoms of Haemophilia.*
18. • Description of Reproduction system of Living beings	• Define reproduction. • Mention the reproductive organs of human and flowering plants.	• Define Asexual and Sexual Reproduction • State the Methods of Asexual reproduction • Explain the	• Describe the Methods of Asexual reproduction • Mention the significance of Asexual Reproduction	• State types of Natural and Artificial Methods of Vegetative Propagation and Mention their Advantages & Disadvantages	• Describe Artificial Methods of Vegetative Propagation and its types. • Describe the types and process of	• Define the Nature of offspring produced from Asexual or sexual reproduction

		function of major four parts of a flower	• Write the basic features of Sexual Reproduction • Define Unisexual & Bisexual Organisms	• Draw the figure of flower showing Androecium and Gynoecium • Draw the chart of Sexual Reproduction in Animals • Differences between Sexual & Asexual reproduction, Self & Cross Pollination	Pollination & Fertilization	• Define Double fertilization
	What is reproduction?	*What is asexual reproduction?*	*Write four types of asexual reproduction.*	*Write four characteristics of Sexual Reproduction.*	*Define Grafting. Write two differences between cross and self pollination.*	*Define Double fertilization.*
19. • Introduction of Mendel's laws and the causative factors of inheritance.	• List out the similarities between offspring and their parents.	• Define heredity • Define variation • Introduce Mendel and his study	• Define genetics and genes • Describe the different contrasting traits in pea plants studied by Mendel • Describe Dominant & Recessive traits / genes with examples • Define types of Variation	• Functions of genes • Describe Mendel's experiments • Define Hybrids • Define genotype and phenotype • Describe the significance of Variation • Differentiate between variation and mutation	• Describe Mendel's laws of inheritance • Define monohybrid and dihybrid cross • State the significance of Mentalism	• Define sex-linked diseases and describe its examples. • Compare the heredity character of own family members
	List out your two similarities with parents.	*What is heredity?*	*Explain genetics. What are the types of variation? Name them.*	*What are the three laws of inheritance? Mention them.*	*Write two differences between monohybrid cross and di-hybrid cross.*	*Why Haemophilia is a transmitted disease and How is it transmitted?*
20. • Explanation of causes, effects and preventive	• Define the environment and human	• Describe the Effects of Human activities on	• State the types of pollution and their sources	• Describe Air, Water and Land pollution and its causes	• Describe the human activities for pollution.	• Trace out the dependency of Human

measures of Environmental Pollution.	activities • Mention the components of Environment.	Environment • Define the Concept of Pollution	• Define conservation of forest and water resources	&effects • Mention the effects of deforestation in respect to pollution • List out the importance of water	• Explain the Control Measures of Air, Water and Land Pollution	species in Natural resources. • Define concept and importance of Eco-Green city
	What is environment?	*What is pollution?*	*Define air pollution and state its sources.*	*How is human health affected by deforestation?*	*State four human activities for pollution and write two control measures of Land pollution.*	*Write two features of Eco-Green City.*

Geology and Astronomy

Criteria	**Standards**					
21. Explanation of history of the Earth and interpretation of fossilization fuel.	**Basic**		**Proficient**			**Advance**
	1	**2**	**3**	**4**	**5**	**6**
	• Introduce rock, fossils and evolution Q: Name any two rocks.	• Define geological time scale and mention the methods / tools to find the age of rocks Q: What are fossils?	• Explain some hypothesis about the origin of the Earth *Q: Describe the Nebular hypothesis about origin of the Earth.*	• Explanation of four Era of Geological Timescale with time boundaries *Q: Name the four Era of geological timescale with their duration of time.*	• Describe evolution of life related to each Era and to mention the major litho-stratigraphic events of each Era. *Q: Explain the major development of life in Palaeozoic Era.*	Draw the conclusion from the study of history of the earth. Q: How does the study of earth help to support the organic evolution?
22. Explanation of atmospheric layers, green house effect	• Introduce atmosphere and green house.	• Mention different layers of atmosphere and introduce atmosphere as a natural green house	• Identify the effects of ozone layer and recognize the greenhouse effect.	• Describe the depletion of ozone layers and acid rain.	• Draw the structure of different layers of atmosphere reflecting its characteristics and	• Analyse the effect of changing pattern of our life style on the environment and vice-versa.

and climate change.	*Q:Name the gases present in the atmosphere.*	*Q: Name the layers of atmosphere.*	*Q: Point out two importance of ozone layer.*	*Q: Explain the role of CFC on depletion of ozone layer.*	climate change. • Mention the effects of ozone layer depletion and methods of its conservation *Q: Draw and labelled the different layers of atmosphere with their thickness and traced out their characteristics.*	*Skin diseases are increased with industrialization. Analyse the relation.*
23. Explanation of solar system including artificial satellites.	• Introduce Universe, planets and satellites *Name the planet in the solar system according to the distance from the sun*	*Identify stars, galaxy, comments, constellations in the sky with examples* *Q: Define constellation with an example.*	• Differentiate between: i)planet and star ii) Meteor and meteorites • Explain the comets, meteors and asteroids Q: Differentiate star and planet according to their motion and luminicity	• Explain the major characteristics of planets *Q: Why does Mars appear red in colour?*	• Explain the solar system with its drawing, structure and shape *Q: Draw the shape of Ursa Major (Saptarishi) with the position of major stars.*	• Identify the possible constellations and major planets in the sky and compare their position. • Analyse the possibility of life in other planets. *Q: Mention the name of a planet and a constellation in the night sky at 10:30 PM of 31st June.*

4.4 Specification of Items

The following specification table presents content domain, criteria, weightage percentage, number and types of items, allocation of marks and distribution items in each of the six standards.

Table 4.5: Table of specification for item selection

Content domain	**Criteria No.**	**Weightage (%)**	**Marks**	**Weightage for items of various standards**
Physics		30	24	The weightage of items in each set should be around as follows: Level 1: 10%, Levels 2, 3, 4 and 5 each; 20%, and Level 6: 10%.
Chemistry		30	24	
Biology		30	24	
Geology and Astronomy		10	8	
Total		100%	80	

Note:

1. The total number of SR (selected response)items (MCQ) should be between 18 to 24 and the number of CR (constructed response) items carrying 1 mark each (very short answer question) should be between 6 to 12 so that the total number of questions carrying 1 mark each will be 28-32, CR items carrying 2 or 3 marks each should be 16 to 25 depending upon the how much marks each question carries provided that total marks of the test will be 80.
2. While selecting the items for each content domain it is necessary to select both SR and CR items with a reasonable ratio.

Note that the weightage for items of various standards as mentioned above are tentative as the actual weightage of each standard will be calculated and adjusted based on the students' actual score in the test. However, the above suggested weightage of each standard help for item selection.

If the contents areas having small number of items (weightages) have the difficulty in covering six levels of standards in one set of test booklet, such contents areas may be covered by three sets of questions, which are administered at a time to different student.

4.5 Cognitive Domain

Various levels of Cognitive Domains should be taken into consideration while developing and selecting items. Items should be selected according as the six standards defined as above; however, we should check and ensure the representation of various cognitive s in an adequate

level. Therefore, within the six levels of standard various levels of cognitive domain (as in table 4.6) should be included.

Along with content domain, the assessment items should represent various levels of cognitive domain, which are generally hierarchical in the sense of complexity and abstraction of knowledge and skills and their application. The levels of cognitive domain in this framework are adopted from revised Bloom's taxonomy for learning (see, Aderson & Karthwohl, 2001). Among six levels of taxonomy, first three Remembering, Understanding and Applying are considered separately and the last three analysing, evaluating and creating are combined as Reasoning. While defining cognitive domain, Solo Taxonomy of surface and deep learning as categorized into five levels: pre-structural, structural, multi-structural, relational and extended abstract (See, www.uq.edu.au/teach/assessment/docs/biggs-SOLO.pdf) has also been taken into consideration.

As in the Bloom's definition remembering shows memory of previously learned material by recalling facts, terms, basic concepts, and answers. Understanding demonstrates understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas. Applying includes solving problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way (Aderson & Karthwohl, 2001). Reasoning is not limited to the solution of routine problems but also includes unfamiliar situations, complex contexts, and solving multi-step problems using more than one relations and contexts (IEA, 2015).

Table 4.6: Representation of various cognitive domain in the test

Cognitive Domain	**Weightage**
Remembering	10%
Understanding	35%
Applying	35%
Reasoning	20%
Total	100%

Chapter 5: Assessment Framework for English (Grade 10)

5.1 Introduction

National Assessment of Student Achievement (NASA) for Grade 10 is designed to assess the curricular competencies of the approved curriculum of respective subject for Nepali school. As a second language English Language has been taught as one of the compulsory subjects throughout the school curriculum from grade 1 to 10. This chapter presents the analysis of curriculum approved by the government of Nepal for Grade 10 in English Language focusing on curricular competencies and expected performance of the students after completion of the study. While analyzing the curriculum of Grade 10 in English Language for defining domain and contents to be assessed vertical sequence and performance level at least from Grade 8 up to the Grade 10 has been analyzed, particularly the competencies of grade 9 and 10 in English has been taken into consideration. It indicates that this assessment of grade 10 students is not confined with the only the objectives and contents of Grade 10 curriculum rather suggest to assess the overall English Language competencies of grade 10 completed students looking at the over all School English Language programme of Nepal.

After analyzing the curriculum, this chapter identifies domain and construct to be asessed in English so that the assessment will be designed to measure students' performance against the curricular competencies. Based on the analysis of curriculum and its domain and contents it defines the criteria and six standards in each of reading and writingin a hierarchical order of complexity of competencies. Finally, it discusses the various levels of cognitive domain to be performed by the students and suggest a test blue print that is, a table of specification for item construction.

The definition of reading literacy given by OECD (2016) in PISA assessment framework for 2015 states that "An individuals capacity to understand, use, reflect on and engage with written texts, in order to achieve one's goals, to develop one's knowledge and potential, and to participate in society" (P 13). Along with curricular contents, consideration of this definition of reading literacy could be useful while developing assessment standards and developing items for national assessment.

5.2 Defining the Content Domain

This curriculum primarily focuses on language skills. In the revision of this curriculum, level-wise competencies have been devised for this level. These competencies relate to listening to, and reading of fiction and non-fiction texts about own and other countries, to communicate orally and in writing in English about own and other cultures, and to compare and contrast Nepali values, beliefs and customs with those of people from other countries. The linguistic competencies of studying English also begin to emerge at this stage, as learners become increasingly able to identify, understand and analyze patterns in English grammar, vocabulary and phonology.

Overall objectives of teaching English in school are to develop the basic language skills including listening, speaking, reading and writing. These competencies relate to listening to, and reading of fiction and non-fiction texts about own and other countries, to communicate orally and in writing in English about own and other cultures, and to compare and contrast Nepali values, beliefs and customs with those of people from other countries. The linguistic competencies of studying English also begin to emerge at this stage, as learners become increasingly able to identify, understand and analyze patterns in English grammar, vocabulary and phonology (CDC, 2072). However, this assessment only tests two language skills: Reading and writing.

It is relevant to start with a definition of reading skills "Reading literacy is defined as the ability to construct meaning from texts through understanding, interpreting, and responding personally and critically to text content in order to make sense of the world and participate in society" (PCAP, 2016, p 12). Similarly, as a form of communication, writing skills provide students with the capacities of communicating information and ideas on paper in an organized way to produce sequential and convincing arguments. As mentioned in PACP (2016), reading literacy generally includes three competencies: understanding texts; interpreting texts; and responding personally and critically to texts.

Competencies of the English curriculum for grade 9 and 10 are to enable the learners to (CDC, 2072):

a) understand spoken English for general purposes with a good degree of precision;
b) use spoken English for general purposes with a good degree of fluency and accuracy;
c) interact, communicate and collaborate effectively with others orally in pairs, groups and whole class discussion;
d) read a range of fiction and non-fiction texts, in a range of media, understanding the ideas and information they convey with a good degree of precision;
e) write descriptive, narrative and imaginative texts, in a range of different forms and media with a fair degree of accuracy;
f) use all four language skills in a variety of personal, social and academic contexts; and
g) Use English language to think creatively, critically and to solve problems that crop up in the real life and to promote tolerance and maintain sociocultural harmony.

These curricular competencies are general in nature. To make them more specific and workable competencies, learning objectives of each content domain for each of the grades 9 and 10 has been identified in the curriculum of English for grade 9 and 10. The following are the learning outcomes set by the curriculum for Grade 9 and 10 in English (CDC, 2072BS).

Reading

- Construct meaning from written, printed and digital forms for detailed understanding.
- Show an understanding of the underlying themes and the ideas of the texts.
- Identify the structure and the organization of paragraphs by developing an awareness of connectives.
- Interpret information presented in tables.
- Retrieve specific information from texts to analyze and synthesize by means of a variety of reading techniques.
- Deduce the meaning of unfamiliar words and phrases in given contexts.
- Practice thinking skills while reading.

Writing

- Prepare book and film reviews, compose essays with introduction, body and conclusion under guidance; short stories, dialogues with the help of given clues and hints.
- Draft news stories on current issues and events and predict the likely reasons and consequences of an event.

- Make notes on a variety of texts using mind map to generate ideas for writing.
- Write about personal experiences creatively in different forms (e.g. messages, menus, cooking recipes, letters and invitation cards, a letter to an editor, CVs and brochure etc.).
- Write reflective notes on public opinion, beliefs, attitudes and taboos in the sociesty.
- Complete the unfinished text in a coherent way.
- Develop essays on the given topics.
- Follow conventions for standard writing (e.g., spelling, punctuation, usage) for appropriate Grade.
- Observe information presented in non-verbal/verbal text and convert the information into one another.
- Understand the relationship between particular words (e.g., synonym/ antonym, cause/effect, part/whole, item/category, word collocation) and use them appropriately.

In order to achieve the above reading and writing learning outcomes the following areas to be covered in reading and writing tasks:

Reading

Some***seen texts***could be used for reading.

The **unseen text** to be covered the following areas:

- Stories,
- Menus,
- Notices,
- Manuals,
- Advertisements,
- Diary entry,
- e-mails,
- Product guides,
- Time tables,
- Stories,
- Essays,
- Letters,
- Science articles,

- Newspaper articles,
- Book/film reviews, etc.

Writing

Areas to be covered in Guided **writing** are:

- directions,
- instructions,
- obligations and
- prohibitions,
- posters,
- electronic text messages,
- post cards,
- advertisements,
- messages of condolence,
- messages of congratulations,
- Menus, recipes.
- charts, graphs, tables, lists, pictures,
- short skeleton stories,
- invitation letters,
- thanks giving letters,
- letter of regret,
- news stories,
- invitation letters
- paragraph

Areas to be covered in **free writing** are:

- Dialogue (with the situation given),
- paragraph
- on personal
- experiences,

- short stories (only provide either the beginning, ending , title or the moral),
- views and attitudes (on some current issues of importance)
- Letters and emails (personal/informal, official/formal),
- essays (descriptive, narrative, cause effect), newspaper
- articles (on a given topic),
- reviews (of films, movies, books),
- brochures/leaflets (on places and events of historical/cultural/religious/ social / tourism)

The reading test should test the following reading constructs (CDC, 2072):

(1) Reading for gist;

(2) Reading for specific information/important;

(3) Reading for main ideas and supporting details;

(4) Reading for deducing the meaning of words detail.

Writing assessment should be based the following construct (CDC, 2072):

(1) the content, i.e. the supporting details

(2) the accuracy;

(3) the fluency;

(4) the organization, i.e. coherence and cohesion;

(5) the appropriateness of language used by the students;

(6) the orthographic convention and

(7) the originality and creativity.

Writing is not complete and correct ignoring grammar. So, the grammatical items like articles, prepositions, tags, concord, sentence transformation, tense, voice, conditional sentences, reported speech, causative verbs, connectives, etc. are recommended to be incorporated while assessing

writing(CDC, 2072). Grammar should not be included as a separate domain to be tested, it should integrated in the reading and writing tasks. As mentions in the curriculum of grade 9 and 10 writing is not complete and correct ignoring grammar. So, the grammatical items like articles, prepositions, tags, concord, sentence transformation, tense, voice, conditional sentences, reported speech, causative verbs, connectives, etc. are recommended to be incorporated while assessing writing.

5.3 Criterion and Standards

As mentioned in the assessment framework for NASA 2017 at grade 8 (Pant, Singh Poudel, 2016), criteria generally tell what should be the expected competencies, but it does not tell how well the student demonstrate the competencies, and standards in each criteria describe different levels of competencies and therefore standards tell how well the student demonstrate the competencies. Based on the analysis of competencies and learning objectives and contents of English curriculum of grade 10 as well as grade 9 on reading and writing 19 criteria have been identified for assessing the students' performance in English at grade 10. To each skill area reading and writing for NASA 2019 at grade 10 English, six standards have been defined according as the depth of knowledge and skills as well as complexity of related concepts. These six standards are named as below basic, basic, proficient 1, proficient 2, proficient 3 and advanced.

There are not a uniform practices on defining standards and levels of students' learning and competencies. Literatures on assessment and standards suggested three to six or more than six standards (see, The University of the state of New York, 2014, PARCC, 2016, OECD, 2015). However, three standards of students 'competencies: basic, proficient and advanced or four standards: below basic, basic, proficient and advanced have widely been used. For the purpose of NASA 2019 in grade 10, competencies of grade 10 students' have been defined into six categories: below basic, basic, proficient 1, proficient 2, proficient 3 and advanced. The idea of general standards of six levels has been developed studying the curriculum of the grade with the analysis of depth of knowledge, skills and competencies. To analyze curriculum and identify the standards, a number of subject teachers' workshops, experts' workshops and discussions were organized. Similarly, while defining and developing standards, several practices and works on

standards based assessments for example, the University of the state of New York's four levels of performance standards for grade 8 mathematics: level 1, 2, 3 and 4 (The University of the state of New York, 2014); PARCC's five levels: does not meets expectations, partially meets expectations, approaches expectations, meets expectations, exceeds expectations (See, PARCC, 2016,http://parccinc.org/); PISA's six levels of reading performances (See, OECD, 2015); three standards are discussed by several testing agencies and literatures (e.g., PCAP, 2016; IEA, 2015). While developing this framework, Common European Framework of Reference for Language has also been studied, but CERF is the not a grade specific standards rather they are the general competency level ranges from early year to school graduates. Thereby, the competencies defined for NASA may not match exactly with the CERF standards.

Table 5.1: Criteria and standards of grade 10 English for NASA, 2018

Reading

Criteria	Level of Standards	Descriptions of standards	Model items
1. Construction of meaning from written, printed and digital forms for detailed understanding 2. Understanding of the underlying themes and the ideas of the texts, 3. Identification of the structure and the organization of paragraphs by developing an awareness of connectives, 4. Interpretation of information presented in tables,	1 (per-basic)	• Understand very short, simple texts and can find specific, information such as facts, vocabulary, dates, times, and location in simple everyday material such as advertisements, prospectuses, menus and timetables.	Example: Uttam had been a sore trial to him for twenty years. He had begun life decently enough: he went into business, married, and had two children. *Q. How many children did Uttam have?*
	2 (Basic)	• Understand the straightforward meaning of the text, such as facts, vocabulary, dates, times, and locations and combine information from various parts of the text.	Example: I am a young man aged 22. I possess sound health and handsome personality. Regarding my academic qualifications, I passed High School, the SLC from Mahendra Gram High School in 2010. Q. How old is the writer and when did he pass the SLC?
	3 (Proficient 1)	• Understand the text that contains the information which is not explicitly stated. • Identify the logical order of the various parts of a text. • Combine the meaning of the text with their own knowledge and intuitions. • Suggest the most suitable title for the text (passage, story, poem, dialogue, etc.)	Example 1: The mother said to the children, "Your father and I agreed to marry each other even without seeing before, without even knowing our names. We first saw each other on the wedding day." *Q. Was the writer's parents' marriage a love marriage? Why or why not?* Example 2: *Q. Read the story and give it a suitable title.* Once upon a time there lived a lion in a forest. One day after a heavy meal, it was sleeping under a tree. After a while, there came a mouse and it started to play on the lion. Suddenly the lion got up with anger and looked for those who disturbed its nice sleep. Then, it saw a small mouse standing trembling with fear. The lion jumped on it and started to kill it. The mouse requested the lion to forgive it. The lion felt pity and left it. The mouse ran away. On another day, the lion was caught in a net by a hunter. The mouse came there and cut the net. Thus, it escaped. Thereafter, the mouse and the lion became friends. They lived happily in the forest afterwards.
	4 (Proficient 2)	• Make sensible predictions based on their understanding of the reading	Example: • *Give a good ending to the story.*

5. Retrieving specific information from texts to analyze and synthesize by means of a variety of reading techniques. 6. Deduction of the meaning of unfamiliar words and phrases in a given contexts 7. Development of thinking skills while reading 8. Understanding the practices and values of		texts. • Relate the meanings drawn from the texts to their everyday life events and experiences. • Identify central idea of the texts of various types	There were two goats. Over a river was a very narrow bridge. One day a goat was crossing this bridge. Just at the middle of the bridge he met another goat. There was no room for them to pass. "Go back," said one goat to the other, "There is no room for both of us." "Why should I go back?"Said the other goat. "Better you must go back."…… *Q. What is the main idea of the text?* The duty of a citizen is not merely to vote but to vote wisely. S/he must be guided by reason, and by reason alone. S/he must vote for the best person, irrespective of any other consideration and irrespective of the party level. The right man in the wrong party is any way preferable to wrong man in the right party.
	5 (Proficient 3)	• Understand the meaning of the text with reference to their background knowledge of the related themes. • Interpret both literal and literary meaning of texts. • Justify arguments based on the text and related issues.	Example: A scholar of language and grammar undertook a journey. A river had to be crossed. As was the custom in those days, the scholar hired the boat of a waiting ferryman who took people across the river. During the journey, the scholar asked the ferryman, with obvious pride and mockery, if he knew anything about grammar and the rules of language. The ferryman simply replied, "I don't." "Alas!" retorted the rude scholar of grammar, "You have wasted half of your life." At this, the sailor was terribly hurt and aggrieved. But he kept quiet. Suddenly the boat was extremely nervous in the high waves and gushing water. "Do you know how to swim, learned Sir?" asked the sailor. "No!" said the scholar. The ferryman remarked, "Alas! You have wasted your whole life for the boat is sure to capsize in a few minutes." a. *Who can save our life while crossing a river, a boatman or a scholar?* *b. What is the meaning of the expression "Alas?You have wasted your whole life for the boat is sure to capsize in a few minutes."* *c. "Knowledge in one branch is not enough to be proud about." Justify your argument based on the text.*
	6 (Advance)	• Identify the issues raised in the reading texts and discuss their	*Example*

both national and target cultures.		relevance in their lives. • Show comprehensive understanding of the text.	Many people don't understand why or how other people become addicted to drugs. They may mistakenly think that those who use drugs lack moral principles or willpower and that they could stop their drug use simply by choosing to. In reality, drug addiction is a complex disease, and quitting usually takes more than good intentions or a strong will. Drugs change the brain in ways that make quitting hard, even for those who want to. Fortunately, researchers know more than ever about how drugs affect the brain and have found treatments that can help people recover from drug addiction and lead productive lives. Q. *a. What issues are discussed in the text?* *b. How does the drug affect our society?* *c. What are the causes, consequences and preventive measures of drug addiction?*

Writing	Levels	Descriptors	Model Items
1. Preparation of book and film reviews, compose essays with introduction, body and conclusion under guidance; short stories, dialogues with the help of given clues and hints. 2. Drafting news stories on current issues and events and predict the likely reasons and consequences of an event. 3. Making notes on a variety of texts using mind map to generate ideas for writing 4. Writing about personal experiences creatively in different forms (e.g. messages, menus, cooking recipes, letters and invitation cards, a letter to an editor, CVs and brochure etc.). 5. Writing about famous national and international figures. 6. Write reflectively on public opinion, beliefs, attitudes and taboos of national culture. 7. Completion of the unfinished text in a coherent way. 8. Development of essays on imaginary topics. 9. Following conventions for standard writing (e.g., spelling, punctuation, usage) for appropriate grade. 10. Observation of the information presented in non-verbal/verbal text and conversionof the information into one another. 11. Understanding the relationship between particular words (e.g.,	1 (Pre-basic)	• Contains rudimentary structure, basic vocabulary and limited grammatical accuracy • Contains deviated ideas or contents on the topic • Includes erroneous mechanics • Contains less creativity/originality • Contains inappropriate format and layout	• Write a letter to your friend about a famous person in your own community? You should mention who he is and why he is famous for. Limit your letter in 300 words. • Write a newsreport describing a social problem and its consequcnes in your own community?
	2 (Basic)	• Contains noticeable structural and mechanical errors that cause some comprehension problems • Presents only few ideas without much supporting details • Presents the ideas vaguely which are not coherently organized • Contains significant problems in layout and format • Includes limited use of vocabulary (repetition of vocabularies)	• Although smoking is injurious to health, many young people still smoke. What an essay (300 words) on why young people would like to smoke? • Develop a brochure for your own school. The brochure should highlight the major strengths of your own.
	3 (Proficient 1)	• Contains noticeable structural and mechanical errors that may not cause some comprehension problems • Presents some original ideas relevant to the topic with supporting details • Contains coherently organized ideas but with mostly inappropriate cohesive devices • Depicts very little originality/creativity of ideas • Contains minor problems in layout and format that does not affect the writings. • Uses good range of vocabulary with some issues in appropriate use	• The use of mobile phone is increasing among students. Do you think that it is good to allow stundents to use mobile phone in school? Why? Why not. Please write your opinions in 300 words.
	4(Proficient 2)	• Uses a wide range of structures with minor grammatical and structural errors. • Uses cohesive devices but at times there is under and over use • Depicts some originality of ideas related to the topic. • Selects appropriate layout and or format. • Shows correct and appropriate use of adequate range of vocabulary	• Forests are necessary to keep air cleaner. But nowadays trees are being cut down rapidly. How should be done to preserve forests? Explian your suggestion in 300 words.

synonym/ antonym, cause/effect, part/whole, item/category, word collocation) and use them appropriately			
	5 (Proficient 3)	• Demonstrates mastery in the use of grade-appropriate cohesive devices • Demonstrates good orthographical (spellings, handwriting, punctuation) Control throughout with rare structural and mechanical error. • Uses the ideas which are mostly original and they are relevant to the topic. • Selects appropriate layout and/or format leading to the smooth flow of ideas. • Depicts correct and appropriate use of wide range of vocabulary.	• Describe you're the happiest or the saddest moment in life. What was the moment about? Where did it take place? What did actually happen? How did you feel? Describe the moment and your experiences in 500 words.
	6 (Advanced)	• Shows excellent capability in the use of wide range of structures with grammatical accuracy. • Shows perfect command over the structural and mechanical aspects • Demonstrates excellent linkage and smooth logical flow of the ideas without any structural and semantic errors. • Possesses outstanding command in the use of cohesive devices/connectors and selects appropriate layout and/or format. • Depicts exceptional originality of ideas. • Discusses ideas creatively with supporting details. • Depicts natural use of wide range of vocabulary.	What roles can you paly in the overall development of your own community? Write three roles you would like to play in 400 words.

5.4 Specification of Items

The following specification table presents content domain, criteria, weightage percentage, number and types of items (Selected response-SR and Constructed response-CR), allocation of marks and distribution items in each of the six standards.

Table 5.2: Table of specification for item selection

Content domain	**Criteria No.**	**Weightage (%)**	**Marks**	**Weightage for items of various standards**
Reading		60%	48	The weightage of items in each set should be around as follows: Level 1: 10%, Levels 2, 3, 4 and 5 each; 20%, and Level 6: 10%.
Writing		40%	32	
Total		100%	80	

Note:

1.The total number of SR (selected response) items (MCQ) should be between 18 to 24 and the number of CR (constructed response) items carrying 1 mark each (very short answer question) should be between 6 to 12 so that the total number of questions carrying 1 mark each will be 28-32, CR items carrying 2, 3 or 4 marks each should be 16 to 24 depending upon the how much marks each question carries provided that total marks of the test will be 80.

2. While selecting the items for each content domain it is necessary to select both SR and CR items with a reasonable ratio.

Note that the weightage for items of various standards as mentioned above are tentative as the actual weightage of each standard will be calculated and adjusted based on the students' actual score in the test. However, the above suggested weightage of each standard help for item selection.

If the contents areas having small number of items (weightages) have the difficulty in covering six levels of standards in one set of test booklet, such contents areas may be covered by three sets of questions, which are administered at a time to different student.

5.5 Cognitive Domain

Various levels of Cognitive Domains should be taken into consideration while developing and selecting items. Items should be selected according as the six standards defined as above; however, we should check and ensure the representation of various cognitive domains in an

adequate level. Therefore, within the six levels of standard various levels of cognitive domain (as in table 5.3) should be included.

Along with content domain, the assessment items should represent various levels of cognitive domain, which are generally hierarchical in the sense of complexity and abstraction of knowledge and skills and their application. The levels of cognitive domain in this framework are adopted from revised Bloom's taxonomy for learning (see, Aderson & Karthwohl, 2001). Among six levels of taxonomy, first three Remembering, Understanding and Applying are considered separately and the last three analyzing, evaluating and creating are combined as Reasoning. While setting cognitive domain Solo Taxonomy of surface and deep learning as categorized into five level: pre-structural, structural, multi-structural, relational and extended abstract (See, www.uq.edu.au/teach/assessment/docs/biggs-SOLO.pdf) has also been taken into consideration.

As in the Blooms' definition remembering shows memory of previously learned material by recalling facts, terms, basic concepts, and answers. Understanding demonstrates understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas. Applying includes solving problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way (Aderson & Karthwohl, 2001). Reasoning is not limited to the solution of routine problems but also includes unfamiliar situations, complex contexts, and solving multi-step problems using more than one relations and contexts (IEA, 2015).

Table 5.3: Representation of various cognitive domains in the test

Cognitive Domain	**Weightage**
Remembering	10%
Understanding	35%
Applying	35%
Reasoning	20%
Total	100%

We can compare and obsereve equivalency between these cognitive domains: remembering, understanding, applying and reasoning, and the five aspects of reading literacy: retrieving information, forming a broad understanding, developing an interpretation, reflecting on and evaluating the content of a text and reflecting on and evaluating the form of a text as identifies in PISA 2015 assessment framework for reading literacy (see, OECD, 2016). For example, remembering, understanding and applying may be compared with retrieving information, forming a broad understanding, developing an interpretation respectively and reasoning may be compared with reflecting on and evaluating the form of the content of a text and a text.

Chapter 6: Assessment Design: Methodological Framework

6.1 Introduction

The National Assessment of Student Achievement (NASA) for Grade 10 in Mathematics, Nepali, Science and English is designed by adopting an IRT model. The IRT model is a major basis for the calibration of test-items and equating the scores. For NASA 2019, the tools development, including the test preparation and questionnaire development, sampling of schools and students, and data analysis will be carried out by ERO, with support of assessment experts and subject teachers. The test items will be written by a team of subject experts, including curriculum officers, university professors and school teachers teaching at Grades 9 and 10. The draft test-items will be pretested and analysed to ensure their reliability and validity, and the final items will be selected, accordingly. Test administration, scoring of test papers and data entry in OMR sheets will be outsourced to a consulting company. The following procedure will be adopted for the NASA 2019 design process.

6.2 Sample design

The main goal of NASA is to assess the effectiveness of the system, rather than the assessment of individual students. In this sense, school becomes the unit of sampling for NASA studies. For NASA 2019, a stratified random sampling procedure will be used to select districts and schools. This is a form of probability sampling that ensures the representation of subgroups, or starta that may differ in the characteristics being studied (see Ary et al. 2002, Gay 2006). The schools will be selected in such a way that they represent the nature of schools as much as possible. Therefore, two major geographical strata will be considerd, first; they are ecological zones (Mountain, Hill, Tarai and the Kathmandu Valley) and second; provinces (provinces 1 to 7).

Within these broader strata, the following sub-strata will be taken into consideration in sampling:

- Districts (75 altogether)
- School types (community and institutional)
- School location (rural and urban)

From each sample district, schools are again grouped into their types (community and institutional) and locations (rural and urban) and they are selected proprortionately from each stratum.

6.3 Sample size

For the national level assessments, including NASA 2019 (Grade 10), the conventional maximum sample size is less than 5% of total population (see Cochran 1977, Kortlik & Higgins, 2001) with 95% confidence level (see Flower 2002) could be used. The actual sample size is calculated based on the latest official list of schools. For convenience, the number of students from the selected schools is fixed, based on the average number of students in the selected districts.

6.4 Tools development

For item writing, ERO organizes a series of workshops of subject experts, university teachers, and subject teachers from different schools, both community and institutional. A separate workshop will be conducted in order to prepare background questionnaires for students, teachers and head teachers. For the purpose of writing test items, first, the content domain will be defined based on the curricular goals and learning competencies of each subject. Then, learning criteria and learning standards will be defined in each domain of learning. For this, a particular focus will be given to cognitive domain as specified in the curriculum. Bloom's taxonomy (see Bloom, 1956, Anderson et al. 2001) will be used to include questions of various cognitive levels(e.g. remembering, understanding, applyingand reasoning). Moreover, a specification table will be prepared which show the types and levels of questions from each content domain. A team of item writers, first, draft the test items from each domain in a large number, and they will be stored in an item bank. After that, a team of experts will choose the best possible items from the bank.

6.5 Piloting and revision

The selected items from various sets will be pre-tested or piloted among the students from a specific number of schools in different districts. The districts and schools will be representative of the geographical locations and types of the schools. To conduct a pretest, ERO, in collaboration with districts or local level, will organize an orientation session;

monitor the processes in school; coordinate for the collection of test papers; and score tests and tabulating the scores. The pretest will be done carefully by ensuring that no test papers will be left in schools during the piloting of test items. Among the pre-tested items, three sets of items will be selected as the final test items. The following major critieria are considered while selecting the items for the final tests:

- The test items measure the objectives of the curriculum.
- The items will cover the contents and maintain content validity.
- The items will measure various levels of standards from below basic to advanced levels.
- The items will represent different cognitive levels according to main classifications according to the revised Bloom's taxonomy (remembering, understanding, applying and reasoning).
- The test items have appropriate difficulty level and discriminatory power.
- For multiple choice (MCQ) type SR items, the power of distractors will also be analysed.

During the item analysis process, the distractors will be revised through the analysis of distractors for multiple-choice items.

6.6 Preparation of test booklet

After the finalisation of test items, they are selected and assembeled in three different sets. These three sets of tests will be set in a standard format and printed out in required numbers. Three sets will be equated by using IRT modelling so that the test scores of the students in various sets can be compared. For this purpose, some linking items will be selected and used for analysis. While arranging linking items, either certain questions will be included to all the sets or set 1 and set 2 will be linked with some common questions and then either set 1 and 3 or set 2 and 3 will be linked with some common questions. Alternatively, some common test items will be used across the three sets. In order to compare the results with previous years' results, some items from those years' tests will be used.

6.7 Test administration

The overall administration of test in each district will be coordinated by the NASA focal person at the district, who will be oriented for the task well before the day of the test administration. The orientation will cover the contents including the test administration procedure, maintaining the standard and fairness in the test, and the verification of sample schools and student number in the schools. The consulting firmwill be hired to help administer and score the test and carry the test papers to the sample districts. A one-day orientation for the heads of test centres (head teachers mainly) will be organized in district headquarters. The center heads will take the main responsibility to administer the test papers in their schools on the same day throughout the country while the representatives of the DEO, ERO and the consulting firm will supervise and monitor the entire process of test administration. All the three versions of tests will be administered in each school, providing each set with the student alternatively. After the test, the consulting firm will collect and bring the test papers back to the scoring centre in Kathmandu.

6.8 Scoring and data preparation

The consulting firm is responsible for scoring and preparing the data. The firm will select the appropriate number of scorers, mainly the school teachers, having teaching qualifications (B.Ed.) and at least two years of teaching experiences either in community or institutional schools. The scorers will be trained on the scoring rubrics and procedures by ERO. The scorers mark the test papers based on the assessment guidelines and rubrics, and their work is supervised by ERO officials as well as scoring coordinators. The rubrics or marking scheme is prepared by subject experts with examples of what kind of correct answers should be or should not be awarded with the marks.

After completing the scoring of the test papers, the responses from background questionnaires and test scores are recorded on OMR sheets. The verification of scores and their proper record on OMR sheets will be carried out by a scrutiny team comprising senior subject experts. The OMR sheets, which are readable by a machine, will be scanned to generate an Excel file from both the background questionnaires and students' test scores.

6.9 Data analysis

The data analysis involves the following steps or phases:

Data cleaning

When ERO receives data from the consultancy firm, a team of experts first cleans the data from the test of each subject. Then, the data will be verified even from the OMR sheets to check whether erroneous and/or missing data are found. In this process, the background variables and items will be recorded carefully by creating other indicators for the analysis purpose.

Preparation of database

Relevant software (e.g. ConQuest, STATA, R) for an IRT anlaysis will be used for preparation of the database and analysis of the results. Initial data are prepared and analysed in Excel and SPSS. In the initial analysis process, the items rest correlation will be calculated, andItem Characteristic Curve (ICC) will be generated using one PLM and Partial Credit Model (PCM) of IRT.

Equating students' scores and latent ability

At this stage, ability scores (theta) will be generated and equating of three versions of students' scores in each subject and latent ability (theta) will be done. The equated data will be merged into the original SPSS file to make a complete set of databases. In doing so, each version of students' test scores and background variables of all respondents (students, teachers and head teachers) will be merged to prepare SPSS database for the analysis.

Checking data fit

Before analysis of data relevant parameter will be calculated and item fit will be checked by drawing Item Characteristic Curve (ICC) using Two Parametric Model (2PM) as well Partial Credit Model (PCM) of IRT. PCM is necessary because there will be Selected Response (SR) as well as Created Response (CR) items in the test.

Standards Setting (Cut score determination)

Among the various methods used to calculate a cut score calculation, an appropriate method such as bookmarkmethod (see, Cizek & Bunch, 2007), Item Descriptor Matching (ID matching) method (see, Ferrara, 2012, Cizek & Bunch (edited), 2012) will be used to set the standard of student learning achievement.

Calculation and analysis

At this stage, various statistical results will be calculated, analysed and interpreted. The basic statistical methods to analyse assessment results include descriptive statistics such as mean, standard deviation, percentage and frequency; inferential statistics such as z-score, t-score, chi-square test; relational statistics such as correlation and regression analysis.

Reporting and dissemination

The data analysis and report preparation will be carried out simultaneously. A team of content editors will work with the statistician to draft and finalize the report. A series of workshops will be organised in order to analyse the data and prepare the report. The draft report is peer reviewed by subject and assessment experts and their feedback will be incorporated in the revised version of the report. The final report will be proofread by a language editor and published on ERO's website as well as in a print form. The findings of the report will be disseminated by organizing national and regional workshops and press releases.

Chapter 7: Identification of Contextual Variables

7.1 Introduction

A national assessment aims to obtain a reliable set of data of student learning measured through a scientifically constructed standardized test. However, considering that a number of associated variables influencing student-learning achievement, NASA also collect relevant information through a set of questionnaires about the variables that are associated with differences in students' learning achievement. As Anderson and Morgan (2008) argue, "[…] questionnaires – when used in conjunction with the tests – collect data about variables that might be associated with, or help explain, differences in levels of student performance" (p.99). This chapter reviews international and national practices in order to gather information about the key contextual variables that are associated with students' learning and identifies some major variables that are relevant and useful in national assessments of Grade 10 in 2019.

7.2 A review of contextual variables: International and national practices

Learning achievement of students is affected by various factors, which "might be associated with, or help explain, differences in levels of student performance" (Anderson & Morgan, 2008). A good questionnaire helps to collect multiple contextual variables that are related to students themselves, parents, schools, teachers and head teachers. Anderson and Morgan (2008) suggest that the policy makers should know about the variables that are associated with important educational issues in the country and the NASA questionnaires should include specific contextual variables that have major impact on student learning. They suggest that such contextual variables will vary for students, parents, teachers and head teachers, and accordingly, they advise suitable topics (see Table 7.1) for questionnaires for each of these groups (pp. 103-105).

Table 7.1. Information about the contextual variables for national assessment
Student Questionnaires • Gender, age, and language background (all usually collected on the front of the test booklet) • Educational background, such as years at school and periods away from school

- Opportunities to attend school
- Expectations of success and personal or family attitudes about the value of school
- Perceptions of classroom environments, such as sense of safety, friendliness of other students, or support from teachers.

Parent Questionnaires

- Nationality, gender, and language background
- Home environment, such as access to books, desks, and lights
- Family background, such as education of parents and language spoken at home
- Attitudes toward education, such as commitment to sending children to school, perceptions of the value and relevance of education, or perceptions of the quality of education
- Attention to homework and study resources provided at home for children
- Affordability and accessibility of education for children
- Expectations of educational achievement for children
- Involvement with schools, such as participation in the classroom or on committees
- Nature of school reports about children's progress and their value
- Financial support for school in the form of payment for textbooks and fees

Teacher Questionnaires

- Gender and age
- First language
- Teaching conditions, such as class size, access to resources, percentage of students who have textbooks, access to replacement teachers when sick, and assistance with challenging students
- Educational experience, teacher qualifications, and number of years in this school
- Professional engagement with learning, such as access to and interest in professional development, interest in teaching, and time spent preparing for classes
- Availability of instructional support through classroom visits by head teachers, school inspectors, or supervisors
- Teaching methodology, such as language of instruction, use of assessment, and style of teaching
- Satisfaction with working conditions, such as tenure, rates of pay, and level of supervision
- Relationship with the school community, such as interactions with parents, involvement in school committees, and participation in local community events
- Distance from teacher's home to school.

Head-Teacher Questionnaires

- Gender and age
- Educational and management experience and qualifications

- School environment, such as quality of buildings and facilities, as well as availability of resources
- School records, such as fluctuations in student numbers, the extent of student or teacher absenteeism, and the frequency of students changing schools
- Professional engagement with school leadership, such as access to and interest in professional development and interest in education
- Leadership style and use of time
- Satisfaction with working conditions, such as tenure, rates of pay, and level and frequency of supervision
- Relationship with school community, such as interactions with parents and participation in local community events.

The major international assessments such as PISA and TIMSS have included a good set of contextual variables in their respective tests. The PISA questionnaire framework, for example, has following contextual variables (OECD, 2016, p. 17):

- Students and their family backgrounds, including their economic, social and cultural capital.
- Aspects of students' lives, such as their attitudes towards learning, their habits and life in and outside of school, and their family environment.
- Aspects of schools, such as the quality of the schools' human and material resources, public and private management and funding, decision-making processes, staffing practices and the school's curricular emphasis and extracurricular activities offered.
- Context of instruction, including institutional structures and types, class size, classroom and school climate, and science activities in class.
- Aspects of learning, including students' interest, motivation and engagement.

In addition, the 2015 PISA framework includes the following contextual factors (OECD, 2016, p.17):

- A computer familiarity questionnaire, focusing on the availability and use of information and communications technology (ICT) and on students' ability to carry out computer tasks and their attitudes towards computer use.

- An educational career questionnaire, which collects additional information on interruptions in schooling, on preparation for students' future career, and on support with science learning.
- A parent questionnaire, focusing on parents' perceptions of and involvement in their child's school, their support for learning at home, school choice, their child's career expectations, and their background (immigrant/non-immigrant).
- A teacher questionnaire, which is new to PISA, will help illustrate the similarities and differences between groups of teachers in order to establishbetter the context for students' test results. Science teachers, for example, are asked to describe their teaching practices through a parallel questionnaire that also focuses on teacher-directed teaching and learning activities in science lessons, and a selected set of inquiry-based activities. The teacher questionnaire asks about the content of a school's science curriculum and how it is communicated to parents too. The new optional teacher questionnaire gathers information on transformational leadership as well.

Similarly, 2015 TIMSS framework also includes such contextual factors in its test. The following contextual variables are included in 2015 TIMSS framework (Mullis & Martin, 2013).

- National and community contexts (which include economic resources, population demographics, and geographic characteristics; organization and structure of the educational system; student flow; languages of instruction; intended mathematics and science curriculum; teachers and teacher education; monitoring curriculum implementation)
- Home contexts (Home resources for learning, languages spoken in the home, parental educational expectations and academic socialization; early literacy, numeracy, and science activities)
- School contexts (school location, school composition by student socio-economic background, instruction affected by mathematics and science resource shortages; teacher available and retention; principal leadership; school emphasis on academic success; and safe, orderly, and disciplined school)

- Classroom contexts (teacher preparation and experience, TIMSS mathematics and science topics taught, classroom instructional resources and technology; instructional time; instructional engagement; and classroom assessment)
- Student characteristics and attitudes toward learning (student readiness to learn, student motivation, student self-concept, and student characteristics).

The previous NASA in Nepal (e.g. ERO, 2013, 2015a, 2015b, 2016) have also included a number of contextual variables in teacher, head teacher and student questionnaires. For example, background questionnaires were included for the students (student and family related questions include motivation, attitude, working habits, and so one), teachers (teacher and teaching related questions including teaching skills, use of teaching materials, classroom activities), and head teachers (teacher, teaching, school and resource related questions, including managerial and physical factors). Like the previous NASA studies, NASA 2019 (Grade 10) study has to set out a conceptual framework that depicts the key variables, which are associated with the students' level of learning. The following section describes NASA 2019 framework for the background and contextual information.

7.3 A conceptual framework for the background information for NASA 2019

The conceptual framework that includes the contextual factors and variables associated with the learning achievement of students for NASA 2019 for Grade 10 is shown in Figure 7.1. This framework is an adapted version of the Finnish National Education Board of Education (Metsämuuronen, 2009) and the previous NASA studies (ERO, 2013, 2015a, 2015b, 2016). This framework provides a theoretical basis for preparing the background questionnaire for students, teachers and head teachers. The key idea of this model is that learning outcomes of students are closely associated with various factors—the factors related with the students themselves, their peer groups, home environment, teachers, physical facilities both at school and home, and school leadership.

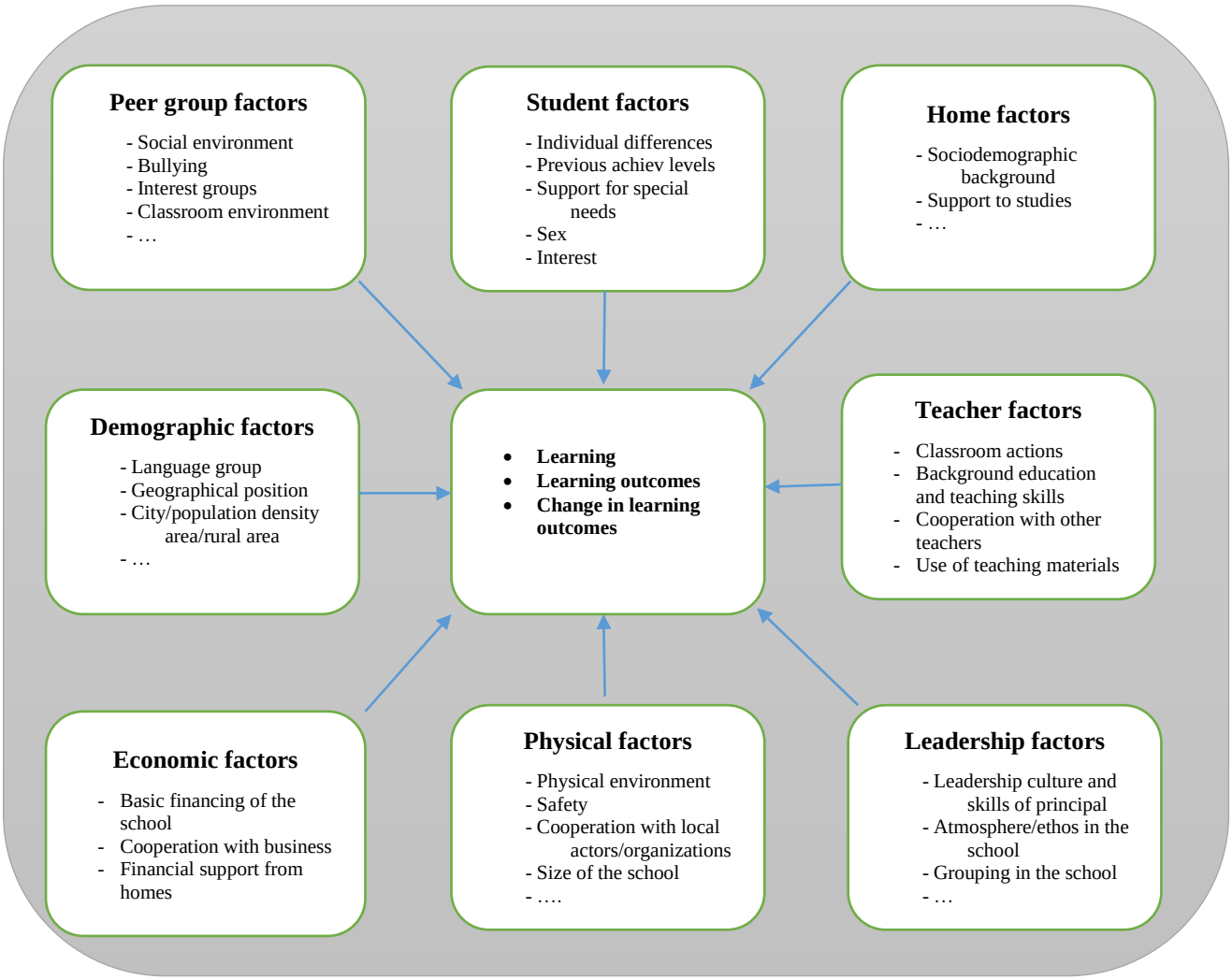
As presented in Figure 7.1, the student background questionnaire includes the information related to students' individual factors, home or family factors, and peer group factors. The **students' individual factors** are the most crucial factors that influence the level of student learning. Such factors may include their sex, ethnicity, interest, levels of motivation, individual difference in learning habits and style, previous achievement level, and support system for the children of special needs. The **home or family factors**, which are equally

important in shaping student learning, include SES, support to the studies of children, literacy in the family and so on. The **peer group factors** are associated with the characteristics of students' close peers including social support, bullying, classroom environment and interest groups.

The teacher questionnaire includes the variables associated with the **teacher factors** such as teachers' experience of teaching, teaching skills, classroom activities, and use of teaching materials. In addition to the teacher factors, there are school-related factors that are divided into **managerial** and **physical factors**. The managerial factors include the head teacher's leadership and managerial skills and accomplishments. The managerial aspect also includes the schools' ethos and missions, including the school academic atmosphere and culture. Likewise, the physical factors include the physical facilities and standards of the school including the school building, classrooms, furniture, playground, canteen, toilets, safety, and others. The head teacher questionnaire includes the questions related to the managerial and physical factors.

The **demographic factors**, which are the part of the sampling scheme, are related to the students' ethnicity, language, and the physical location. The **economic factors**, on the other hand, include the financing of the schools and other monetary contributions to the schools. These two factors – demographic and economic – are available in national statistics, so are not the part of student, teacher and head teacher questionnaires.

Figure 7.1. Conceptual framework for developing questionnaires to collection background information



Student questionnaires

Based on the above framework, NASA 2019 (Grade 10) will use a student questionnaire, which includes items to solicit students' individual demographic information such as gender, language, ethnicity, and geographical location. The questionnaire also solicits information about how students spend time at home in various activities, whom they consult if they need assistance for their homework or lessons, availability of textbook and other resources, distance from home to the school, homework and feedback, parental education and occupation, participation in extracurricular activities, bullying and others.

Student attitude survey

As part of the student questionnaire, NASA 2019 study (Grade 10) will include the items to solicit information from the students about their attitude/opinion towards various aspects of learning in their particular subjects (Nepali and Mathematics) such as teachers' activities, teaching styles and behaviours. For this purpose, the student questionnaire includes a number of statements and the students will rate them in a 4-point scale. As done in the previous NASA studies, an adapted version of Fennema-Sherman Attitude Scale is used (see, Fennema and Sherman, 1976) to develop the student attitude survey questionnaire.

Teacher questionnaire

Teacher questionnaire includes the items about the teachers' mother tongue, highest qualification, types of appointment (e.g. permanent, temporary, locally appointed etc.), years of teaching experience, status of training, and availability and use of curriculum, textbooks, teachers' guide and other reference materials. The questionnaire also solicits information from teachers about the various teaching activities they used, types and frequency of students' learning assessment, class supervision, professional development activities, areas of difficulties in teaching and other opinion about school facilities and provisions, motivation and satisfaction towards the profession, and opportunities and limitations they experienced in the school.

Head teacher's questionnaire

Head teachers' questionnaire includes the items to gather information about their qualifications, years of teaching and leadership experiences, the number of students and teachers in school, student attendance, physical facilities, availability and use of curriculum, textbook and teaching materials, composition and functioning of SMC and PTA and problems related to students and teachers. The questionnaire also includes the items such as opinion about community support, teachers' cooperation and partnership, teachers' dedication and involvement in work.

This chapter has discussed a conceptual overview of the contextual variables that are related with the students' learning achievement. Reviewing various national and international practices, this chapter provides some important areas and sources of information about the variables that are to be considered in such a large-scale national assessment. The review suggests that there will be four major sources of information from which contextual information are collected – students, teachers, parents and head teachers. For NASA 2019, (Grade 10), questionnaires will be prepared for students, teachers and head teachers. The items related to parental support will be incorporated into student questionnaire. The information collected through these questionnaires will be associated with students' test scores to explain how the contextual variables can influence students' learning achievement.

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