



Grade

7

Mathematics

Teacher's Guide

(Implemented from year 2016)



Department of Mathematics

Faculty of Science & Technology

National Institute of Education

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Message of the Director General

The first phase of the new competency based curriculum, with 8 years curriculum cycle was introduced to secondary education in Sri Lanka in 2007 replacing the existed content based education system with basic objective of developing the national level competencies recommended by the National Education Commission.

The second phase of the curriculum cycle to be introduced to grades 6 and 10 starts from 2015. For this purpose, National Institute of Education has introduced a rationalization process and developed rationalized syllabi for these grades using research based outcomes and various suggestions made by different stakeholders.

In the rationalization process, vertical integration has been used to systematically develop the competency levels in all subjects from fundamentals to advanced levels using the bottom up approach. Horizontal integration is used to minimize the overlapping in the subject content and to reduce the content over loading in the subjects to produce more students friendly and implementable curricular.

A new format has been introduced to the teachers' guide with the aim of providing the teachers with the required guidance in the areas of lesson planning, teaching, carrying out activities and measurement and evaluation. These guidelines will help the teachers to be more productive and effective in the classroom.

The new teachers' guides provide freedom to the teachers in selecting quality inputs and additional activities to develop the competencies of the students. The new teachers' guides are not loaded with subject content that is covered in the recommended textbooks. Therefore, it is essential for the teacher to use the new teachers' guides simultaneously with the relevant textbooks prepared by Education Publication Department as reference guides to be more aware of the syllabi.

The basic objectives of the rationalized syllabi and the new format of teachers' guide and newly developed textbooks are to bring a shift from the teacher centered education system into a student centered and more activity based education system in order to develop the competencies and skills of the school leavers and to enable the system to produce suitable human resource to the world of work.

I would like to take this opportunity to thank the members of Academic Affairs Board and Council of National Institute of Education and all the resource persons who have immensely contributed in developing these new teacher guides.

Director General
National Institute of Education

Message of the Deputy Director General

Education from the past has been constantly changing and forging forward. In recent years, these changes have become quite rapid. Past two decades have witnessed a high surge in teaching methodologies as well as in the use of technological tools and in the field of knowledge creation.

Accordingly, the National Institute of Education is in the process of taking appropriate and timely steps with regard to the education reforms of 2015.

It is with immense pleasure that this Teachers' Guide where the new curriculum has been planned based on a thorough study of the changes that have taken place in the global context adopted in terms of local needs based on a student-centered learning-teaching approach, is presented to you teachers who serve as the pilots of the schools system.

An instructional manual of this nature is provided to you with the confidence that, you will be able to make a greater contribution using this.

There is no doubt whatsoever that this Teachers' Guide will provide substantial support in the classroom teaching-learning process at the same time. Furthermore the teacher will have a better control of the classroom with a constructive approach in selecting modern resource materials and following guide lines given in this book.

I trust that through the careful study of this Teachers Guide provided to you, you will act with commitment in the generation of a greatly creative set of students capable of helping Sri Lanka move socially as well as economically forward.

This Teachers' Guide is the outcome of the expertise and unflagging commitment of a team of subject teachers and academics in the field Education.

While expressing my sincere appreciation of this task performed for the development of the education system, my heartfelt thanks go to all of you who contributed your knowledge and skills in making this document such a landmark in the field.

M.F.S.P. Jayawardhana
Deputy Director General
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Try outting the lesson plans in schools of Western
and North-western Provinces

Instructions on the use of the Teacher's Guide



The Department of Mathematics of the National Institute of Education has been preparing for the new education reforms to be implemented in 2015 for the first time since 2007, in accordance with the education reforms policy which is implemented once every eight years. The Grade 7 Mathematics Teacher's Guide which has been prepared accordingly has many special features.


The **Grade 7 syllabus** is included in the first chapter. The syllabus has been organized under the titles Competencies, Competency Levels, Content, Learning Outcomes and Number of Periods. The proposed **lesson sequence** is given in the second chapter. The **Learning-Teaching-Evaluation methodology** has been introduced in the third chapter. A special feature of this is that the best method to develop each of the subject concepts in students has been identified from various methods such as the discovery method, the guided discovery method, the lecture-discussion method etc and the lesson plan has been developed based on it.

Following the proposed lesson sequence, the relevant competency and competency levels as well as the number of periods required for each lesson have been included at the beginning under each topic. Specimen lesson plans have been prepared with the aim of achieving one or two of the learning outcomes related to a selected competency level under each competency. These lesson plans have been carefully prepared to be implemented during a period or a maximum of two periods.

To create awareness amongst the students regarding the practical applications of the subject content that is learnt, a section titled '**Practical Use**' which contains various such applications has been introduced in some of the lessons.

You have been provided with the opportunity to prepare suitable lesson plans and appropriate assessment criteria for the competency levels and related learning outcomes for which specimen lesson plans have not been included in this manual. Guidance on this is provided under the title '**For your attention**'.

Another special feature of this Teacher's Guide is that under each lesson, websites which can be used by the teacher or the students, in the classroom or outside which contain resources that include videos and games to enhance students' knowledge is given under the title '**For further use**' and the symbol . Although it is not essential to make use of these, the learning-teaching-evaluation  process can be made more successful and students' subject knowledge can be enhanced by their use, if the facilities are available.

Further, in selected lessons, under the title "**For the teacher only**" and the symbol , facts which are especially for the teacher are included. This information is only to enhance the teacher's knowledge and is not given to be discussed with the students directly. The teacher has the freedom to make necessary amendments to the specimen lesson plan given in the new teacher's manual which includes many new features, depending on the classroom and the abilities of the students. We would be grateful if you would send any amendments you make or any new lessons you prepare to the Director, Department of Mathematics, National Institute of Education. The mathematics department is prepared to incorporate any new suggestions that would advance mathematics educations in the secondary school system.

Project Leader

Contents

Chapter	Page
01. Syllabus	1 - 30
1.1 Common National Goals	2 - 3
1.2 Common National Competencies	4 - 6
1.3 Aims of Learning Mathematics	7
1.4 Subject Content	8 - 30
02. Lesson Sequence	31
03. Instructions for the Learning-Teaching-Evaluation Process	32 - 146

Syllabus

1.0 Syllabus

1.1 Common National Goals

The national system of education should assist individuals and groups to achieve major national goals that are relevant to the individual and society.

Over the years major education reports and documents in Sri Lanka have set goals that sought to meet individual and national needs. In the light of the weaknesses manifest in contemporary educational structures and processes, the National Education Commission has identified the following set of goals to be achieved through education within the conceptual framework of sustainable human development.

- I Nation building and the establishment of a Sri Lankan identity through the promotion of national cohesion, national integrity, national unity, harmony and peace, and recognizing cultural diversity in Sri Lanka's plural society within a concept of respect for human dignity.
- II Recognizing and conserving the best elements of the nation's heritage while responding to the challenges of a changing world.
- III Creating and supporting an environment imbued with the norms of social justice and a democratic way of life that promotes respect for human rights, awareness of duties and obligations, and a deep and abiding concern for one another.
- IV Promoting the mental and physical well-being of individuals and a sustainable life style based on respect for human values.

- V Developing creativity, initiative, critical thinking, responsibility, accountability and other positive elements of a well-integrated and balance personality.
- VI Human resource development by educating for productive work that enhances the quality of life of the individual and the nation and contributes to the economic development of Sri Lanka.
- VII Preparing individuals to adapt to and manage change, and to develop capacity to cope with complex and unforeseen situations in a rapidly changing world.
- VIII Fostering attitudes and skills that will contribute to securing an honourable place in the international community, based on justice, equality and mutual respect.

1.2 Common National Competencies

The following Basic Competencies developed through education will contribute to achieving the above National Goals.

(I) Competencies in Communication

Competencies in Communication are based on four subsets; Literacy, Numeracy, Graphics and IT proficiency.

Literacy: Listen attentively, speak clearly, read for meaning, write accurately and lucidly and communicate ideas effectively.

Numeracy: Use numbers for things, space and time, count, calculate and measure systematically.

Graphics: Make sense of line and form, express and record details, instructions and ideas with line form and colour.

IT proficiency: Computer literacy and the use of information and communication technologies (ICT) in learning, in the work environment and in personal life.

(II) Competencies relating to Personality Development

- Generic skills such as creativity, divergent thinking, initiative, decision making, problem solving, critical and analytical thinking, team work, inter-personal relations, discovering and exploring;
- Values such as integrity, tolerance and respect for human dignity;
- Emotional intelligence.

(III) Competencies relating to the Environment

These competencies relate to the environment: social, biological and physical.

Social Environment: Awareness of the national heritage, sensitivity and skills linked to being members of a plural society, concern for distributive justice, social relationships, personal conduct, general and legal conventions, rights, responsibilities, duties and obligations.

Biological Environment: Awareness, sensitivity and skills linked to the living world, people and the ecosystem, the trees, forests, seas, water, air and life- plant, animal and human life.

Physical Environment: Awareness, sensitivity and skills linked to space, energy, fuels, matter, materials and their links with human living, food, clothing, shelter, health, comfort, respiration, sleep, relaxation, rest, wastes and excretion.

Included here are skills in using tools and technologies for learning working and living.

(IV) Competencies relating to Preparation for the World of Work

Employment related skills to maximize their potential and to enhance their capacity

- to contribute to economic development,
- to discover their vocational interests and aptitudes,
- to choose a job that suits their abilities, and
- to engage in a rewarding and sustainable livelihood.

(V) Competencies relating to Religion and Ethics

Assimilating and internalizing values, so that individuals may function in a manner consistent with the ethical, moral and religious modes of conduct in everyday living, selecting that which is most appropriate.

(VI) Competencies in Play and the Use of Leisure

Pleasure, joy, emotions and such human experiences as expressed through aesthetics, literature, play, sports and athletics, leisure pursuits and other creative modes of living.

(VII) Competencies relating to “learning to learn”

Empowering individuals to learn independently and to be sensitive and successful in responding to and managing change through a transformative process, in a rapidly changing, complex and interdependent world.

1.3 Aims of Learning Mathematics

The following objectives should be aimed at and achieved to further develop the mathematical concepts, creativity and sense of appreciation in students entering the junior secondary stage, so that their mathematical thinking, understanding and abilities are formally enhanced.

- (1) The development of computational skills through the provision of mathematical concepts and principles, as well as knowledge of mathematical operations, and the development of the basic skills of solving mathematical problems with greater understanding.
- (2) The development of correct communication skills by enhancing the competencies of the proper use of oral, written, pictorial, graphical, concrete and algebraic methods.
- (3) The development of connections between important mathematical ideas and concepts, and the use of these in the study and improvement of other subjects. The use of mathematics as a discipline that is relevant to lead an uncomplicated and satisfying life.
- (4) The enhancement of the skills of inductive and deductive reasoning to develop and evaluate mathematical conjectures and conversations.
- (5) The development of the ability to use mathematical knowledge and techniques to formulate and solve problems, both familiar and unfamiliar and which are not limited to arithmetic or the symbolical or behavioral, which arise in day to day life.

1.4 Subject Content

Competency	Competency Level	Content	Learning Outcomes	Periods
<p><i>Numbers</i></p> <p>Competency – 1 Manipulates the mathematical operations in the set of real numbers to fulfill the needs of day to day life.</p>	<p>1.1 Methodically simplifies expressions involving whole numbers.</p>	<ul style="list-style-type: none"> • Simplifying whole numbers • Rules of Simplification (BODMAS) 	<ul style="list-style-type: none"> • Follows the rules on the order of the application of operations (BODMAS) when manipulating numbers under the arithmetic operations. • Simplifies numerical expressions of whole numbers consisting of no more than three digits and involving the basic arithmetic operations, that result in a solution which is a positive whole number. • Simplifies numerical expressions of whole numbers consisting of no more than three digits and involving the basic arithmetic operations and brackets, that result in a solution which is a positive whole number. 	<p>04</p>
	<p>1.2 Adds directed numbers with an understanding of directions.</p>	<ul style="list-style-type: none"> • Directed Numbers <ul style="list-style-type: none"> • Concept • Addition of Integers (With the aid of the number line as well as without using the number line) • Addition of Directed Numbers 	<ul style="list-style-type: none"> • Expresses that a directed number is a number which is written with a positive or negative sign, to illustrate the fact that it is a number on a number line which is a certain distance from the origin, and in a particular direction. • By using a number line, expresses that the sum of two positive integers is a positive integer. • By using a number line, expresses that the sum of two negative integers is a negative integer. • By using a number line, expresses that the sum of two integers of distinct signs is obtained by considering the difference between the numerical values of the two numbers. 	<p>06</p>

Competency	Competency Level	Content	Learning Outcomes	Periods
			<ul style="list-style-type: none"> • Accepts that the sign of the sum of two integers of distinct signs is the sign of the integer of larger numerical value. • Adds integers with the aid of a number line. • Adds directed numbers without using a number line. 	
	<p>1.3 Solves simple problems using the factors and multiples of numbers.</p>	<ul style="list-style-type: none"> • Factors and Multiples (Up to 1000) • Prime factors (Up to 100) • Highest common factor (Up to three numbers) • Least common multiple (Up to three numbers) 	<ul style="list-style-type: none"> • Writes down the prime factors of a number consisting of no more than two digits. • Accepts that the highest common factor (of no more than three numbers) is the largest number which divides each of the given numbers without remainder. • Finds the highest common factor of no more than three numbers. • Finds the least common multiple of no more than three numbers by considering the multiples of each of them. • Accepts that the least common multiple of several numbers is the smallest number than can be divided without remainder by each of them. • Finds the least common multiple of no more than three numbers using their prime factors. • Applies the knowledge on factors and multiples to solve simple problems. 	06

Competency	Competency Level	Content	Learning Outcomes	Periods
	1.4 Makes decisions regarding the divisibility of a number.	<ul style="list-style-type: none"> • Rules of divisibility • By 3, by 4, by 6 and by 9 	<ul style="list-style-type: none"> • Finds the digital root of a number. • States that when the digital root of a number is a multiple of three, then the number is divisible by three. • States that if the last two digits of a number are zero or if the last two digits represent a number which is divisible by four, then the number itself is divisible by four. • States that numbers that are divisible by two and three are divisible by six also. • States that a number with digital root 9 is divisible by 9. • Examines whether a number is divisible by 3 or 4 or 6 or 9 by using the rules of divisibility. 	05
Competency – 3 Manipulates units and parts of units under the mathematical operations to easily fulfill the requirements of day to day life	3.1 Manipulates fractions under the operations of addition and subtraction.	<ul style="list-style-type: none"> • Fractions <ul style="list-style-type: none"> • Introducing mixed numbers • Introducing improper fractions • Conversion <ul style="list-style-type: none"> • Improper fractions \Leftrightarrow mixed numbers • Comparison <ul style="list-style-type: none"> • Fractions with unrelated 	<ul style="list-style-type: none"> • Recognizes that a mixed number consists of a whole number and a proper fraction. • States that fractions which have a numerator which is greater or equal to the denominator are improper fractions. • Converts a mixed number into an improper fraction. Converts an improper fraction into a mixed number. • Compares fractions with unrelated denominators, where the denominator of each is less than or equal to 12. 	10

Competency	Competency Level	Content	Learning Outcomes	Periods
		<p>denominators (denominator less than or equal to 12)</p> <ul style="list-style-type: none"> • Addition and Subtraction <ul style="list-style-type: none"> • With mixed numbers 	<ul style="list-style-type: none"> • States that when two mixed numbers are being added or subtracted, they can either be converted into improper fractions and simplified, or be simplified by first separating out the whole numbers and the proper fractions. • Adds no more than three numbers consisting of mixed numbers and proper fractions with equal denominators. • Adds no more than three numbers consisting of mixed numbers and proper fractions with related denominators. • Adds no more than three numbers consisting of mixed numbers and proper fractions with unrelated denominators. • Subtracts from a mixed number, a proper fraction with the same denominator. • Subtracts from a mixed number, a proper fraction with a related denominator. • Subtracts from a mixed number, a proper fraction with an unrelated denominator. • Subtracts from a mixed number, a mixed number with the same denominator. • Subtracts from a mixed number, a mixed number with a related denominator. 	

Competency	Competency Level	Content	Learning Outcomes	Periods
			<ul style="list-style-type: none"> • Subtracts from a mixed number, a mixed number with an unrelated denominator. <p>Simplifies expressions involving the addition and subtraction of fractions.</p>	
	<p>3.2 Manipulates decimals under the operations of multiplication and division.</p>	<ul style="list-style-type: none"> • Decimals • Conversion <ul style="list-style-type: none"> • Terminating Decimals \Leftrightarrow Fractions • Multiplying and Dividing <ul style="list-style-type: none"> • By powers of 10 • By a whole number 	<ul style="list-style-type: none"> • Converts into decimals, fractions that can be converted into terminating decimals. • Converts a terminating decimal into a fraction and writes it in its simplest form. • Multiplies a decimal number by powers of 10. • Divides a decimal number by powers of 10. • Multiplies a decimal number by a whole number. • Divides a decimal number by a whole number. • Solves problems related to decimals. 	05
<p>Competency – 4 Uses ratios to facilitate day to day activities.</p>	<p>4.1 Shares resources fairly by applying the knowledge on ratios.</p>	<ul style="list-style-type: none"> • Ratios <ul style="list-style-type: none"> • Dividing in a ratio (Up to three terms) • Calculating the total quantity 	<ul style="list-style-type: none"> • Divides a quantity into three according to a ratio. • Calculates the total quantity when the ratio and the value of one of the terms are given. • Calculates the values of the rest of the terms when the ratio and the value of one term are given. • Applies the knowledge on ratios in practical situations. 	04

Competency	Competency Level	Content	Learning Outcomes	Periods
<p>Competency - 5 Uses percentages to make successful transactions in the modern world.</p>	<p>5.1 Analyses the different ways of representing a number.</p>	<ul style="list-style-type: none"> • Percentages <ul style="list-style-type: none"> • Concept • Conversion <ul style="list-style-type: none"> • Fractions → Percentages (The denominator a factor of 100) • Decimals → Percentages (Up to two decimal places) 	<ul style="list-style-type: none"> • Describes the concept of percentages. • Uses the symbol % to represent a percentage. • Writes as percentages, fractions that have denominators which are factors of 100. • Writes a decimal number of up to two decimal places as a percentage. 	<p>05</p>
<p>Competency – 6 Uses logarithms and calculators to easily solve problems in day to day life.</p>	<p>6.1 Manipulates the laws of indices and simplifies powers that have an algebraic symbol as the base.</p>	<ul style="list-style-type: none"> • Indices <ul style="list-style-type: none"> • Writing a number as a product of powers of prime factors (Numbers less than 100) • Introducing powers that have an algebraic symbol as the base (Two symbols and the index less than 4) • Expansion of powers with algebraic bases • Substitution into powers with algebraic bases (Positive integers) 	<ul style="list-style-type: none"> • Writes a number less than 100 as a product of powers of prime factors. • Finds the value of a product of powers of prime numbers. • States that when an algebraic symbol is multiplied repeatedly, a power is obtained, with base the algebraic symbol and index the number of times the symbol is repeatedly multiplied. • Expands products of powers of the form $x^m y^n$ ($m, n < 4$). • Writes a product of algebraic terms in the form $x^m y^n$. • Finds the value of a power that has an algebraic symbol as its base, by substituting positive integers. • By substituting positive integers, finds the value of a product of powers that have algebraic symbols as bases. 	<p>06</p>

Competency	Competency Level	Content	Learning Outcomes	Periods
<p><i>Measurements</i></p> <p>Competency – 7 Investigates the various methods of finding the perimeter to carry out daily tasks effectively.</p>	<p>7.1 Manipulates measurements related to length under the basic mathematical operations to fulfill various needs.</p>	<ul style="list-style-type: none"> • Measurements related to length <ul style="list-style-type: none"> • Addition, subtraction • Multiplication, division (By a whole number only) 	<ul style="list-style-type: none"> • Adds, subtracts lengths involving cm and mm. • Adds, subtracts lengths involving m and cm. • Adds, subtracts lengths involving km and m. • Multiplies, divides by a whole number, lengths involving cm and mm. • Multiplies, divides by a whole number, lengths involving m and cm. • Multiplies, divides by a whole number, lengths involving km and m. • Solves problems related to measurements of length to fulfill various needs. 	04
	<p>7.2 Applies formulae to solve problems related to the perimeters of rectilinear plane figures.</p>	<ul style="list-style-type: none"> • Application of formulae for the perimeter <ul style="list-style-type: none"> • Equilateral triangle • Square • Rectangle 	<ul style="list-style-type: none"> • Finds the perimeter of an equilateral triangle by using the formula. • Finds the perimeter of a square by using the formula. • Finds the perimeter of a rectangle by using the formula. • Finds the length of a side of an equilateral triangle, a square or a rectangle, when the perimeter is given. • Applies formulae when solving problems involving perimeters. 	04
<p>Competency – 8 Makes use of a limited space in an optimal manner by investigating the area.</p>	<p>8.1 Investigates the areas of rectilinear plane figures.</p>	<ul style="list-style-type: none"> • Area <ul style="list-style-type: none"> • Square • Rectangle • Standard units (cm^2, m^2) • Estimation of the area • Area of compound plane figures 	<ul style="list-style-type: none"> • Identifies the standard unit of area. • Finds the area of a square using the formula. • Finds the area of a rectangle using the formula. • Finds the length of a side of a square or a rectangle when the area is given. • Estimates the area of a square. • Estimates the area of a rectangle. 	06

Competency	Competency Level	Content	Learning Outcomes	Periods
		(Including squares and rectangles)	<ul style="list-style-type: none"> • Accepts that when finding the area of compound figures consisting of squares and rectangles, the figure should first be separated appropriately into squares and rectangles. • Finds the area of compound plane figures consisting of squares and rectangles. • Solves problems related to the area of compound plane figures consisting of squares and rectangles. 	
<p>Competency – 9 Uses the knowledge on mass to fulfill daily needs.</p>	<p>9.1 Manipulates masses given in terms of milligrams, grams and kilograms under the basic mathematical operations.</p>	<ul style="list-style-type: none"> • Mass <ul style="list-style-type: none"> • Relationship between milligram and gram • Estimation of mass • Mass (mg, g, kg) <ul style="list-style-type: none"> • Addition and subtraction • Multiplication and division (By a whole number only) 	<ul style="list-style-type: none"> • Identifies the units mg, g and kg which are used to measure mass. • States the relationship between mg and g. • States the relationship between g and kg. • Converts $mg \rightleftharpoons g$, $g \rightleftharpoons kg$. • Estimates the mass of an object or an amount. • Adds, subtracts masses given in terms of mg and g. • Adds, subtracts masses given in terms of g and kg. • Multiplies, divides by a whole number, measurements of masses given in terms of mg and g. • Multiplies, divides by a whole number, measurements of masses given in terms of g and kg. • Solves problems involving masses given in terms of mg, g and kg. 	06
<p>Competency – 10 Gets the maximum out of space by working critically with respect to volume.</p>	<p>10.1 Inquiries into the amount of space taken up by cubes and cuboids.</p>	<ul style="list-style-type: none"> • Volume (Of cubes and cuboids) <ul style="list-style-type: none"> • Concept • Volume in terms of arbitrary units • Volume in terms of standard units (cm^3, m^3) 	<ul style="list-style-type: none"> • Explains the concept of volume. • Expresses the volume of a cube in terms of arbitrary units. • Expresses the volume of a cuboid in terms of arbitrary units. • Expresses the volume of a cube in terms of standard units. 	05

Competency	Competency Level	Content	Learning Outcomes	Periods
		<ul style="list-style-type: none"> • Estimation of volume 	<ul style="list-style-type: none"> • Expresses the volume of a cuboid in terms of standard units. • For a given volume of a cuboid, mentions possible lengths, breadths and heights. • Estimates the volume of a cube/ cuboid. • Identifies the relationships between the volumes of cubes, cuboids as well as between the volumes of cubes and cuboids. 	
<p>Competency – 11 Works critically with the knowledge of liquid measurements to fulfill daily needs.</p>	<p>11.1 Manipulates liquid measurements involving milliliters and liters under the basic mathematical operations.</p>	<ul style="list-style-type: none"> • Liquid measurements • Units of Measurements (ml, l) • Multiplication (By a whole number) • Division (By a whole number) 	<ul style="list-style-type: none"> • Multiplies by a whole number, measurements of liquid volume expressed in terms of ml and l. • Divides by a whole number, measurements of liquid volume expressed in terms of ml and l. • Solves problems related to the multiplication and division of liquid volume measurements. 	04
<p>Competency – 12 Manages time to fulfill the needs of the world of work.</p>	<p>12.1 Manipulates measurements of time under addition and subtraction.</p>	<ul style="list-style-type: none"> • Time <ul style="list-style-type: none"> • Introduction • Month, year, leap year, decade, century, millennium • Measurements of time <ul style="list-style-type: none"> • Addition • Subtraction 	<ul style="list-style-type: none"> • Identifies the units month, year, decade, century and millennium which are used to measure time. • Identifies a leap year. • States the relationships between days, months and years. • Converts units used to measure time; year → month, month → day, year → day. • Adds, subtracts time given in terms of days and months. 	05

Competency	Competency Level	Content	Learning Outcomes	Periods
			<ul style="list-style-type: none"> Adds, subtracts time given in terms of months and years. Adds, subtracts time given in terms of days, months and years. 	
Competency – 13 Uses scale diagrams in practical situations by exploring various methods.	13.1 Represents rectangular and square shapes observed in the environment by scale diagrams.	<ul style="list-style-type: none"> Scale diagrams <ul style="list-style-type: none"> Selecting suitable scales Drawing rectilinear plane figures to scale <ul style="list-style-type: none"> Square Rectangle 	<ul style="list-style-type: none"> Proposes suitable scales to draw a figure that was obtained from the environment with measurements. Describes various ways of representing a scale. States that an actual length of x is represented by a length of 1 cm in a scale diagram drawn to the scale given by 1: x. Makes a scale diagram of a rectangular shape in the environment by using a suitable scale. Makes a scale diagram of a square shape in the environment by using a suitable scale. Calculates the actual lengths using the scale and the lengths in the scale diagram. 	06
<i>Algebra</i> Competency – 14 Simplifies algebraic expressions by systematically exploring various methods.	14.1 Constructs algebraic expressions using all four mathematical operations.	<ul style="list-style-type: none"> Algebraic expressions <ul style="list-style-type: none"> Construction of algebraic expressions <ul style="list-style-type: none"> With integral and fractional coefficients (including all 	<ul style="list-style-type: none"> Constructs using only one mathematical operation, linear algebraic expressions in one unknown, with integral coefficients. Constructs, using several mathematical operations, linear algebraic expressions in one unknown, with integral coefficients. Describes a linear algebraic expression in one unknown in words. 	02

Competency	Competency Level	Content	Learning Outcomes	Periods
		<p>four basic mathematical operations.)</p> <ul style="list-style-type: none"> • With no more than two unknowns 	<ul style="list-style-type: none"> • Constructs using only one mathematical operation, linear algebraic expressions in one unknown, with fractional coefficients. • Constructs using several mathematical operations, linear algebraic expressions in one unknown, with fractional coefficients. • Constructs using only one mathematical operation, linear algebraic expressions in two unknowns, with integral coefficients. • Constructs using several mathematical operations, linear algebraic expressions in two unknowns, with integral coefficients. • Constructs using only one mathematical operation, linear algebraic expressions in two unknowns, with fractional coefficients. • Constructs using several mathematical operations, linear algebraic expressions in two unknowns with fractional coefficients. 	
	<p>14.2 Simplifies algebraic expressions containing like and unlike terms</p>	<ul style="list-style-type: none"> • Terms of an algebraic expression <ul style="list-style-type: none"> • Addition • Subtraction (Including like and unlike terms) • Multiplication <ul style="list-style-type: none"> • A linear algebraic term by a whole number 	<ul style="list-style-type: none"> • Separates the like terms and unlike terms in a set of algebraic terms. • Identifies the coefficient of an algebraic term. • Adds several linear like terms together. • Subtracts a term with a positive coefficient from a like term with a positive coefficient such that the answer has a positive coefficient. • Simplifies a linear algebraic expression containing like and unlike terms, such that the answer has positive coefficients. 	<p>04</p>

Competency	Competency Level	Content	Learning Outcomes	Periods
		<ul style="list-style-type: none"> • Substitution in an algebraic expression (Whole numbers, not including roots) 	<ul style="list-style-type: none"> • Multiplies a linear algebraic term with a positive integral coefficient by a positive whole number. • Finds the value of an algebraic expression of the form $ax + b$, where $a \in \mathbb{Z}^+$ and $b \in \mathbb{N}$, by substituting a whole number for x. • Finds the value of an algebraic expression of the form $ax + by + c$ where $a, b, c \in \mathbb{N}$ and $a, b \neq 0$, by substituting whole numbers for x and y. 	
<p>Competency – 17 Manipulates the methods of solving equations to fulfill the needs of day to day life.</p>	<p>17.1 Uses linear equations to solve problems encountered in daily life.</p>	<ul style="list-style-type: none"> • Construction of linear equations <ul style="list-style-type: none"> • Of the form $ax \pm b = c$, where $a, b, c \in \mathbb{N}$ and $a \neq 0$ • Solving linear equations (of which the answer is a positive number) <ul style="list-style-type: none"> • Using flow charts • Using algebraic methods 	<ul style="list-style-type: none"> • Based on the information that is given, constructs linear equations of the form $x \pm a = b$, where $a, b \in \mathbb{N}$ and $a \neq 0$. • Based on the information that is given, constructs linear equations of the form $ax = b$, where $a, b \in \mathbb{N}$ and $a \neq 0$. • Based on the information that is given, constructs linear equations of the form $ax \pm b = c$, where $a, b, c \in \mathbb{N}$ and $a \neq 0$. • Using flow charts, solves equations with positive answers, of the form $x \pm a = b$, where $a, b \in \mathbb{N}$ and $a \neq 0$. • Using flow charts, solves equations with positive answers, of the form $ax = b$, where $a, b \in \mathbb{N}$ and $a \neq 0$. • Using flow charts, solves equations with positive answers, of the form $ax \pm b = c$, where $a, b, c \in \mathbb{N}$ and $a \neq 0$. 	05

Competency	Competency Level	Content	Learning Outcomes	Periods
			<ul style="list-style-type: none"> • Accepts that inverse mathematical operations need to be used with a proper understanding of them, when solving linear equations. • Using algebraic methods, solves equations with positive answers, of the form $x \pm a = b$, $ax = b$ and $ax \pm b = c$, where $a, b, c \in \mathbb{N}$ and $a \neq 0$. • Examines the accuracy of the solution by substituting it back into the equation. • Solves problems by using the knowledge on solving linear equations. 	
Competency – 19 Explores the methods by which formulae can be applied to solve problems encountered in day to day life.	19.1 Easily solves problems encountered in daily life by constructing simple formulae.	<ul style="list-style-type: none"> • Formulae <ul style="list-style-type: none"> • Construction (Up to three variables) • Substitution(Positive whole numbers) 	<ul style="list-style-type: none"> • Constructs a simple formula by considering the relationship between two variables. • Constructs a simple formula by considering the relationship between three variables. • Finds the value of a variable by substituting positive whole numbers for the other variables. • Easily solves problems encountered in daily life by using the knowledge of formulae. 	03
Competency – 20 Easily communicates the mutual relationships that exist between two variables by exploring various	20.1 Describes the location of a certain place with respect to two mutually perpendicular axes.	<ul style="list-style-type: none"> • Coordinate plane <ul style="list-style-type: none"> • Ordered pairs (Only the first quadrant) • Marking points 	<ul style="list-style-type: none"> • Accepts that a standard method is required to indicate the position of an object. • Identifies the Cartesian coordinate plane • Expresses the coordinates of a point in the first quadrant of a Cartesian coordinate plane as an ordered pair. 	06

Competency	Competency Level	Content	Learning Outcomes	Periods
methods.			<ul style="list-style-type: none"> • Writes down the coordinates of a point in the first quadrant of a Cartesian coordinate plane. • Marks a point with coordinates (x, y) where $x, y \geq 0$, on a coordinate plane. • In daily activities, determines the location of an object using the knowledge of a coordinate plane. 	
<p>Geometry</p> <p>Competency – 21 Makes decisions by investigating the relationships between various angles.</p>	<p>21.1 Analyzes angles through static and dynamic concepts.</p>	<ul style="list-style-type: none"> • Angles <ul style="list-style-type: none"> • Concept of angles <ul style="list-style-type: none"> • Static and dynamic • Naming angles • Measuring angles • Drawing angles 	<ul style="list-style-type: none"> • Gains an understanding of the concept of static angle by considering certain locations in the environment. • Gains an understanding of the concept of dynamic angle by considering certain rotations in the environment. • Recognizes that an angle is formed by the intersection of two straight line segments. • Identifies the arms and the vertex of an angle when a figure of an angle is given. • Draws a straight line segment using a straight edge and names it. • Draws various angles using a straight edge and names them. • Writes down the arms, vertex and the angle when a figure of an angle which has been named is given. • Identifies the protractor as an instrument which is used to measure the magnitude of angles. 	<p>05</p>

Competency	Competency Level	Content	Learning Outcomes	Periods
			<ul style="list-style-type: none"> • Measures given acute/obtuse/reflex angles using a protractor. • Draws acute/obtuse/reflex angles of given magnitude using a protractor. 	
	21.2 Investigates the magnitude of angles.	<ul style="list-style-type: none"> • Classifying angles based on magnitude (in degrees) <ul style="list-style-type: none"> • Right angle(90°) • Straight angle (180°) 	<ul style="list-style-type: none"> • Recognizes that the magnitude of a right angle is 90°. • Recognizes that the magnitude of a straight angle is 180°. • Identifies acute angles, obtuse angles and reflex angles by means of angles of magnitude 90° and 180°. 	02
Competency – 22 Engages in creations by exploring various solids.	22.1 Engages in the creation of models of square pyramids and triangular prisms.	<ul style="list-style-type: none"> • Solids <ul style="list-style-type: none"> • Creation of models <ul style="list-style-type: none"> • Square pyramid • Triangular prism 	<ul style="list-style-type: none"> • Recognizes a square pyramid. • Draws the net of a square pyramid on a square ruled piece of paper. • Creates a model of a square pyramid. • Prepares various nets to make models of square pyramids. • Identifies the shapes of the faces of a square pyramid, the faces with identical shapes and the edges of equal length. • Recognizes a triangular prism. • Draws the net of a triangular prism on a square ruled piece of paper. 	04

Competency	Competency Level	Content	Learning Outcomes	Periods
			<ul style="list-style-type: none"> • Creates a model of a triangular prism. • Prepares various nets to make models of triangular prisms. • Identifies the shapes of the faces of a triangular prism, the faces with identical shapes and the edges of equal length. • Determines the number of edges, vertices and faces that various square pyramids have. • Determines the number of edges, vertices and faces that various triangular prisms have. 	
	<p>22.2 Investigates the relationships between the properties of solids.</p>	<ul style="list-style-type: none"> • Euler's Relationship 	<ul style="list-style-type: none"> • Recognizes that square pyramids/triangular prisms satisfy Euler's Relationship: • Number of vertices + Number of faces = Number of edges + 2 • Investigates whether the various solids found in the environment satisfy Euler's relationship. • Engages in creations that contain square pyramids and triangular prisms. 	02
<p>Competency – 23 Makes decisions regarding day to day activities based on geometrical concepts related to rectilinear</p>	<p>23.1 Classifies triangles based on various properties.</p>	<ul style="list-style-type: none"> • Rectilinear plane figures • Classifying triangles <ul style="list-style-type: none"> • According to the angles • According to the sides 	<ul style="list-style-type: none"> • Identifies the three angles and the three sides as properties of a triangle. • Identifies a triangle with all three angles acute, as an acute angled triangle. • Identifies a triangle with a right angle as a right angled triangle. • Identifies a triangle with an obtuse angle as an obtuse angled triangle. 	03

Competency	Competency Level	Content	Learning Outcomes	Periods
plane figures.			<ul style="list-style-type: none"> • Identifies a triangle with three equal sides as an equilateral triangle. • Identifies a triangle with two equal sides as an isosceles triangle. • Identifies a triangle with three unequal sides as a scalene triangle. • Classifies triangles into 6 types by considering both their sides and their angles. 	
	<p>23.2 Classifies polygons according to their shapes.</p>	<ul style="list-style-type: none"> • Classification of polygons <ul style="list-style-type: none"> • Convex • Concave • Regular 	<ul style="list-style-type: none"> • Identifies a closed plane figure bounded by straight line segments as a polygon. • Draws various polygons using a straight edge. • Identifies polygons with all the interior angles of magnitude less than 180° as convex polygons. • Identifies polygons with at least one interior angle of magnitude greater than 180° as concave polygons. • Identifies polygons with all sides equal and all interior angles equal as regular polygons. • Engages in classifying polygons with reasons as convex, concave, regular or irregular polygons. • Gives reasons as to why a concave polygon cannot be a regular polygon. 	03
<p>Competency – 24 Thinks logically to make decisions based on geometrical concepts related to circles.</p>	<p>24.1 Creates designs using circles.</p>	<ul style="list-style-type: none"> • Circle <ul style="list-style-type: none"> • Drawing circles • Creating designs using a pair of compasses • Centre 	<ul style="list-style-type: none"> • Draws circles by accurately manipulating a pair of compasses. • Creates circular designs by using a pair of compasses. • Investigates the different instruments that can be used to draw circles. • For a given situation, identifies the instrument that is suitable to be used to draw a circle. 	04

Competency	Competency Level	Content	Learning Outcomes	Periods
		<ul style="list-style-type: none"> • Radius • Diameter 	<ul style="list-style-type: none"> • Identifies the point right at the middle of a circle as its centre. • Identifies a straight line segment which joins the centre to a point on the circle as the radius of the circle. • Identifies a straight line segment which joins two points on a circle and passes through its centre as a diameter of the circle. • Engages in simple calculations by using the fact that the diameter of a circle is twice its radius. • Draws circles of given radii using a pair of compasses. 	
<p>Competency – 25 Observes the beauty of the environment by exploring the properties of various shapes.</p>	<p>25.1 Engages in creations while examining the properties of symmetric plane figures.</p>	<ul style="list-style-type: none"> • Bilateral symmetry • Concept • Axes of symmetry 	<ul style="list-style-type: none"> • Identifies plane figures that can be folded into two coinciding parts as plane figures with bilateral symmetry. • Draws the axes of symmetry of a plane figure that has bilateral symmetry. • Accepts that a plane figure with bilateral symmetry has at least one axis of symmetry. • Finds the number of axes of symmetry that a given plane figure has. • Draws plane figures with bilateral symmetry on a square ruled paper. • Creates plane figures with bilateral symmetry using various methods such as folding papers and cutting them, using paint etc. 	<p>05</p>

Competency	Competency Level	Content	Learning Outcomes	Periods
<p>Competency – 26 Investigates the methods of organizing various geometric shapes and uses them to enhance beauty.</p>	<p>26.1 Engages in creations using tessellation.</p>	<ul style="list-style-type: none"> • Tessellation • Concept • Pure tessellation • Semi-pure tessellation 	<ul style="list-style-type: none"> • Recognizes tessellation as the process of creating a two dimensional plane by methodically and repeatedly using shapes, ensuring that there are neither overlaps nor gaps between the shapes. • Identifies tessellations using just one plane figure as pure tessellations. • Engages in pure tessellation by using any triangle/any quadrilateral. • Identifies the plane figures that can be used in a pure tessellation and engages in tessellation. • Identifies tessellations using two or more plane figures as semi-pure tessellations. • Engages in semi-pure tessellation by using triangles and quadrilaterals. • Identifies various plane figures that are suitable for semi-pure tessellation and engages in semi-pure tessellation by using them. • Cuts a given square lamina into pieces and organizes the pieces to form a plane figure that is suitable for pure-tessellation. • Engages in creations using tessellation. 	<p>05</p>
<p>Competency – 27 Analyzes according to geometric laws,</p>	<p>27.1 Draws plane figures by considering the parallelism of a</p>	<ul style="list-style-type: none"> • Parallel lines • Concept • Drawing (Using set-squares) • Examining 	<ul style="list-style-type: none"> • Recognizes straight lines between which there is an equal gap as parallel lines. • Recognizes the gap between a pair of parallel lines as the perpendicular distance, or else the shortest distance between the two lines. 	<p>03</p>

Competency	Competency Level	Content	Learning Outcomes	Periods
the nature of the locations in the surroundings.	pair of straight lines.		<ul style="list-style-type: none"> • Identifies locations in the environment that contain parallel lines. • Examines whether a given pair of straight lines is parallel or not by using a set square and a straight edge. • Draws various pairs of parallel lines using a set square and a straight edge. • Draws a line parallel to a given straight line at a given distance using a set square and a straight edge. • Draws a line parallel to a given straight line through a given point outside the line, by using a set square and a straight edge. • Draws various plane figures containing parallel lines using a set square and a straight edge. 	
	27.2 Constructs rectilinear plane figures.	<ul style="list-style-type: none"> • Construction of plane figures <ul style="list-style-type: none"> • Line segments • Equilateral triangles • Regular hexagons 	<ul style="list-style-type: none"> • Constructs a straight line segment of given length using a straight edge and a pair of compasses. • Constructs an equilateral triangle of given side length using a straight edge and a pair of compasses. • Constructs a regular hexagon by means of an equilateral triangle. • Constructs a regular hexagon by means of a circle. • Engages in creations consisting of equilateral triangles and hexagons. 	04

Competency	Competency Level	Content	Learning Outcomes	Periods
<p><i>Statistics</i></p> <p>Competency – 28 Investigates the various methods of representing data to facilitate daily work.</p>	<p>28.1 Represents data appropriately by bar graphs and by multi-bar graphs.</p>	<ul style="list-style-type: none"> • Representation of data <ul style="list-style-type: none"> • Graphs <ul style="list-style-type: none"> • Bar graphs • Multi-bar graphs (Of no more than 3 types) 	<ul style="list-style-type: none"> • States that bar graphs are drawn using bars of equal width. • Expresses that bar graphs can be drawn using either vertical or horizontal bars. • Expresses that the length of a bar represents the relevant number of data. • Represents a given set of data by a bar graph. • Provides examples of occasions when data of no more than three types are represented in one graph. • Expresses that when multi-bar graphs are used to represent data, for each occasion, the bars representing the different types are drawn adjoining each other. • Represents by multi-bar graphs, given data of no more than three types. • Represents data graphically by selecting the appropriate method from bar graphs and multi-bar graphs. • Confirms the suitability of the method that is selected from bar graphs and multi-bar graphs to represent given data. 	<p>04</p>
<p>Competency – 29 Makes predictions after analyzing data by various methods to facilitate daily activities.</p>	<p>29.1 Analyses information using bar graphs and multi-bar graphs.</p>	<ul style="list-style-type: none"> • Interpretation of date <ul style="list-style-type: none"> • Using bar graphs • Using multi-bar graphs 	<ul style="list-style-type: none"> • By comparing the lengths of the bars, determines the greatest value and when it occurs. • By comparing the lengths of the bars, determines the least value and when it occurs. • By comparing the lengths of the bars, determines 	<p>04</p>

Competency	Competency Level	Content	Learning Outcomes	Periods
			<p>when equal values occur.</p> <ul style="list-style-type: none"> • Compares information by considering the lengths of the bars. • Recognizes that bar graphs and multi-bar graphs aid in perceiving the information more effectively. 	
<p><i>Sets and Probability</i></p> <p>Competency – 30 Manipulates the principles related to sets to facilitate daily activities.</p>	<p>30.1 Identifies groups with common properties as sets and represents them by various methods.</p>	<ul style="list-style-type: none"> • Sets <ul style="list-style-type: none"> • Concept • Writing the elements • Representation of sets <ul style="list-style-type: none"> • By Venn diagrams • Using curly brackets 	<ul style="list-style-type: none"> • Describes a set as a group of items that has been specifically defined. • From a collection of groups, selects and names those which are sets. • Describes the items in a set as the elements of the set. • States what the elements of a given set are. • Accepts that a closed figure can be used to represent a set. • Identifies the closed figure that is used to represent a set as a Venn diagram. • Represents a given set by a Venn diagram. • Represents the elements of a given set in a curly bracket. 	<p>05</p>

Competency	Competency Level	Content	Learning Outcomes	Periods
Competency – 31 Analyzes the likelihood of an event occurring to predict future events.	31.1 Groups events based on the likelihood of occurrence.	<ul style="list-style-type: none"> • Likelihood of an event • Events that definitely occur • Events that definitely do not occur • Events of which the occurrence or non-occurrence cannot be stated definitely 	<ul style="list-style-type: none"> • States that, events which definitely occur are known as events that definitely occur. • States that, events which definitely do not occur are known as events that definitely do not occur. • Expresses events of which the occurrence cannot be stated definitely as events of which the occurrence or non-occurrence cannot be stated definitely. • Groups given events as events which definitely occur, events which definitely do not occur and events of which the occurrence or non-occurrence cannot be stated definitely. 	03
	31.2 Decides on the nature of an experiment related to an event.	<ul style="list-style-type: none"> • Experiments • Biased • Unbiased 	<ul style="list-style-type: none"> • Describes the outcomes of an experiment. • Provides examples of experiments with equally likely outcomes. • Provides examples of experiments of which the outcomes are not equally likely. • States that the objects used in experiments with equally likely outcomes are unbiased. • States that the objects used in experiments of which the outcomes are not equally likely are biased. • Distinguishes given experiments as those with biased objects and those with unbiased objects. 	03
			Total	170

Lesson Sequence

Content	Competency levels	Number of Periods
First Term		
1. Bilateral Symmetry	25.1	05
2. Sets	30.1	05
3. Mathematical Operations on Whole Numbers	1.1	04
4. Factors and Multiples	1.3, 1.4	11
5. Indices	6.1	06
6. Time	12.1	05
7. Paralell Strait Lines	27.1	03
8. Directed Numbers	1.2	06
9. Angles	21.1, 21.2	07
		52
Second Term		
10. Fractions	3.1	10
11. Decimals	3.2	05
12. Algebraic Expressions	14.1, 14.2	06
13. Mass	9.1	06
14. Rectilinear Plane Figures	23.1, 23.2	06
15. Equations and Formulae	17.1, 19.1	08
16. Length	7.1, 7.2	08
17. Area	8.1	06
18. Circles	24.1	04
19. Volume	10.1	05
20. Liquid Measurements	11.1	04
		68
Third Term		
21. Ratios	4.1	05
22. Percentages	5.1	05
23. Cartesian Plane	20.1	05
24. Construction of Plane Figures	27.2	05
25. Solids	22.1, 22.2	05
26. Data Representation and Interpretation	28.1, 29.1	08
27. Scale Diagrams	13.1	06
28. Tessellation	26.1	05
29. Likelihood of an Event	31.1, 31.2	06
		50
	Total	170

Instructions for the Learning-Teaching Evaluation Process

1. Bilateral symmetry

Competency 25: Observes the beauty of the environment exploring the properties of various shapes

Competency level 25.1: Engages in creations while examining the properties of symmetric plane figures

Number of periods: 05

Introduction

Most of the things in our environment including the human being are made out of parts with similar features. Different patterns can be observed in plant leaves, branching of some trees and the division of leaflets in coconut leaves. These patterns make our environment beautiful. It is needed to encourage students to study these patterns and identify the mathematical concepts in them. This is important for students to reach competency 25, their higher studies and to produce make them an environment - friendly community. Under competency 25.1, it is expected to identify bilateral plane figures, draw axes of symmetry, find the number of axes of symmetry and draw plane figures with bilateral symmetry. This lesson enables students to acquire those skills and create beautiful figures with bilateral symmetry using methods such as folding papers, usage of ink and drawing figures. This lesson can be taught in a more practical and attractive way and will enhance interest in mathematics.

Learning outcomes related to competency level 25.1

1. Identifies plane figures that can be folded into two coinciding parts as plane figures with bilateral symmetry.
2. Draws the axes of symmetry of a plane figure that has bilateral symmetry.
3. Accepts that a plane figure with bilateral symmetry has at least one axis of symmetry.
4. Finds the number of axes of symmetry of a given plane figure.
5. Draws plane figures with bilateral symmetry on a square ruled paper.
6. Creates plane figures with bilateral symmetry using various methods such as folding papers and cutting them, using paint etc.

Glossary of Terms:

Symmetry	-	සමමතිය	-	சமச்சீர்
Bilateral symmetry	-	ද්වි පාර්ශ්වික සමමතිය	-	இருபுடைச் சமச்சீர்
Axis of symmetry	-	සමමති අක්ෂය	-	சமச்சீர் அச்ச
Symmetrical plane figures	-	සමමතික තලරූප	-	சமச்சீரான தளவுரு

Instructions to plan the lesson:

This lesson is designed to achieve 1, 2 and 3 learning outcomes. The lesson is developed based on a simple practical exercise.

Time: 40 minutes

Quality inputs :

- Copies of student activity sheets

Instructions for the teacher:**Approach:**

- Introducing with examples and non-examples for bilateral symmetry lead a discussion pointing out that most of the things in our environment are composed of parts with identical characteristics.

Development of the lesson:

- Group the students so that each group consists of 4-5 students.
- Distribute one student activity sheet to each student.
- Bring the students out of the classroom.
- Take one leaf each from different plants in the environment and ask students to check whether it is possible to coincide them.
- Instruct to fill column (1) and column (2) of table (A) of the student activity sheet.
- Appreciate these wonderful characteristics of plants.
- Bring the students back to the classroom and instruct to fill the rest of the activity sheet. Instruct them to sketch a diagram of coinciding plant leaves and its folding line in the student activity sheet.
- Demonstrating how to fold rectangular lamina into two similar parts, explain that plane figures which can be folded into two parts which coincides are plane figures with bilateral symmetry.
- Explain the axis of symmetry of a bilateral plane figure and describe that bilaterally symmetrical plane figures have at least one axis of symmetry and some plane figures have more than one axis of symmetry.
- After discussing above facts, instruct students to complete the rest of the student activity sheet.

Activity sheet for students:



- Observe the plant leaves collected from the environment and fill the column 1 and 2 of Table 'A'.
- According to the teacher's instructions complete column 3 of the table.

Table A

Column 1 Name of the plant which has coinciding leaves	Column 2 Name of the plant which does not have coinciding leaves	Column 3 Sketches of coinciding leaves and folding line

- Complete Table B according to the teacher's instructions

Table B

Plane figure	Figure	Bilateral symmetry	
		Yes	No
1. Rectangle			
2. Square			
3. Equilateral triangle			
4. Isosceles triangle			
5. Scalene triangle			
6. Circle			
7. -----			
8. -----			
9. -----			
10. -----			

Assessment and Evaluation:

- Assessment criteria:
 - Correctly identifies of bilateral symmetry of a plane figure.
 - Correctly identifies the axis of symmetry of a plane figure with bilateral symmetry.
 - Finds and draws the axis of symmetry of a plane figure with bilateral symmetry.
 - Adopts concepts developed through concrete experiences in abstract situations.
 - Appreciates wonderful creations of the nature.
- Direct the students to do the exercises of lesson 1st in the textbook.

Practical situations:

- Discuss with students about the following which have bilateral symmetry.
 - Some items available in natural environment
 - House plans
 - Dress designing blocks
 - Drawings
 - Molecules of compounds

For your attention...**Development of the lesson:**

- Include plane figures such as parallelogram, rhombus and trapezoid for learning outcome 4 and, design and implement suitable activities to discuss symmetry or non-symmetry of plane figures.
- Design suitable activities for learning outcomes 5 and 6 and implement with students.

Assessment and Evaluation:

- Direct students to do the relevant exercises of the lesson 1st in the textbook

For further reference:

- <http://www.youtube.com/watch?v=LrTn4cvsewk>

2. Sets

Competency 30: Manipulates the principles related to sets to facilitate daily activities

Competency level 30.1: Identifies groups with common properties as sets and represents them by various methods.

Number of periods: 05

Introduction:

Man has to deal with the objects in his living environment. Based on different needs these objects are divided into groups. A collection of objects grouped based on a specific property is called a set. Objects in a set are called elements. Indicating a set in the form of a closed figure is known as Venn diagram. This illustration of sets was conceived by John Venn, so they are referred to as 'Venn diagrams'.

Learning outcomes related to competency level 30.1:

1. Describes a set as a group of items that has been specifically defined.
2. From a collection of groups, selects and names those which are sets.
3. Describes the items in a set as the elements of the set.
4. States the elements of a given set.
5. Identifies a closed figure used to represent a set as a Venn diagram.
6. Represents a given set by a Venn diagram.

Glossary of Terms:

Set	- කුලකය	- தொடை
Elements	- අවයවය	- மூலகங்கள்
Venn diagram	- වෙන් රූපසටහන	- வென் வரிப்படம்

Instructions to plan the lesson:

Given below is a specimen lesson based on a group activity and discussion to achieve learning outcome 1, 2, 3 and 4 of competency level 30.1.

Time: 40 minutes

Quality inputs :

- Cardboard boxes each containing 12 strips of paper in which the sets and non-sets given in the annex 1 are written (one for each group).

Instructions for the teacher:**Approach:**

- Recall the activity done in grade six under the lesson 'Selection'.
- Recall that the term 'set' is used for a group of items categorized according to specified characteristics.

Development of the lesson:

- Group the class appropriately.
- Select examples for instances where the elements can be grouped as sets and cannot be grouped as sets. Explain why they are categorized as sets and non-sets.
- Give the boxes with paper strips and the activity sheets to the groups and engage them in the exercise.
- Give opportunity for the students to present their findings to the class.
- Lead the discussion to show that specifically identifiable groups of items are sets and the items which cannot be specifically identified are not considered as sets while taking into consideration and appreciating students' findings.
- State that objects of each set are identified as elements.
- Take few examples for sets and discuss with students on the elements of the each set.

**Activity sheet for the students:**

- Read carefully the statement written in paper strips received by you.
- Divide statements into two groups which indicate sets and non-sets.
- Complete the following table accordingly.

Statement	Set	Non-set
1. Colours of the rainbow		
2.		
3.		
4.		
5.		

- Present information to the whole class.

Assessment and Evaluation

- Assessment criteria:
 - Identifies sets and non-sets from a given list.
 - Accepts that a set is a specifically defined group which has common properties.
 - Accepts that the objects in a set are known as elements.
 - Name the elements of a given set.
 - Work as a team in the group
- Direct students to do the exercises of the lesson 2nd in the textbook.

Practical situations:

- Classifying the items used in day today life

For your attention...**Development of the lesson**

- Emphasize that closed diagrams are used as Venn diagrams to represent sets.
- Explain with examples that circular, rectangular or elliptical shapes can be used as closed diagrams.
- Design suitable activities for learning outcome 6 and implement them.

Assessment and Evaluation

- Direct students to do the exercises of the lesson 2nd in the textbook.

For further reference:

- <https://www.youtube.com/watch?v=Z5owJFmHncg>

Annex 1Examples for sets

1. White flowers blooming in your garden
2. Pets with four legs
3. School textbooks for grade 7
4. Houses in your school
5. Types of rice used as food
6. Planets so far discovered in the solar system
7. Multiples of 2 from 1 to 20
8. Number of students in your class
9. Colours of the rainbow

Examples for non-sets

1. Beautiful cloths
2. Rich people in this village
3. Tall teachers in the school
4. Sweet fruits
5. Long rivers
6. Cleaver students in your class
7. Good children Students in your class
8. Beautiful countries in the world

3. Mathematical Operations on Whole Numbers

Competency 1: Manipulates the mathematical operations in the set of real numbers to fulfill the needs of day to day life

Competency level 1.1 : Methodically simplifies expressions involving whole numbers.

Number of periods: 04

Introduction:

When a few whole numbers are connected with mathematical operations in a numerical expression, those mathematical operations should be done in a specific order. It is not the order presented in the expression. When the expression is described in words, the order of mathematical operations emerges.

Eg: Description of the expression $5+2\times 7$ gives the statement, 'add 5 and 2 and multiply by 7'.

According to that expression the answer is $5+2\times 7=5+14=19$

This mathematical expression cannot be explained as 'addition of 5 and 2 and multiply by 7'. To explain a mathematical expression in that way it is required to put parentheses as follows; $(5+2)\times 7$. It indicates that $(5+2)$ should be simplified first.

Therefore, the order of performing mathematical operations is as follows.

- (i) The part within parentheses
- (ii) "by"
- (iii) Multiplication and division
- (iv) Addition and subtraction

"by" discussed under above rules are not used in this lesson.

Learning outcomes relevant to competency level 1.1:

1. Follows the rules on the order of the application of operations (BODMAS) when manipulating numbers under the arithmetic operations.
2. Simplifies numerical expressions of whole numbers consisting of no more than three digits involving the basic arithmetic operations, solving out to a positive whole number.
3. Simplifies numerical expressions of whole numbers consisting of no more than three digits and involving the basic arithmetic operations and parentheses, that result in a solution which is a positive whole number.

Glossary of Terms:

Mathematical operations	- கணித கார்ப்பம்	- கணிதச் செய்கைகள்
Addition	- சேர்த்தல்	- கூட்டல்
Subtraction	- குறைத்தல்	- கழித்தல்
Multiplication	- பெருக்கல்	- பெருக்கல்
Division	- வகுத்தல்	- வகுத்தல்
Parentheses	- வரையறை	- அடைப்புகள்

Instructions to plan the lesson:

Given below is a specimen lesson plan adopting 'guided inquiry' method to develop concepts related to the first learning outcome of competency level 1.1 and to improve skills of children to do mathematical operations in a given expression according to the prescribed order.

Quality inputs:

- Copies of the student activity sheet

Instructions to the teacher:**Approach:**

- Display the expression $5+2 \times 7$ on the board and draw students' attention to it.
- Guide students to explain mathematical operations in the expression in words and to simplify the same.
- Lead a discussion to explain that there is a possibility of getting different answers due to changes in the order of performing mathematical operations. Therefore, it is required to have an order to perform it and simplification should be done according to that order.
- Direct the students to do the activity after the discussion.

Development of the lesson:

- Divide the class into small groups so that each group consists of four students.
- Distribute activity sheets among the groups.
- Direct students to do the activity.

- After the activity give an opportunity to the students to present their findings to the whole class.
- Based on the findings prepare a table as follows on the board.

	Expression	First mathematical operation	Second mathematical operation
A (i)	$12 + 4 \times 2$		
(ii)	$12 \times 4 + 2$		
(iii)	$320 + 14 \times 2$		
B (i)	$12 - 4 \times 2$		
(ii)	$12 \div 4 \times 2$		
(iii)	$320 - 4 \times 2$		
C (i)	$12 + 4 \div 2$		
(ii)	$12 \div 4 - 2$		
(iii)	$320 + 4 \div 2$		
D (i)	$12 - 4 \div 2$		
(ii)	$12 \times 4 - 2$		
(iii)	$320 - 4 \div 2$		

- Based on the prepared table make a review to explain that there is an order to perform mathematical operations of an expression. According to that order, division, multiplication, addition and subtraction has to be performed respectively.

Activity sheet for the students:



- Divide expressions named A, B, C, D among four members of the group.

A	(i) $12 + 4 \times 2$ =12 + 8 =20	(ii) $12 \times 4 + 2$ =..... =50	(iii) $320 + 4 \times 2$ =..... =328
B	(i) $12 - 4 \times 2$ =12 - 8 =4	(ii) $12 \times 4 - 2$ =..... = 46	(iii) $320 - 4 \times 2$ =..... =312
C	(i) $12 + 4 \div 2$ =12 + 2 =14	(ii) $12 \div 4 + 2$ =..... = 5	(iii) $320 + 4 \div 2$ =..... =322
D	(i) $12 - 4 \div 2$ =12 - 2 =10	(ii) $12 \div 4 - 2$ =..... = 1	(iii) $320 - 4 \div 2$ =..... =318

- According to (i), fill the blank second step of (ii) and (iii) so that it matches with the answers and note down (i), (ii) and (iii) in your exercise book.
- According to (ii) and (iii) explore the order of mathematical operations and discuss among the group members.
- Present the order of mathematical operations explored through A, B, C, D four groups of expressions to the whole class.

Assessment and Evaluation:

- Assessment criteria:
 - Accepts the need of an order for mathematical operations when simplifying expressions with basic mathematical operations.
 - Simplifies expressions involving multiplication and addition or subtraction leading to whole number solutions.
 - Simplifies expressions involving division and addition or subtraction leading to whole number solutions
 - Simplifies expressions with basic mathematical operations.
- Direct students to do the exercises of the lesson 3rd in the textbook.

Practical situations:

- When calculating balance of an item after distributing it among individuals in equal or unequal amounts, basic mathematical operations have to be used for simplification.

For your attention...**Development of the lesson:**

- Plan a lesson to achieve the learning outcomes 2 and 3 of competency level 1.1 and implement it with the students.

Assessment and Evaluation:

- Direct the students to do the relevant exercises of the lesson 3rd in the textbook.

For further reference:

- <http://www.youtube.com/watch?v=CIYdw4d4OmA>
- http://www.youtube.com/watch?v=GiSpzFKI5_w
- <http://www.youtube.com/watch?v=gjrGd9TjjnY>

4. Factors and multiples

Competency 1: Manipulates the mathematical operations in the set of real numbers to fulfill the needs of day to day life

Competency level 1.3: Solves simple problems using the factors and multiples of numbers

Competency level 1.4: Makes decisions regarding the divisibility of a number

Number of periods: 11

Introduction:

If a whole number can be divided by another whole number without a remainder, the divisor is identified as a factor of the dividend.

The largest common factor of all the common factors of several numbers is called the highest common factor for those numbers and by writing each number as a multiple of prime numbers the highest common factor can also be found. The smallest divisor that divides a set of numbers without a remainder is the least common multiple of those numbers.

The least common multiple of a set of numbers can be found by writing its multiples, dividing each number by prime factors or writing each number as multiples of prime numbers.

The sum of the digits of a number obtained as a single digit is called the digital index of that number. If the digital index of a number is 3, 6 or 9, it can be divided by 3 without a remainder. If the index of a number is 9, it can be divided by 9 without a remainder.

If the last two digits of a number are zero or can be divided by 4 without a remainder, the two digits are divisible by 4 without a remainder. The numbers that can be divided by 2 or 3 without a remainder, are divisible by 6 without a remainder.

Finding the highest common factor and least common multiple of more than three numbers and solving related simple problems related to them is expected from competency level 1.3. Competency level 1.4 aims to test the possibility of dividing a number by 3, 4, 6 or 9 without a remainder by applying the knowledge of the digital index and divisibility rules.

Learning outcomes relevant to the competency level 1.4

1. Finds the digital index of a number.
2. States that when the digital index of a number is a multiple of three, the number is divisible by three without a remainder.
3. States that if the last two digits of a number are zero or if the last two digits represent a number which is divisible by four, then the number itself is divisible by four.
4. States that numbers that are divisible by two and three are divisible by six also without a remainder.
5. States that a number with digital root 9 is divisible by 9.
6. Examines whether a number is divisible by 3, 4, 6 or 9 using the rules of divisibility.

Glossary of Terms:

Factor	-	சாடகை	- காரணி
Multiple	-	ஓகாக்கார	- ஡டங்கு
Greatest common factor	-	஡ஓ ஓகாக்கார	- ஡ஓதுக்காரணிகளுள் ஡ெரியது
Least common multiple	-	கூஓ ஓகாக்கார	- ஡ஓது ஡டங்குகளுள் சிறியது
Prime number	-	ஓஓ஡க சாடகை	- ஡ுதன்஡ைக் காரணி
Digital root	-	ஓஓக்க஡ி ஡ீஓகை	- ஓலக்கச்சு஡ி
Divisibility	-	ஓஓஓஓஓ	- வகு஡ஓதன்஡ை

Instructions to plan the lesson:

Following example is designed with the lecture-discussion method and a student activity to develop subject concepts related to learning outcomes 1 and 2 of competency level 1.4, after achieving subject matters related to competency level 1.3.

Time: 40 minutes

Quality inputs :

- Copies of the activity sheet
- Half sheets

Instructions for the teacher:**Approach :**

- Present a few large numbers and ask whether they are divisible by 2, 3, 5 and 10. Lead a discussion asking the methods used to answer the question and recollecting the lesson learnt in grade 6.

Development of the lesson:

- Select one number from the above set of numbers and while discussing with students, sum up the digits of the number until the relevant single digit value is obtained.
- Tell the students that the value of the single digit obtained by adding the digits that form a number is called the digital index.
- Write down about two numbers with four digits on the blackboard and direct the students to find the digital index. Showing how the teacher gets the answer check the accuracy of answers of students.
- Group students appropriately and distribute activity sheets to start the work.
- Give six numbers which are divisible by 3 and indivisible by 3, to each group.
- After completing the student activity, discuss their answers.
- Develop the lesson reminding that the digital index of a number divisible by 3, is always 3, 6 or 9.

**Activity sheet for the students:**

- Answer the questions considering the set of numbers given to your group by the teacher.
 1. Write down the digital index of each number.
 2. Divide digital indices you got by 3.
 3. Divide each given number by 3.
 4. Copy the following table and complete it using your answers.

Number	Digital index	Whether the digital root is divisible by 3 (Yes/No)	Whether the number is divisible by 3 (Yes/No)

- Based on your results develop a relationship between the digital index of a number and its divisibility by 3.

Assessment and Evaluation

- Assessment criteria:
 - Explains the method of finding the digital index of a number.
 - Calculates digital index of a number.
 - Accepts that the digital index of a number divisible by 3 has to be 3, 6, or 9.
 - Completes the table correctly.
 - Work with the group cooperatively.
- Direct the students to do the relevant exercises of the lesson 4th in the textbook.

Practical situations:

- According to numerology, lucky number of a person is the single digit resulted by iterative addition of the digits of his/her birthday.

For your attention...**Development of the lesson:**

- Plan lessons appropriately for the learning outcomes 3 to 6 under the competency level 1.4 and implement with students.

Assessment and Evaluation:

- Direct students to do the relevant exercises of the lesson 4th in the textbook

For further reference:

- <http://www.youtube.com/watch?v=vcn2ruTOwFo>
- <http://www.youtube.com/watch?v=ZKKDTfHcsG0>
- <http://www.youtube.com/watch?v=jFd-6EPfnec>
- <http://www.youtube.com/watch?v=Df9h5t64NIQ>
- <http://www.youtube.com/watch?v=XAZFGx3Ruig>
- http://www.youtube.com/watch?v=2G_Jr_XpnY4

5. Indices

Competency 6: Uses logarithms and calculators to solve problems easily in day to day life

Competency level 6.1: Manipulates the laws of indices and simplifies powers with an algebraic symbol as the base

Number of periods: 06

Introduction:

Logarithms have an unmatched place in mathematics syllabi upto grade 11 and in simplifying mathematical problems beyond. Logarithms are primarily based on the concept of indices. Therefore, in order to manipulate logarithms properly, students have to have a clear knowledge in indices. Students have become familiar with indices learnt index notation and to write numbers less than 100 as a power and expanded powers. Beyond that, in grade 7, students are expected to be able to write numbers, less than 100 as a product of prime factors introduce powers with an algebraic symbol as the base, expand those powers and find the values of a power that has an algebraic symbol as its base substituting integers.

Learning outcomes relevant to the competency level 6.1:

1. Writes a number less than 100 as a product of powers with prime number bases.
2. Finds the value of a product of powers with prime number bases.
3. States that when an algebraic symbol is multiplied repeatedly, a power is obtained, whose base is the algebraic symbol and the index is the number of times the symbol is repeatedly multiplied.
4. Expands products of powers of the form $x^m y^n$ ($m, n < 4$).
5. Writes the product of algebraic bases in the form $x^m y^n$.
6. Finds the value of a power that has an algebraic symbol as its base, by substituting positive integers.
7. By substituting positive integers, finds the value of a product of powers that have algebraic symbols as bases.

Glossary of Terms:

Prime factors	-	புரக்க சாடக	- முதன்மைக் காரணிகள்
Product of powers	-	வலவல குணக	- வலுக்களின் பெருக்கம்
Algebraic symbols	-	பீழை சங்கை	- அட்சரக் குறியீடு
Expansion of powers	-	வல ப்ரஸாரண	- வலுக்களின் விரிவு
Substitution	-	ஊடேய	- பிரதியீடு
Negative integers	-	சாண திவில	- மறை நிறைவெண்
Positive integers	-	வக திவில	- நேர் நிறைவெண்

Instructions to plan the lesson:

The following specimen lesson plan is designed with lecture-discussion method and a group activity to reinforce subject matter related to the learning outcomes 1 and 2 of competency level 6.1.

Time: 40 minutes

Instructions for the teacher:**Approach:**

- Recalling the definition of the prime numbers ask few prime numbers from students.
- Give an opportunity for the students to show examples for the index notation and power expansion learnt in grade 6.

Development of the lesson:

- Demonstrate on the board how to get prime factors by dividing a number less than 100 by a prime numbers in the ascending order.
- Show how the above number is written as a product of the powers with the base of prime numbers.
- Take another example and write down it as a product of the powers with prime number bases.
- According to the achievement levels of the students in your class, discuss few examples and write down on the blackboard.
- Taking a few examples and discussing with students, find the value of the products of powers with prime number base.

- Group the students in the class and prepare a sheet with three questions each to reinforce learning outcomes 1 and 2 and give it to the groups to complete within the given time period.
- Call up purposively one selected student to the front of the class to present one answer in the sheet.
- Present a summary related to learning outcomes 1 and 2 on the blackboard.

Assessment and Evaluation:

- Assessment criteria:
 - States that any number can be presented as a product of powers of prime number bases.
 - Expresses a given number as a product of powers with prime number bases.
 - Finds the value of the product of powers with of prime bases.
 - Writes a number as a product of powers with prime number bases and states that the multiplication of them gives the initial number.
 - Actively participates in discussion sessions.
- Direct the students to do the relevant exercises of the lesson 5th in the textbook.

For your attention....**Development of the lesson:**

- Adopt a suitable methodology to achieve learning outcomes 3, 4, 5, 6, and 7 of competency level 6.1 and plan and implement an appropriate activity to reinforce the subject matter.

Assessment and Evaluation:

- Direct students to do the relevant exercises of the lesson 5th in the textbook.

For further reference:

6.Time

Competency 12: Manages time to fulfill the needs of the world of work

Competency level 12.1: Manipulates measurements of time under addition and subtraction

Number of periods: 05

Introduction:

The student who learnt about the second, minute, hour and day as the units of time in Grade 6, learns about the month, year, decade, century, and millennium in grade 7.

Leap year is an year that is divisible by four and years which are multiples of 100 such as 2000, 2100 are leap years only if they can be divided by 400 without a remainder.

Considering that there are 12 months for an year, 30 days for a month and 365 days for a year, this section aims to develop the ability of conversions among years \rightarrow days, months \rightarrow days, years \rightarrow months and addition and subtraction relating to those conversions.

Learning outcomes related to competency level 12.1:

1. Identifies the units month, year, decade, century and millennium which are used to measure time.
2. Identifies a leap year.
3. States the relationships among days, months and years.
4. **Converts the units used to measure time as year \rightarrow months, month \rightarrow days, and year \rightarrow days.**
5. Adds, subtracts time given in days and months.
6. Adds, subtracts time given in months and years.
7. Adds, subtracts time given in days, months and years.

Glossary of Terms:

Time	-	காலம்	- காலம்
Month	-	மாதம்	- மாதம்
Year	-	வருடம்	- வருடம்
Decade	-	தசாப்தம்	- தசாப்தம்
Century	-	நூற்றாண்டு	- நூற்றாண்டு
Millenium	-	ஆயிரம் ஆண்டு	- ஆயிரம் ஆண்டு

Leap year - අධික අවුරුද්ද - நெட்டாண்டு

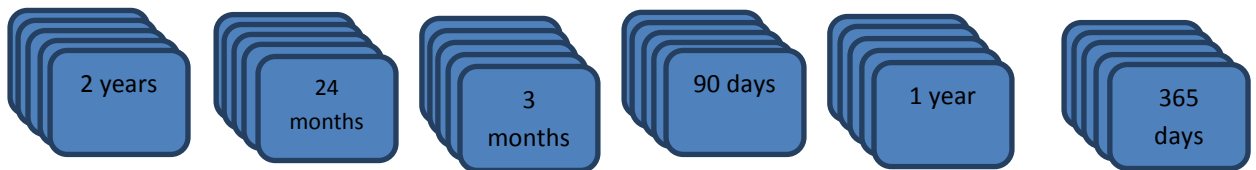
Instructions for the lesson plan

After achieving subject concepts of learning outcomes 1, 2 and 3 of competency level 12.1 to achieve fourth learning outcome, following example has been designed with lectures, discussions and a game,

Time: 40 minutes

Quality inputs:

- Five sets of cards made out of 30 cards; Five pairs of cards indicating the number of months for a certain number of years, five pairs of cards indicating the number of days for a certain number of months, five pairs of cards indicating number of days for certain number of years



- Copies of the activity sheet

Instructions for the teacher

Approach:

- Recall that to measure short time periods seconds, minutes, hours and days were used in grade 6.
- Recall that longer time periods are measured in months, years, decades and millennia.
- Recall that there are 30 days for a month, 12 months for an year and 365 days for an year.

Development of the lesson:

- Ask the no. of months for two years and discuss how to convert a certain no. of years into months.
- Discuss in the same way, the conversion of a number of years into days, and a number of months into days with examples.
- Group the students of the class appropriately and give one set of cards to each group. Provide following instructions and let them play the game.
 - Mix the cards well.
 - Each member has to take three cards from the cluster.
 - Keep the remaining cards at the centre face down so that information in cards cannot be seen.

- If same time period is indicated in two or more cards, separate those from other cards and keep it in pairs.
- Members of the group should take one card each.
- The first member has to take the card at the top of the cluster in the middle and compare it with the set of cards in hand.
- If it matches with a card in hand (4 months and 120 days, 3 years and 36 months, 2 years and 730 days) keep that pair of cards aside and place a card from the set of cards in hand at the centre of the group so that information in it can be seen.
- If the card taken does not match with the time in a card in hand, take any card of your choice and place it at the centre of your group.
- If a card in second member's hand matches with the card placed at the centre by the first member, keep the pair at aside and place a card from the set in his hand at the centre so that others can see the information.
- If it does not match, let the second member to take the card at the top of the cluster in the middle and compare the information of it with that of the card in hand. Repeat the process as per the first member.
- Give opportunity to the other members of the group in order.
- At the end of the game, recall the way how conversions are done from years to months, months to days and years to days and this conversion is used to simplify the time-related measurements in future lessons.

Assessment and Evaluation:

- Assessment criteria:
 - States the number of months for a certain number of years
 - States the number of days for a certain number of years and number of days for a certain number of months
 - Finds the number of months for a given number of years out of given number of years, months and days
 - Finds the number of days for a given number of months and a given number of years based on given number of years, months and days.
 - Participate in the game cooperatively and bears up both win and loss equally.
- Direct the students to do the exercises of the lesson 6th in the textbook.

For your attention....**Development of the lesson:**

- Plan and implement suitable methods to develop concepts relevant to 5, 6, and 7 of the competency level 12.1.

Assessment and Evaluation

- Direct the students to do the exercises of the lesson 6th in the textbook.

For further reference:



- <http://www.youtube.com/watch?v=S7CLLRHe8ik>

7. Parallel Strait Lines

Competency 27: Analyzes according to geometric laws, the nature of the locations in the surroundings.

Competency level 27.1: Draws plane figures by considering the parallelism of a pair of straight lines

Number of periods: 03

Introduction:

A pair of straight lines in a plane may or may not intersect depending on their location. If straight lines do not intersect and maintain the same distance between them, they are called parallel lines. It is very important to understand special facts about parallelism of lines for geometry and other day today activities. In architecture and other creations, consideration of parallelism enables to maintain accuracy of the design and enhances its beauty. Therefore to check the parallelism, designers use different equipment such as marking gauge and different methods. It is seen that the knowledge on parallelism is important to carry out day today activities successfully. It is expected to improve skills of students on identifying parallel lines, drawing parallel lines using the ruler and the set square, checking the parallelism of a pair of lines and drawing plane figures with straight lines from this lesson.

Learning outcomes relevant to competency level 27.1:

1. Recognizes straight lines with an equal gap between them as parallel lines.
2. Recognizes the gap between a pair of parallel lines as the perpendicular distance, or the shortest distance between the two lines.
3. Identifies locations in the environment that contain parallel lines.
4. Examines whether a given pair of straight lines is parallel or not using the set square and the ruler.
5. Draws various pairs of parallel lines using the set square and the ruler.
6. Draws lines parallel to a given straight line at a given distance using the set square and the ruler.
7. Draws lines parallel to a given straight line through a given point outside the line, using the set square and the ruler.
8. Draws various plane figures containing parallel lines using the set square and the ruler.

Glossary of Terms:

Parallel lines

- සමාන්තර සරල රේඛා - சமாந்தர நேர் கோடுகள்

Perpendicular distances	- லூலை டூர்	- செங்குத்துத் தூரம்
Set square	- வீதின லகூர஑ூய	- மூலை மட்டம்
Straight edge	- ஑ரல டூர்ய	- நேர்விளிம்பு (வரைகூல்)

Instructions to plan the lesson:

Given below is an activity that starts with discussion method and continues with teacher demonstrations for developing subject concepts and skills relevant to the learning outcomes 1,2,3,4 and 5 under the competency level 27.1.

Time: 40 minutes

Quality inputs:

- An enlarged copy of annex 1
- Copies of student activity sheets
- Set squares and straight edges (rulers)

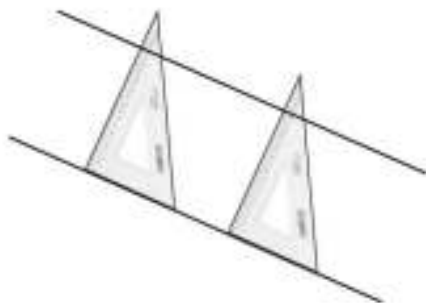
Instructions for the teacher:

Approach:

- Discuss about different settings of straight lines on a plane. Pay your attention to the events in the environment as well.

Development of the lesson

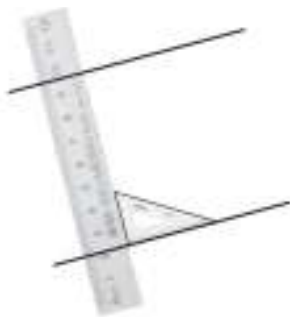
- Display the enlarged diagram with two straight lines on the blackboard.
- Observe that straight lines in diagram I and II are intersect and those of III and IV do not intersect. Discuss above facts and explain that straight lines that do not intersect are parallel lines.
- Keep the set square and the ruler at few different positions of diagrams III and IV and explain that the perpendicular distance or the shortest distance between the pair of lines is a constant.



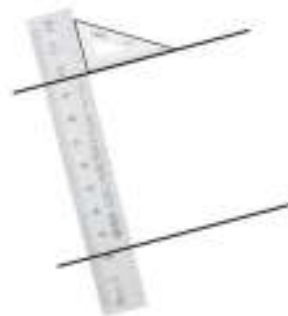
- Explain that there are examples for parallel lines at various places in our environment. Give examples such as grill designs, railway track, door-frames and elicit more examples from the students.
- Group the class, distribute student activity sheets among groups and engage students in the activity along with teacher demonstrations.
- As per annex I, demonstrating how the set square and the ruler are used to see whether a pair of lines is parallel, draw students' attention to problem (1) in the students activity sheet.



Place an edge of the right angle of set square on one straight line.



Place the ruler on the other edge of the right angle of the set square.



Keeping the ruler without moving, slide the set square along the ruler and check whether the right angle edge coincides with the other line. If it coincides with the line, two lines are parallel to each other.

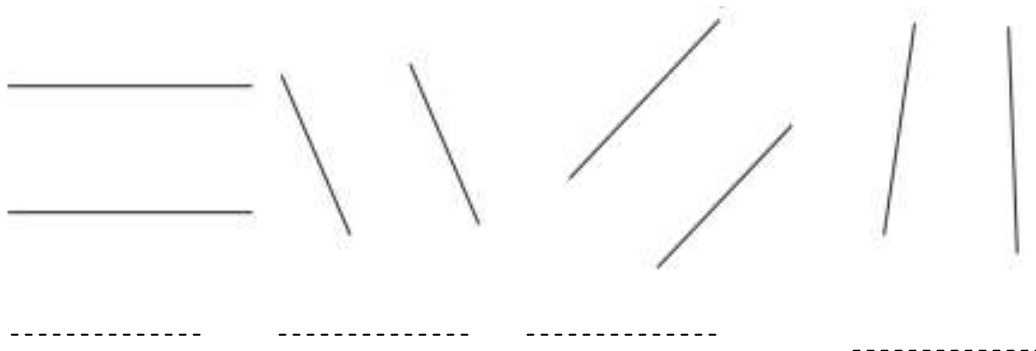
- Direct the student to problem (2) of the student activity sheet while manipulating equipment to draw parallel lines as described above and demonstrating.

Activity sheet for the students:

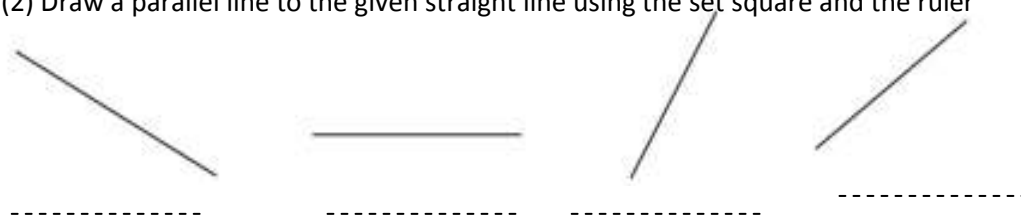


- Do the following exercise individually

(1) Using the set square and the ruler check whether the following lines are parallel to each other and write down your conclusion on the given blank space.



(2) Draw a parallel line to the given straight line using the set square and the ruler



Assessment and Evaluation:

- Assessment criteria:
 - States characteristics of a pair of parallel lines.
 - Names places where straight lines can be observed in our surrounding environment.
 - Checks the parallelism of two lines and write down.
 - Draws a parallel line to a given straight line.
 - Works as a team efficiently and achieve objectives.
- Direct students to do the exercises of the lesson 7th in the textbook

For your attention...**Development of the lesson:**

- Prepare exercises and activities relevant to learning outcomes 6 and 7 with teacher demonstrations and engage students in activities individually.
- Provide dimensions of the quadrangles, square, rectangle, parallelogram, rhombus, trapezoid and direct students to draw such shapes.

Assessment and Evaluation:

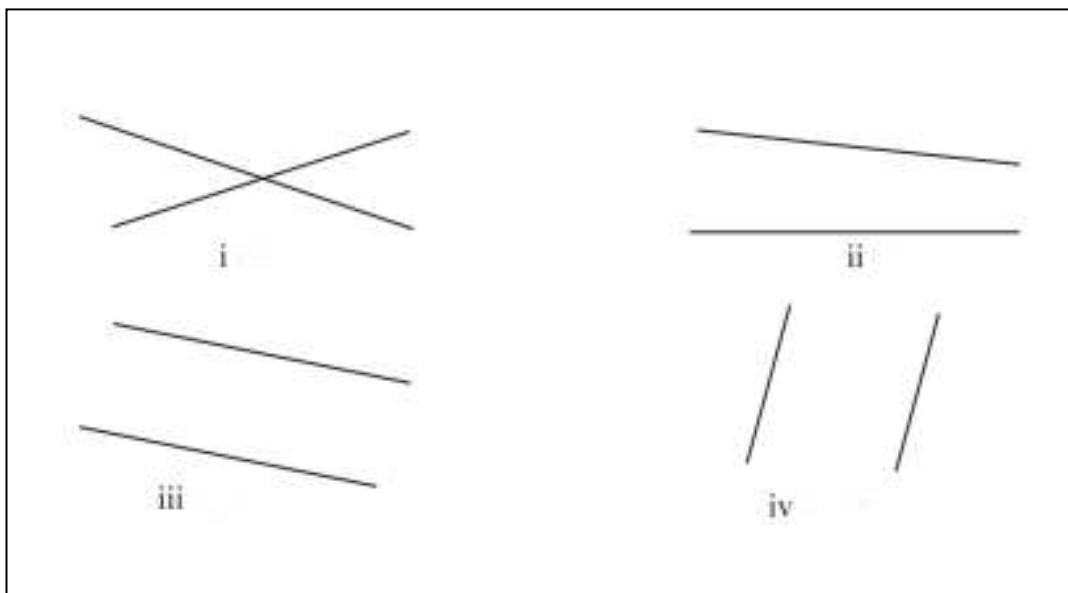
- Direct students to do the exercises of the lesson 7th in the textbook.

For further reference:

- <https://www.youtube.com/watch?v=pRPa2JGiZL0>
- <https://www.youtube.com/watch?v=3EEDynIJVHQ>
- <https://www.youtube.com/watch?v=zsln2MCd-UU>



Annex 1



8. Directed Numbers

Competency 1: Manipulates the mathematical operations in the set of real numbers to fulfill the needs of day today life

Competency level 1.2: Adds directed numbers with an understanding of directions

Number of periods: 06

Introduction:

When the direction of a number is indicated by a + or - sign placed in front of it, it is called a directed number.

Eg: -3 (minus three) , +12 (plus twelve)

A number is considered a plus number although the plus sign is not placed in front of it. So, 3 is identified as +3.

When two directed numbers with same sign are added, the sign of the answer is similar to that of added numbers.

When two directed numbers with different signs are added, the sign of the answer is the sign of the larger number.

Learning outcomes relevant to competency level 1.2:

1. States that a directed number is a one written with a positive or negative sign, to indicate that it is located at a certain distance from the origin of the number line in a particular direction.
2. Using the number line, states that the sum of two positive integers is a positive integer.
3. **Using the number line, states that the sum of two negative integers is a negative integer.**
4. **Using the number line, states that the sum of two integers of different signs is the difference between the numerical values of the two numbers.**
5. Accepts that the sign of the sum of two integers of different signs is the sign of the integer of larger numerical value.
6. Adds integers with the aid of the number line.
7. Adds directed numbers without using the number line.

Glossary of Terms:

Directed numbers	-	சீர்டிடு சும்பியா	- திசைகொண்ட எண்கள்
Number line	-	சும்பியா ஓர்லால	- எண்கோடு
Plus	-	பிச	- நேர்
Minus	-	சும்பி	- மறை
Integers	-	சிவிலி	- நிறைவெண்

Instructions to plan the lesson:

Given below is a exemplar lesson plan designed to achieve the learning outcomes 3 and 4 related to the competency level 1.2 after establishing in students the concepts of directed numbers and the skill of adding two numbers with the plus sign related to learning outcomes 1 and 2.

Time: 40 minutes

Quality inputs:

- Red and blue circles marked + and – (One of each colour per student)

Instructions for the teacher:**Approach:**

- Recall again the process of adding two numbers with the plus sign using a number line and without using a number line.
- Ask what would be the answer if one of the two added numbers is minus.
- State that it is expected to find the sum of two numbers with different signs through an activity.

Development of the lesson:

- Distribute red and blue circles marked plus and minus and ask students to wear it. (Only one card with one colour per student).
- Inform that students wearing red circles represent warm air bubbles and students with blue circles represent cold air bubbles.
- Explain that the union of a warm bubble with a cold bubble makes the thing neutral due to loss of hotness and coldness.
- Call five students wearing red circles with plus signs and three students wearing blue circles with minus signs to the front of the class and ask to get paired and neutralized.
- Telling that the loss of warmth or coldness is analogous to zero, ask about the remaining number of gas bubbles that were not neutralized and explain that $(+5) + (-3) = +2$.
- Direct students to engage in activities to get answers for different plus and minus numbers.

- Disclose from the student the process underlying the addition of two numbers with different signs using number line.
- Get the answers from students for the addition of two numbers with different signs without using number line or resorting to the activity

Assessment and Evaluation:

- Assessment Criteria:
 - Adds two directed numbers with different signs using the number line.
 - Adds two directed numbers with different signs.
 - Accepts the sign of the answer when adding two directed numbers with different signs is the sign of the larger number.
 - Actively participates in the session
- Direct the students to do the relevant exercises of the lesson 8th in the textbook.

For your Attention...**Development of the lesson:**

- Explain how to get the answer using number line when two negative integers are added.
- Direct students to add any two integers without using the number line.

Assessment and Evaluation:

- Direct students to do the relevant exercises of the lesson 8th in the textbook.

For further reference:

- http://www.youtube.com/watch?v=NrVvu7cM8_o
- <http://www.youtube.com/watch?v=HlaI9ME2Aig>

9. Angles

Competency 21: Makes decisions by investigating the relationships between various angles

Competency level 21.1: Analyzes angles through static and dynamic concepts

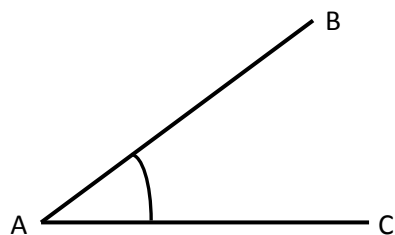
Competency level 21.2: Investigates the magnitude of angles.

Number of periods: 07

Introduction:

Categorizing angles based on the right angle was learnt in grade 6. Static concept of the angle can be identified considering the position of two stationary straight lines in the created environment and dynamic concepts of the angle can be identified considering certain rotational movements in the environment.

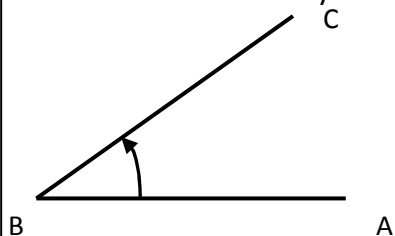
- Definition of a static angle



An angle is formed by AB and AC straight lines with the starting point A. A is the vertex of the angle. AB and AC are arms of the angle. Above angle is denoted as BAC or CAB or A.

Using static definition for an angle a number of activities can be designed to demonstrate and prove many theorems in Euclidean geometry.

- Definition of a dynamic angle



When BA arm is moved leftward keeping point B unchanged, another position of it is indicated by BC. Now ABC constitutes an angle. BA is the starting line of it and BC is the terminal line. Arrow head shows the direction of the rotation.

An angle is formed when two line segments meet at a point. An angle has two arms and a vertex and is named with three English capital letters. It is essential to name the angle so that the letter assigned to the vertex comes to the middle. Therefore an angle can be named in two ways. The size of the angle is measured with a protractor. Referring to the magnitude of the right angle acute angle, obtuse angle and reflex angle can be identified. Objective of this lesson is to improve skills of students on the above subject matters.

Learning outcomes related to the competency level 21.1:

1. Gains an understanding of the concept of **static angle** through the situations in the environment.
2. Gains an understanding of the concept of **dynamic angle** through the rotations observed in the environment.
3. Recognizes that an angle is formed by the meeting two segments of straight lines.
4. Identifies the arms and the vertex of an angle when a figure of an angle is given.
5. Draws a straight line segment using a straight edge and names it.
6. Draws various angles using a straight edge and names them.
7. Writes down the arms, vertex and the angle when a figure of named angle is given.
8. **Identifies the protractor as an instrument used to measure the magnitude of an angle.**
9. **Measures a given acute/obtuse/reflex angle using the protractor.**
10. Manipulates the protractor correctly to measure the magnitude of a reflex angle.
11. Manipulates protractor correctly to draw a reflex angle of a given magnitude.
12. Draws acute/obtuse/reflex angles of given magnitude using a protractor

Glossary of Terms:

Angle	-	கொணல்	- கோணம்
Side	-	வாழ்வு	- புயம் (பக்கம்)
Vertex	-	தீர்ச்சு	- உச்சி
Protractor	-	கொணலாலை	- பாகைமாளி
Acute angle	-	சூழ் கொணல்	- கூர்ங்கோணம்
Right angle	-	சுழ் கொணல்	- செங்கோணம்
Obtuse angle	-	மலகொணல்	- விரிகோணம்
Reflex angle	-	பரவல்கொணல்	- பின்வளைகோணம்
Static concept	-	பீரீதிக சங்கல்பல்	- நிலைசார் எண்ணக்கரு
Dynamic concept	-	தகிக சங்கல்பல்	- இயக்கசார் எண்ணக்கரு
Naming of angles	-	கொணல் தமீ கிரீம	- கோணங்களைப் பெயரிடல்

Instructions to plan the lesson:

Given below is leaning exemplar designed based on student activities and teacher demonstration for building up the subject concepts related to learning outcomes 8 and 9 in students after establishing the first seven learning outcomes under the competency level 21.1

Time: 40 minutes

Quality inputs:

- Demonstration protractor
- A set of cards on which different angles are drawn separately as per the annex 1
- Protractors

Instructions for the teacher:**Approach:**

- Recall what the students have already learnt on the types of angles, sides, vertex, naming an angle etc.
- Recall how that the size of the angle is described based on the right angle.

Development of the lesson:

- Introduce the protractor as the equipment used to measure the magnitude of an angle while showing the demonstration protractor. Show the base line of the protractor to the students.
- Explain the way the protractor is calibrated (on both sides). Introduce that the unit to measure an angle is the degree with its symbol.
- Draw an angle (acute, right or obtuse) on the blackboard and emphasize the steps to be followed when measuring that angle.
- State that the bottom line of the protractor should coincide with one side of the angle and the centre point on the protractor should coincide with the vertex of the angle.
- Explain how to find the magnitude of an angle by reading the number of degrees on the scale of the protractor from 0° at the side which coincided with the bottom line of the protractor to the point at which the other side of the angle coincides with the protractor. Measuring a right angle explain that the magnitude of it is 90° .
- State that the magnitude of an angle can correctly be measured first by judging whether the value of the angle is greater or lesser than right angle and then measuring it.
- Group students appropriately and distribute quality inputs among the groups.
- State that each student has to copy the student activity sheet and record the values of the angles measured in it.
- After completing the activity, lead a discussion pointing out strengths and weaknesses observed during the activity. During the discussion highlight the common mistakes students make when measuring angles and summarize the steps to be followed to measure an angle accurately.

Activity sheet for the students:

Copy the following table in your exercise book.

Exchange the set of cards with diagrams of angles among members of the group and measure the size of each and every angle individually.

- Complete the following table with the measured values.

Angle	Name	Whether greater or lesser than a right angle	Measured value
(i)			
(ii)			
(iii)			
(iv)			
(v)			
(vi)			
(vii)			
(viii)			
(ix)			
(x)			

Assessment and Evaluation:

- Assessment criteria:
 - Identifies protractor as equipment used to measure the size of an angle accurately.
 - State the steps to be followed when measuring an angle with the protractor.
 - Based on observation, states whether mention the size of an angle is greater or smaller than a right angle.
 - Measures the magnitude of an angle by using the protractor correctly.
 - Works with the group cooperatively and fulfills the responsibilities without fail.
- Direct the students to the exercises of the lesson 9th in the textbook.

For your attention...**Development of the lesson:**

- Plan suitable lesson to achieve the learning outcomes 10, 11 and 12 of the competency level 21.1 and implement in the class.
- Plan suitable lesson to achieve the learning outcomes relevant to the competency level 21.2 and implement in the class.

Assessment and Evaluation:

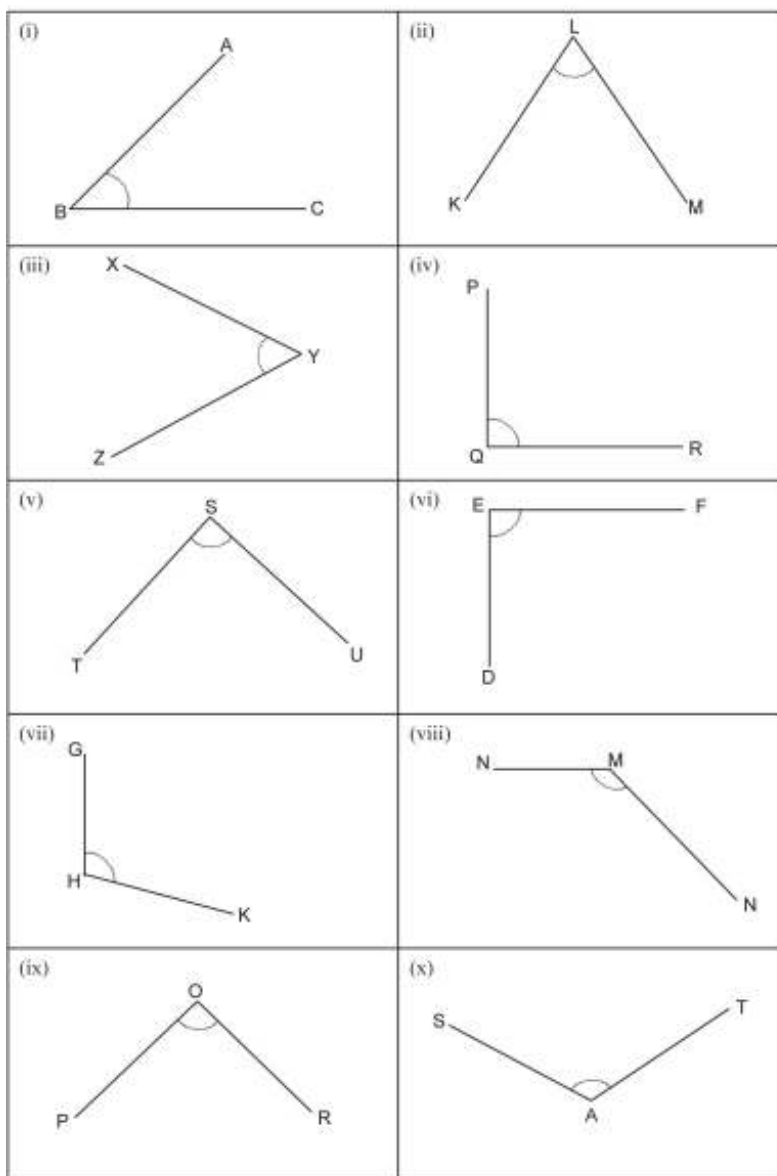
- Direct students to the exercises of the lesson 9th in the text book.

For further reference:



- <http://www.youtube.com/watch?v=H-de6Tkxej8>
- <http://www.youtube.com/watch?v=92aLiyeQj0w>
- <http://www.youtube.com/watch?v=dw41PMWek6U>
- <http://www.youtube.com/watch?v=wJ37GJyViU8>

Annex 1



10. Fractions

Competency 3: Manipulates units and parts of units under the mathematical operations to easily fulfill the requirements of day to day life

Competency Level 3.1: Manipulates fractions under the operations of addition and subtraction

Number of Periods: 10

Introduction:

In grade 6, students have learnt to identify fraction concept, proper fractions and equivalent fractions, to compare proper fractions and add and subtract proper fractions with combined numerators.

When the numerator is greater than the denominator it is an improper fraction. A mixed number is formed by a whole number and proper fraction. It is possible to convert a mixed number to an improper fraction and an improper fraction to a mixed number. When mixed numbers are added or subtracted whole numbers and fractions can be added separately. Further, they can be added as improper fractions as well. These facts are discussed in this section.

Learning outcomes related to competency level 3.1:

1. Recognizes that a mixed number consists of a whole number and a proper fraction.
2. States those fractions which have a numerator which is greater than or equal to the denominator are improper fractions.
3. **Converts a mixed number into an improper fraction.**
4. Converts an improper fraction into a mixed number.
5. Compares fractions with unrelated denominators, where the denominator is less than or equal to 12.
6. States that when two mixed numbers are added or subtracted, simplification can be done either by converting them into improper fractions or by separating out the whole numbers and the proper fractions.
7. Adds no more than three numbers consisting of mixed numbers and proper fractions with equal denominators.
8. Adds no more than three numbers consisting of mixed numbers and proper fractions with related denominators.
9. Adds no more than three numbers consisting of mixed numbers and proper fractions with unrelated denominators.
10. Subtracts from a mixed number, a proper fraction with the same denominator.
11. Subtracts from a mixed number, a proper fraction with a related denominator.
12. Subtracts from a mixed number, a proper fraction with an unrelated denominator.
13. Subtracts from a mixed number, a mixed number with the same denominator.
14. Subtracts from a mixed number, a mixed number with a related denominator.
15. Subtracts from a mixed number, a mixed number with an unrelated denominator.
16. Simplifies expressions involving the addition and subtraction of fractions.

Glossary of Terms:

Equivalent fraction	-	ஐலா லாடா	-	சமவலுப் பின்னங்கள்
Proper fraction	-	நீடம லாடா	-	முறாமைப் பின்னம்
Improper fraction	-	மீலா லாடா	-	முறாமை இல்லாப் பின்னம்
Mixed numbers	-	மீலா ங்கலால	-	கலப்பு எண்
Denominator	-	லாடா	-	பகுதி
Numerator	-	லால	-	தொகுதி

Instructions to plan the lesson:

Given below is a specimen lesson plan based on group activities and discussion method designed to develop in the student the subject concepts related to the learning outcome 3 under the competency level 3.1.

Time: 40 minutes

Quality inputs:

- Copies of the student activity sheet

Instruction for the teacher:**Approach:**

- Displaying a mixed number in the blackboard remind that a mixed number consists of a whole number and a proper fraction.
- Write down an improper fraction in the blackboard and discuss its characteristics.
- Remind that fractions such as $\frac{2}{2}$, $\frac{3}{3}$, $\frac{4}{4}$ are also improper fractions and their value is equal to 1.
- Remind addition of two fractions with equal denominators

Development of the lesson:

- Group students appropriately and provide the activity sheet to each group.
- Draw the attention of students to part 1 of the activity sheet

- After completion of the task inquire into the answers and explain that mixed numbers can be denoted as improper fractions using diagrams.
- Engage students in part II of the activity sheet.
- After completion of the task, ask the answers and describe that mixed numbers can be denoted as improper fraction without using diagrams.
- Recalling the diagram of part I and first instance in part II in activity sheet, indicate that it can be written as follows;

$$1\frac{2}{3} = \frac{(3*1)+2}{3} = \frac{3+2}{3} = \frac{5}{3}$$

- Describe that the numerator can be calculated simply as “three times one is three and when 2 is added five”.
- Reinforce in students, this method of converting mixed numbers into improper fractions by few other examples.

Activity sheet for the students:



Fill the blanks with appropriate numbers in part I and part II.

Part I

$$1\frac{2}{3} \rightarrow \boxed{} \qquad \boxed{} \boxed{}$$

$$1\frac{2}{3} = 1 + \frac{\boxed{}}{3} = \frac{4}{10} = \frac{2}{5}$$

$$1\frac{2}{3} \rightarrow \boxed{} \boxed{} \boxed{} + \boxed{} \boxed{} \boxed{}$$

$$1\frac{2}{3} \rightarrow \frac{\boxed{}}{3} + \frac{\boxed{}}{3} = \frac{4}{10} = \frac{2}{5}$$

$$\therefore 1\frac{2}{3} = \frac{\boxed{}}{3}$$

Part II

$$(1) \quad 1\frac{2}{3} = 1 + \frac{1}{3} = \frac{\square}{3} + \frac{2}{3} = \frac{\square + 2}{3} = \frac{\square}{3}$$

$$(2) \quad 1\frac{3}{5} = 1 + \frac{\square}{5} = \frac{\square}{5} + \frac{\square}{5} = \frac{\square + \square}{5} = \frac{\square}{5}$$

Assessment and Evaluation:

- Assessment criteria:
 - Demonstrates the relationship between mixed numbers and improper fractions using diagrams.
 - Converts a mixed number to an improper fraction taking into consideration the whole number and the proper fraction in mixed number separately.
 - States that there are several methods to convert a mixed number to an improper fraction.
 - Converts a mixed number to an improper fraction using easy methods.
 - Actively participate for the knowledge building process
- Direct students to the exercises of the lesson 10th the text book

For your attention...**Development of the lesson:**

- Use a suitable method to develop in students the ability to convert an improper fraction to a mixed number.
- Use a suitable methodology to explain addition or subtraction of two mixed numbers.
- Use a suitable methodology to demonstrate that two mixed numbers can be added or subtracted by converting to improper fractions or by separating them to a whole number and a proper fraction.

Assessment and Evaluation:

- Direct students to the exercises of the lesson 10th in the text book

For further reference:

- <http://www.youtube.com/watch?v=V8C15AfL6Gk>
- <http://www.youtube.com/watch?v=ouAFk0Jy6TY>
- <http://www.youtube.com/watch?v=2h8XiqSnzaU>
- http://www.youtube.com/watch?v=1xuf6ZKF1_I
- <http://www.youtube.com/watch?v=xkg7370cpjs>
- http://www.youtube.com/watch?v=8JyPzTeA_8w
- http://www.youtube.com/watch?v=N8dlOmk_IHs
- <http://www.youtube.com/watch?v=2dbasvm3iG0>
- <http://www.youtube.com/watch?v=Tuld1spuyoc>
- <http://www.youtube.com/watch?v=QS1LMomm0Gk>
- <http://www.youtube.com/watch?v=4TBVB4hLQhY>
- <http://www.youtube.com/watch?v=WF7L2waDwLw>
- <http://www.youtube.com/watch?v=4LYtLMmDuzw>
- <http://www.youtube.com/watch?v=tj9oLZYA-AQ>
- <http://www.youtube.com/watch?v=PKh5B9xyzSc>
- <http://www.youtube.com/watch?v=5fK8HEYNRuQ>

11.Decimals

Competency 3: Manipulates units and parts of units under the mathematical operations to fulfill the requirements of day today life easily

Competency level 3.2: Manipulates decimals under the operations of multiplication and division

Number of periods: 05

Introduction:

Decimals are used to indicate small parts of a unit. Small fractions such as tenths, hundredths and thousandths are indicated in decimal points. A numerical answer can be more accurately presented in terms of decimals. Decimals can be presented as a fraction while fractions can also be presented as decimals. Knowledge on equivalent fractions is helpful for this. Like integers, decimals are also manipulated under basic mathematical operations. This section draws attention to the conversion of decimals and fractions to each other, multiplication and division of decimals by the powers of 10, 100, 1000 and multiplication and division of a decimal by a whole number.

Learning Outcomes relevant to the competency level 3.2:

1. Converts into decimals, the fractions that can be converted into terminating decimals.
2. Converts a terminating decimal into a fraction and writes it in its simplest form.
3. Multiplies a decimal number by powers of 10.
4. Divides a decimal number by powers of 10.
5. Multiplies a decimal number by a whole number.
6. Divides a decimal number by a whole number.
7. Solves problems related to decimals.

Glossary of Terms:

Decimal numbers	-	දශම සංඛ්‍යා	-	தசம எண்கள்
Terminating decimal	-	අන්ත දශම	-	முடிவுள்ள தசமம்
Fraction	-	භාගය	-	பின்னம்
Whole numbers	-	පූර්ණ සංඛ්‍යා	-	முழுஎண்கள்

Instructions to plan the lesson:

Given below is an activity which enables the students to have discussions in pairs and engage individually to achieve learning outcomes 1.

Time : 40 minutes

Quality inputs:

- An enlarged copy of tables A and B given in annex I.

Instructions for the teacher:

Approach:

- Display enlarged copies of tables A and B.
- While discussing on decimals direct students to select the decimal that is equal to each fraction in table A and connect them.
- Direct students to complete table “B” while inquiring into the knowledge on equivalent fractions.

Development of the lesson:

- After writing the student activity sheet in the blackboard or displaying an enlarged copy of it to the class, direct students to engage in the activity in pairs while discussing its contents.
- After the completion of the student’s task, ask the student about their answers and explain that fraction can be written as decimals by writing the denominator of fraction as a power of 10.

Activity sheet for the students:



- Copy the table and fill in the blanks in it.
- While reflecting on the reversal the above process of converting a fraction into a decimal number, discuss how to write a decimal number as a fraction.

Fraction		Equivalent fraction		Decimal
$\frac{1}{2}$	=	$\frac{5}{10}$	=	0.5
$\frac{3}{5}$	=	$\frac{\square}{10}$	=	.....
$\frac{1}{4}$	=	$\frac{\square}{100}$	=	.....
$\frac{5}{8}$	=	$\frac{\square}{1000}$	=	.....
$1\frac{2}{5}$	=	$1\frac{\square}{10}$	=	1.
$4\frac{3}{20}$	=	$4\frac{\square}{\square}$	=	.....
$12\frac{7}{25}$	=	$\frac{\square}{\square}$	=	.....
$2\frac{3}{50}$	=	$\frac{\square}{\square}$	=	.....

Assessment and Evaluation:

- Assessment criteria:
 - Write a given fraction as an equivalent fraction so that the denominator is a power of ten.
 - Writes a given proper fraction as a decimal.
 - Writes a given mixed number as a decimal number.
 - Accept that the knowledge on equivalent fraction is needed when converting fractions to decimal numbers or vice versa.
- Successfully completes the task according to instructions.
Improve skill of converting fractions into decimals and vice versa using different exercises such as card sets, competitions, puzzles, tables with blanks and domino sets.
- Direct students to do the exercises of the lesson 11th in the textbook.

For your attention...**Development of the lesson:**

- Plan activities or other methodologies appropriately to achieve learning outcomes 2, 3, 4, 5, 6, and 7 and implement them.
- For the seventh learning outcome titled “Solving problems related to decimals” include problems related to conversions units of length, mass and volumes of liquids related to the learning outcomes 3 and 4.

Assessment and Evaluation:

- Direct students to do the exercises of the lesson 11th in the textbook

For further reference:

- <http://www.youtube.com/watch?v=Gn2pdkvdbGQ>
- <http://www.youtube.com/watch?v=NM8qTo361ic>
- <http://www.youtube.com/watch?v=sCVyvfOLI6U>

Table A

Fractions	Decimals
$\frac{1}{10}$	0.83
$\frac{7}{10}$	0.647
$\frac{17}{100}$	0.1
$\frac{83}{100}$	0.153
$\frac{153}{100}$	0.7

$\frac{3}{4} = \frac{\square}{20}$
$\frac{2}{5} = \frac{\square}{10}$
$\frac{3}{20} = \frac{\square}{80}$
$\frac{3}{25} = \frac{\square}{50}$
$1\frac{1}{5} = 1\frac{\square}{5}$
$2\frac{3}{8} = 2\frac{\square}{16}$

Table B

Annex 1

12. Algebraic expressions

Competency 14: Simplifies algebraic expressions by systematically exploring various methods.

Competency Level 14.1: Constructs algebraic expressions using all four mathematical operations

Competency Level 14.2: Simplifies algebraic expressions containing like and unlike terms

No. of periods: 06

Introduction:

Following subject matters are included in this section

- Algebraic expressions are obtained by the combination of an algebraic term with other terms through the mathematical operations of addition or subtraction.
- The coefficient of an unknown is the number that multiplies the unknown.
- When the unknown and the index of the unknown are equal they are called as like terms. The terms lacking this property are unlike terms.

$x, 2x, \frac{1}{2}x$ is a set of like terms.

$y, 2p, 3y^2$, is a set of unlike terms.

- Like terms can be added and or subtracted and in this process their coefficients are subjected to the relevant mathematical operations.
- If the value of the unknown is known, the value of the expression can be obtained by substituting it in the algebraic expression.

Learning outcomes relevant to the competency level 14.1:

1. Constructs using only one mathematical operation, linear algebraic expressions in one unknown, with integral coefficients.
2. Constructs, using several mathematical operations, linear algebraic expressions in one unknown, with integral coefficients.
3. Describes a linear algebraic expression in one unknown in words.

4. Constructs using only one mathematical operation, linear algebraic expressions in one unknown, with fractional coefficients.
5. Constructs using several mathematical operations, linear algebraic expressions in one unknown, with fractional coefficients.
6. Constructs using only one mathematical operation, linear algebraic expressions in two unknowns, with integral coefficients.
7. Constructs using several mathematical operations, linear algebraic expressions in two unknowns, with integral coefficients.
8. Constructs using only one mathematical operation, linear algebraic expressions in two unknowns, with fractional coefficients.
9. Constructs using several mathematical operations, linear algebraic expressions in two unknowns with fractional coefficients

Glossary of Terms:

Algebraic terms	-	විච්ඡේද පද	-	அட்சரகணித உறுப்பு
Algebraic expressions	-	විච්ඡේද ප්‍රකාශන	-	அட்சரகணிதக் கோவை
Linear algebraic expressions	-	ඒක පද විච්ඡේද ප්‍රකාශන	-	ஒருறுப்பு ட்சரகணிதக்கோவை
Polynomial algebraic expression	-	බහුපද විච්ඡේද ප්‍රකාශන	-	பல்லுறுப்பு ட்சரகணிதக்கோவை
Like terms	-	සමානීය පද	-	நிகர்த்த உறுப்புக்கள்
Unlike terms	-	විපාතීය පද	-	நிகரா உறுப்புக்கள்
Coefficients	-	සංගුණකය	-	குணகம்
Unknowns	-	අඥනය	-	தெரியாக் கணியம்

Instructions to plan the lesson:

Given below is an example designed with lectures and discussions to develop subject concepts related to learning outcomes 1,2,4 and 5 of competency level 14.1.

Time: 40 minutes

Quality inputs:

- A demy paper containing written expressions that help to construct algebraic expressions stated under the development of the lesson.

Instructions for the teacher:**Approach:**

- Recall the construction of algebraic expressions in one unknown of coefficient with addition and subtraction learnt in grade 6.
- Present the expressions that give algebraic expressions such as $x+6$, $x-2$ and get relevant algebraic expressions from the students.

Development of the lesson

- Demonstrate that algebraic expressions such as $2x-3$, $\frac{5x}{2}+4$ can be developed not only by addition and subtraction but also from multiplication and division.
- State those algebraic expressions can be developed using several mathematical operations such as addition, subtraction, multiplication and division.
- Explain from above examples that the coefficient of the unknown is not always 1 and it can be other integers or fractions.
- In order to establish the instances with mathematical expressions emerged, present statements such as following and develop algebraic expressions as described below. (Use a demy paper on which statements leading to construction of algebraic expressions mooted in advance are written).

Statements and relevant algebraic expressions:

- The price of a book is Rs. y . The price of a colour pencil box is thrice the price of a book. Construct an algebraic expression for the price of the colour pencil box;

Explain that

Price of the book = Rs. y

Therefore,

Price of the colour pencil box = Rs. $y \times 3$ = Rs. $3y$

Similarly explain the following.

- Weight of a bag of rice is p kg. Derive an algebraic expression for weight of a half of the rice bag.

Weight of the rice bag = p kg

Therefore, weight of a half of the rice bag = $p/2$ kg

Emphasize that $\frac{1}{2}$ is the coefficient of p .

- Jeewani has y ball point pens. The number of ball point pens Mayumi has, is 5 less than thrice of Jeewani's.

Derive an algebraic expression for the number of ball point pens owned by Mayumi.

$$\begin{aligned} \text{Number of Jeewani's pens} &= y \\ \text{Therefore, number of pens with Mayumi} &= y \times 3 - 5 \\ &= 3y - 5 \end{aligned}$$

Emphasize that it is required to deduct 5 from $3y$ which means y multiplied by 3.

- Sachini has Rs. m . Achini has half the sum of rupees obtained when 12 is added to what Sachini has. Derive an algebraic expression for the amount that Achini has.

$$\begin{aligned} \text{Amount that Sachini has} &= \text{Rs. } m \\ \text{Therefore, the amount that Achini has} &= \text{Rs. } (m+12)/2 \end{aligned}$$

Explain to the students that 12 has to be added first and then divided by 2.

- Number of students in Mayura Maha Vidyalaya is 150 less than four times the number of students in Hansa junior school. When an algebraic expression is developed and solved for the number of students in Mayura Maha Vidyalaya, explain that since no unknowns are given for the number of students in both schools, it is required to use symbols. Therefore, state that the number of students in Hansa Junior school is considered x .

$$\begin{aligned} \text{So, the number of students in Hansa school} &= X \\ \text{The number of students in Mayura school} &= X \times 4 - 150 \\ &= 4X - 150 \end{aligned}$$

- After discussing these mathematical problems give few more statements and direct students to develop algebraic expressions.

Assessment and Evaluation:

- Assessment criteria:
 - Recognizes the information given by a statement.
 - Identifies the unknown required to write the algebraic expression according to the statement given.
 - Understands the mathematical operation required to write algebraic expression for the given statement.
 - Writes the suitable algebraic expression for the statement.
 - Works cooperatively with teachers and students.

- Direct the students to do the exercises of the lesson 12th in the textbook.

For your attention...**Development of the lesson:**

- Plan suitable methodologies for learning outcomes 3, 6, 7, 8, and 9 related to competency level 14.1 and implement.
- Plan suitable methodology for learning outcomes related to competency level 14.2

Assessment and Evaluation:

- Direct students to do the exercises of the lesson 12th in the text book.

For further reference:

- <http://www.youtube.com/watch?v=vDqOol-4Z6M>
- <http://www.youtube.com/watch?v=Tm98InrlbMA>
- <http://www.youtube.com/watch?v=edVnqL2Z59A>
- <http://www.youtube.com/watch?v=CLWpkv6ccpA>
- http://www.youtube.com/watch?v=P6_sK8hRWCA
- <http://www.youtube.com/watch?v=1DgDt6gCUKs>

13. Mass

Competency 9: Uses the knowledge on mass to fulfill daily needs

Competency Level 9.1: Manipulates masses given in terms of milligrams, grams and kilograms under the basic mathematical operations

Number of periods: 06

Introduction:

Students have studied grams(g) and kilograms(kg) as the standard units of measuring mass in grade six. Further they have studied the relationship between grams(g) and kilograms(kg) and conversions between those units. Milligrams can be identified as the Standard unit of measuring very small masses. 1g is equal to 1000mg. Accordingly 1mg means 1/1000 g. That is one thousandth a gram. The measurements relating to the mass have to be operated mathematically taking units into consideration. This lesson expects to solve problems relating to mass operating mathematically the masses in mg and g and g and kg.

Learning outcomes relevant to the competency level 9.1:

2. Identifies the units used to measure mass.
3. States the relationship between mg and g.
4. Converts $mg \rightleftharpoons g$.
5. Estimates the mass of an object or an amount of a substance given.
- 6. Adds, subtracts masses given in mg and g.**
7. Multiplies, divides by a whole number, the masses measured in mg and g.
8. Multiplies, divides by a whole number, the masses measured in g and kg.
9. Solves problems involving masses.

Glossary of Terms:

Mass	-	ஈக்கனீடு	-	திணிவு
Conversion	-	பெரிவர்க்கை	-	அலகு மாற்றம்
Convert	-	பெரிவர்க்கை கரவலா	-	அலகு மாற்றம் செய்தல்

Instructions to plan the lesson:

A exemplar lesson plan based on the lecture-discussion method students' activity is given below to impart the learning outcome 5 relevant to the competency level 9.1 following the reinforcement of the learning outcomes 1, 2, 3 and 4.

Time: 40 minutes

Quality inputs :

- Copies of the student activity sheet
- A copy of a bill for a jewelry item
- A set of cards for each group prepared as per annex 2.

Instructions to the teacher:**Approach:**

- Inquire from students how the mass of jewelries' are indicated and measuring units used for that.
- Considering the answers of students, mention about the sovereign and half sovereign and explain that those are not recognized units for measuring mass.
- Show the bills issued by a jewelry shop.
- Explain that milligrams (mg) are used to measure small masses.
- Discuss about the items such as tablets of medicine and jewels that are measured in milligrams.

Development of the lesson

- Explain addition of two masses in grams and milligrams with and without carrying over.
- Explain how a smaller mass is subtracted from a larger mass measured in grams and milligrams with and without carrying over.
- Divide the class into groups appropriately, distribute the activity sheets among groups and engage students in the activity.
- After completion of the task, remind again how two masses are measured in grams and milligrams can be added and subtracted with and without carrying over referring to their answers.

Assessment and Evaluation:

- Assessment criteria:
 - Adds masses in milligrams and grams.
 - Subtracts masses in grams and milligrams.
 - Solves problems involving addition and subtraction of masses in milligrams and grams.
 - Inquires into opportunities involving addition and subtraction of milligrams and grams.
 - Works cooperatively on group activities.
- Direct students to do the exercises of the lesson 13th in the textbook

**Activity sheet for the students:**

Answer following questions taking into account the set of jewellery cards and the information on masses on back.

- (1) What is the total mass of a ring and a pendant?
- (2) What is the total mass of a gold necklace and a bangle?
- (3) By how much is the mass of the bracelet greater than the mass of the ring?
- (4) What are the two jewelry items which are equal in mass to that of a necklace?
- (5) Total mass of two pieces of jewellery is 15g 250mg. What would be those two?

For your attention...**Development of the lesson:**

- Design and implement suitable methods to achieve the subject concepts relating to learning outcomes 6,7 and 8 under the competency level 9.1

Assessment and Evaluation:

- Direct the students to do the relevant exercises of the lesson 13th in the textbook.

For further reference:

- <http://www.metric-conversions.org/weight/kilograms-to-grams.html>
- http://www.checkyourmath.com/convert/weight_mass/g_kg.php
- <https://www.youtube.com/watch?v=8xdudWZx7PE>

14. Rectilinear plane figures

Competency 23: Makes decisions regarding day to day activities based on Geometrical concepts related to rectilinear plane figures

Competency level 23.1: Classifies triangles based on various properties

Competency level 23.2: Classifies polygons according to shape

Number of periods: 06

Introduction :

Closed figures with three segments of straight lines are triangles. Triangles are classified based on lengths of sides and size of angles. Triangles are divided into three groups as equilateral, isosceles and scalene based on the lengths of sides.

Considering the size of the largest angle, triangles are classified as acute triangles, obtuse triangles and right triangles.

Closed figures bounded by three or more segments of straight lines are called polygons. If all the internal angles of a polygon are less than 180° it is a convex polygon while at least one internal angle is more than 180° it is a concave polygon. If a polygon has equal length sides and equal size angles it is called as regular polygon.

Learning outcomes relevant to the competency level 23.2

1. Identifies a closed plane figure bounded by straight line segments as a polygon.
2. Draws various polygons using a straight edge.
3. Identifies polygons with all the interior angles of magnitude less than 180° as **convex polygons**.
4. Identifies polygons with at least one interior angle of magnitude greater than 180° as **concave polygons**.
5. Identifies polygons with all sides equal and all interior angles equal as **regular polygons**.
6. Engages in classifying polygons with reasons as convex, concave, regular or irregular polygons.
7. Gives reasons as to why a concave polygon cannot be a regular polygon.

Glossary of Terms:

Straight line segment	-	සරල රේඛා ඛණ්ඩය	-	நேர்கோட்டுத் துண்டம்
Triangle	-	ත්‍රිකෝණය	-	முக்கோணி
Equilateral triangle	-	සමපාද ත්‍රිකෝණය	-	சமபக்க முக்கோணி
Isosceles triangle	-	සමද්විපාද ත්‍රිකෝණය	-	இருசமபக்க முக்கோணி
Scalene triangle	-	විෂම ත්‍රිකෝණය	-	சமனில்பக்க முக்கோணி
Right-angled triangle	-	සෘජුකෝණී ත්‍රිකෝණය	-	செங்கோண முக்கோணி
Acute-angled triangle	-	සුළු කෝණී ත්‍රිකෝණය	-	கூர்ங்கோண முக்கோணி
Obtuse-angles triangle	-	මහාකෝණී ත්‍රිකෝණය	-	விரிகோண முக்கோணி
Polygon	-	බහුඅස්‍රය	-	பல்கோணி
Convex polygon	-	උත්තල බහුඅස්‍රය	-	குவிவுப் பல்கோணி
Concave polygon	-	අවතල බහුඅස්‍රය	-	குழிவுப் பல்கோணி
Regular polygon	-	සවිධි බහුඅස්‍රය	-	ஒழுங்கான பல்கோணி
Closed plane figures	-	සංවෘත රූප	-	மூடிய தளவுரு
Opened plane figures	-	විවෘත රූප	-	திறந்த தளவுரு

Instructions to plan the lesson:

Given below is a specimen lesson plan based on the lecture-discussion method designed to develop in students the learning outcomes 1 and 2 under the competency level 23.2.

Time: 40 minutes

Quality inputs:

- A large poster as per annex I

Instructions for the teacher:**Approach:**

- Introduce a polygon as a closed plane figure bounded by three or more straight line segments. Emphasize that borders of a polygon should only be straight line segments.

Development of the lesson:

- Display the enlarged poster to the class.
- Direct students to identify polygons in the poster and write down the English letters assigned for the selected figures. Ask reasons for the selection. Emphasize that the borders should only be straight line segments if the figure is to be a polygon.
- Ask reasons for not selecting other plane figures as polygons. Explain that the borders of the plane figures contained segments of curved lines.
- Present an open plane figure and ask students whether it is a polygon. Explain that the reason for not being a polygon is that the figure is not closed.
- Ask whether there is a possibility to exist a polygon made up of two line segments and explain that if a figure is to be a polygon it should be a closed figure consisting at least of three line segments.
- Demonstrate on the blackboard how to draw a polygon using the ruler.
- Direct students to draw few polygons with different shapes and different number of sides.

Assessment and Evaluation:

- Assessment criteria:
 - Correctly identifies polygons from given plane figures.
 - States that the borders of a polygon are only straight line segments.
 - Give reason for non-polygons to be so.
 - Accepts that polygons are closed figures.
 - Draws polygons correctly using rulers.
- Direct students to do the relevant exercises of the lesson 14th in the text book

For your attention...**Development of the lesson:**

- Prepare a suitable example for the learning outcomes 3 and 4. Design an activity to stress that a polygon which has at least one angle larger than 180° is a concave polygon and if all the angles are less than 180° , it is a convex polygon.
- Plan and implement a methodology to achieve learning outcomes 5,6 and 7 of competency level 23.1
- Plan and implement a suitable methodology to establish subject concepts relevant to competency level 23.2

Assessment and Evaluation

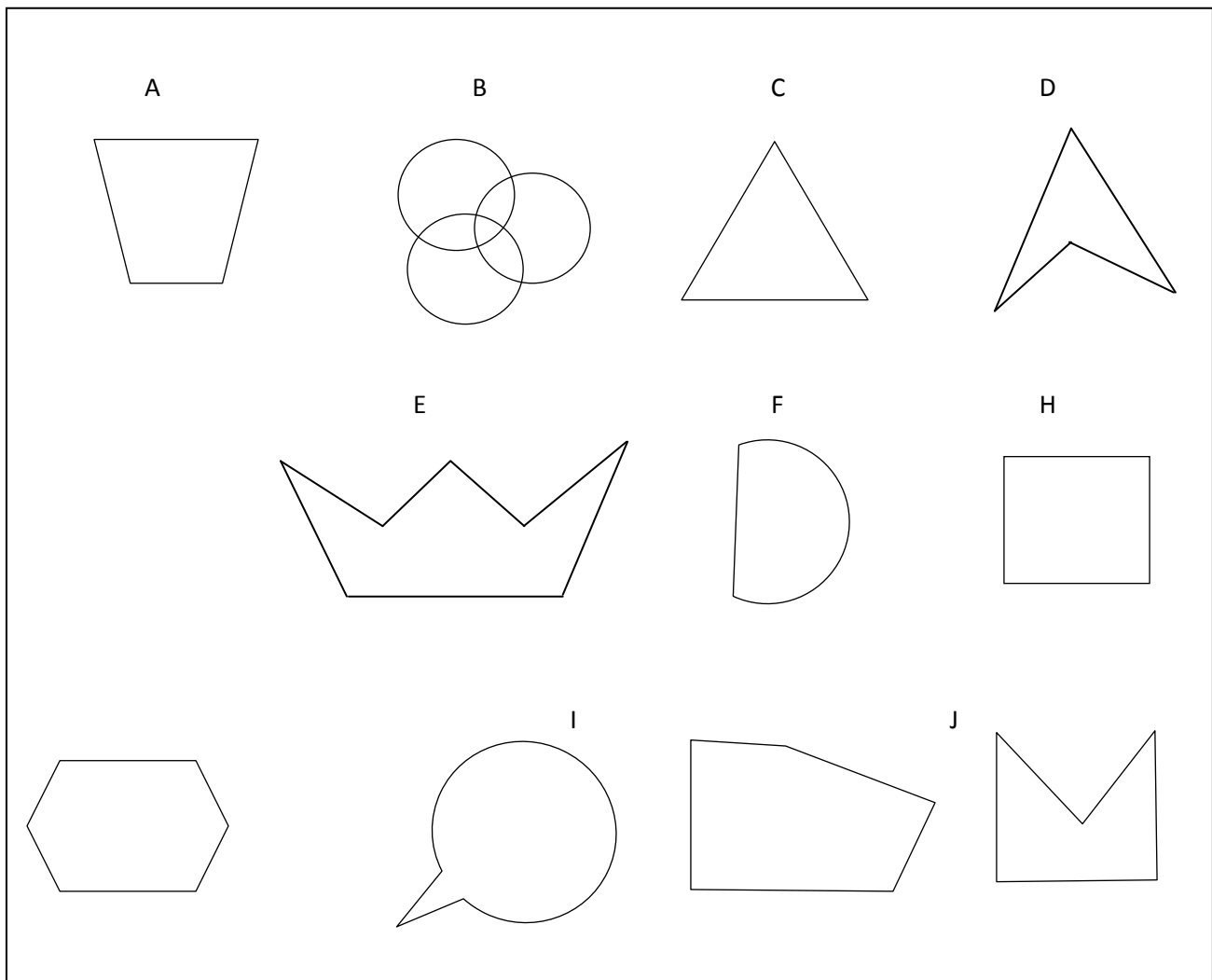
- Direct students to do the exercise of the lesson 14th in the textbook

For further reference:



- <https://www.youtube.com/watch?v=K5Uwcag7QaE>
- <https://www.youtube.com/watch?v=r08CoqG0dxw>

Annex 1



15. Equations and formulae

Competency 17: Manipulates the methods of solving equations to fulfill the needs of day to day life

Competency level 17.1: Uses linear equations to solve problems encountered in daily life

Competency 19: Explores the methods by which formulae can be applied to solve problems encountered in day to day life

Competency level 19.1: Easily solves problems encountered in daily life by constructing simple formulae

Number of periods: 08

Introduction:

Equations and formulae are applied not only to open path to achieve objectives of Mathematics but also to understand most of the subject concepts of algebra. A simple equation is constructed by combining an algebraic expression with an unknown of power one to another algebraic expression or a number by the mark of equality. Solving simple equations finds the numerical value for the unknown of such simple equation. The mostly used method for solving equations or changing the form of a formula is applying same mathematical operation to both sides of the equality.

Flow chart is an occasion which highlights the use of inverse mathematical operations in simplifying simple equations.

When a relationship among several variables is described by an equation in algebraic form it is identified as a formula. Usually one unknown of an equation is made the subject of the equation. This lesson aims to impart knowledge for developing simple equations, solving equations, developing formulae and finding values for variables by substituting positive integers.

Learning outcomes relevant to the competency level 17.1:

1. Based on the information that is given, constructs linear equations of the form $x \pm a = b$, $ax = b$, and $ax \pm b = c$ where $a, b, c \in \mathbb{N}$ and $a \neq 0$.
2. Using flow charts, solves equations with positive answers, of the form $x \pm a = b$, $ax = b$ and $ax + b = c$ where $a, b, c \in \mathbb{N}$ and $a \neq 0$.

3. **Accepts that inverse mathematical operations need to be used with a proper understanding, when solving linear equations.**
4. Using algebraic methods, solves equations with positive answers, of the form $x \pm a = b$, $ax = b$ and $ax \pm b = c$, where $a, b, c \in \mathbb{N}$ and $a \neq 0$.
5. **Examines the accuracy of the solution by substituting it back into the equation.**
6. Solves problems by using the knowledge on solving linear equations

Glossary of Terms:

Simple equations	-	සරල සමීකරණ	-	எளிய சமன்பாடுகள்
Formula	-	සූත්‍රය	-	சூத்திரம்
Flow chart	-	ගැලීම් සටහන	-	பாய்ச்சற்கோட்டுப்படம்
Inverse	-	ප්‍රතිලෝමය	-	மறுதலை
Mathematical operation	-	ගණිත ක්‍රමය	-	கணிதச்செய்கை

Instructions to plan the lesson:

This lesson based on a group activity accompanied by teacher demonstration with an approach through the discussion method is planned to achieve the learning outcomes 2, 3, and 5 relating to the competency level 17.1 after developing the learning outcome 1 in students.

Time: 40 minutes

Quality inputs:

- Demai papers
- Colour pencils or platignum

Instruction for the teacher:

Approach:

- Display an exercise on completion such as the following on the board.

i. $\square + 3 = 5$

ii. $\square - 4 = 3$

iii. $3 \times \square = 12$

iv. $2 \times \square + 3 = 7$

v. $3 \times \square - 4 = 11$

- While discussing find the suitable numbers for the blanks and get the blanks filled by students.
- Let the students write equations on the blackboard by substituting unknowns for the above.
- Explain with simple practical situations that simplifying simple equation means finding the numerical value relevant to the unknowns of simple equations and it should apply the inverse of the mathematical operations performed in constructing equations.
(Explain inverse mathematical operation with examples such as wearing and removing shoes untying several knots in a rope where the last knot is undone first and the stretched rope is loosened.)

Development of the lesson:

- Demonstrate as follows how inverse mathematical operations are used to simplify equations such as (i) $x + 5 = 8$ (ii) $2x - 3 = 5$ using flow charts and how to write it.

(i) $x \xrightarrow{+5} x+5$

(ii) $x \xrightarrow{\times 2} 2x \xrightarrow{-3} 2x-3$

$\xleftarrow{-5} 8$

$\xleftarrow{+3} 8 \xleftarrow{\div 2} 5$

$x=3$

$x=4$

- Group students and give each group a demy paper, colour pencils and a copy of the activity sheet.
- After completing the activity display them in front of the class, evaluate them and make a review explaining further on solving equations using flow charts and checking the accuracy of the answer for an equation.



Activity sheet for the Students:

1. Simplify following simple equations using flow charts.

(i) $x + 4 = 6$	(ii) $x - 3 = 5$	(iii) $3x = 12$
(iv) $5x - 1 = 16$	(v) $3x - 5 = 13$	
2. Discuss and write a method to check the accuracy of the answers obtained above.
3. Confirm the accuracy of the answers of the equation written according to the above method.
4. Get ready to present the group work.

Assessment and Evaluation:

- Assessment criteria:
 - Identifies inverse mathematical operations of each mathematical operation.
 - Solves a given simple equation using a flow chart.
 - Accepts that the accuracy of an answer can be checked by substituting the answer in an equation and simplifying.
 - Presents the work in a creative and beautiful way.
 - Actively participates to achieve common targets of the group, working cooperatively and efficiently.
- Direct students to do the exercises of the lesson 15th in the textbook

For your attention...

Development of the lesson:

- Prepare examples and exercises to achieve learning outcomes 4 and 6 and implement them adopting attractive methods.
- Design and implement appropriate methods to achieve the learning outcomes relevant to the competency level 19.1.

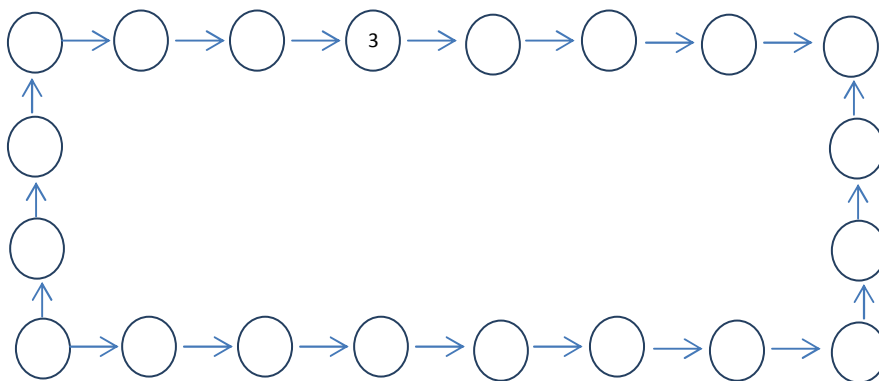
Assessment and Evaluation:

- Direct students to do the exercises of the lesson 15th in the textbook
- Prepare the following cards and let the students play the game

Instructions

- Prepare below set of cards on A5 sheets (half of A4).
- Hang them on a wall keeping a distance in a hall or a corridor or any other suitable place.
- Provide paper strips with twenty circles drawn on each as shown in the diagram to students to write the answers.
- Provide paper strips with twenty circles shown on the other side of the sheet

(30) $2x=6$ $X=?$	(3) $X+1=5$ $X=?$	(4) $3+x=4$ $X=?$	(1) $4x=20$ $X=?$
(5) $x-1=6$ $x=?$	(7) $15-x=5$ $X=?$	(10) $\frac{10}{x}=5$ $X=?$	(2) $x-6=0$ $x=?$
(6) $\frac{x}{3}=5$ $X=?$	(15) $x-6=10$ $x=?$	(16) $15-x=2$ $X=?$	(13) $\frac{40}{x}=5$ $X=?$
(8) $\frac{x}{2}=6$ $X=?$	(12) $x-5=4$ $x=?$	(9) $3x=33$ $X=?$	(11) $X+7=7$ $X=?$
(0) $x-4=10$ $x=?$	(14) $\frac{100}{x}=4$ $X=?$	(25) $\frac{x}{10}=2$ $X=?$	(20) $X + 20 = 50$ $X=?$



- Write one answer each in question card ○ in paper strips provided to the students
- Instruct students to go and find the question card which corresponding to the answer given in the paper strip
- Advice students to find the answer for the equation in the card and write down it in the next circle in the paper strip.
- Advice students to find the question card and write the answer for as done before and continue the game.
- The student who completes all the circles and hand over to the teacher is the winner of the game.

For further reference:

- <http://www.youtube.com/watch?v=4vNloi-zNjU>

16. Length

Competency 7: Investigates the various methods of finding the perimeter to carry out daily tasks effectively

Competency level 7.1: Manipulates measurements related to length under the basic mathematical operations to fulfill various needs

Competency level 7.2: Applies formulae to solve problems related to the perimeters of rectilinear plane figures

Number of periods: 08

Introduction:

Measurements related to length have to be added, subtracted, multiplied or divided in our day today activities. Those measurements can be in one unit or different units. In such occasions, simplification has to be performed with an understanding of the relationships between the measuring units.

Perimeter of a closed plane figure is the total length of its outer edge. Using equations it is easy to find the perimeter of rectilinear plane figure. When the length of a side of an equilateral triangle is 'a', its perimeter is $3a$. When a side of a square is 'a' its perimeter is $4a$. When a rectangle has length and width 'a' and 'b' respectively its perimeter is $2a+2b$ or $2(a+b)$. These formulae can be used to find their perimeter.

Learning Outcomes relevant to competency level 7.1:

1. Adds, subtracts lengths involving cm and mm.
2. Adds, subtracts lengths involving m and cm.
3. Adds, subtracts lengths involving km and m.
4. Multiplies, divides by a whole number, the lengths involving cm and mm.
5. Multiplies, divides by a whole number, the lengths involving m and cm.
6. Multiplies, divides by a whole number, the lengths involving km and m.
7. Solves problems related to measurements of length to fulfill various needs.

Glossary of Terms:

Length	- දිග	- நீளம்
Perimeter	- පරිමිතිය	- சுற்றளவு
Formula	- සූත්‍රය	- சூ்திரம்

Instruction to plan the lesson:

This aims to develop subject concepts related to the first learning outcome of competency level 7.1 in the students. A learning specimen developed with lectures and discussions is given below.

Time: 40 minutes

Instructions for the teacher:**Approach:**

- Discuss with students on units of measuring length.
- Asking students about the relationships among units such as mm, cm and km, discuss about them.
- Discuss with students how to give 50mm in centimeters, 3m in centimeters and 2000m in kilometers.

Development of the lesson:

- Discuss with the students on addition and subtraction of lengths in same units (mm/cm).
- Explain with suitable examples addition and subtraction of lengths measured in cm and mm without carrying over.
- Discuss with an example addition of lengths measured in centimeters and millimeters with carrying over.
- Explain that the part above 10mm of the value obtained after adding the values in mm, is written in that place and 10mm is taken to the left as 1cm here.
- Discuss on subtraction with carrying over through an example involving centimeters and millimeters.
- Explain that when 1cm is brought from left to right and converted to mm, it becomes 10mm, so it is added to the number of mm there followed by subtracting the number of mm given from the total number of mm.
- Direct students to do exercises involving addition and subtraction with carrying over and borrowing such as these.

Assessments and Evaluation:

- Assessment criteria:
 - Adds measurements of length in two different units without carrying over.
 - Subtracts measurements of length in two different units without carrying over.
 - Adds measurements of lengths in two different units with carrying over.
 - Substrates measurements of lengths in two different units with carrying over.
 - Listens to the others' ideas and opinions obligingly.
- Direct student to do the exercises of the lesson 16th in the textbook

Practical situations:

- Discuss with students the instances such as constructional work, carpentry, long distance travel and finding locations on land which involve addition and subtraction of measurements of lengths.
- Discuss the need of calculating perimeter of structures of constructions and other designs.

For your attention...**Development of the lesson:**

- Prepare suitable plans and implement to reinforce concepts of addition and subtraction with m and cm measurements, km and m measurements and multiplication and division with cm and mm, m and cm and km and m measurements.
- Prepare and execute suitable plans to reinforce the concepts of finding the perimeter of plane figures, equilateral triangle, square and rectangle using relevant formulae.

Assessment and Evaluation

- Direct students to do the exercises of the lesson 16th in the text book.

For further reference:



- <http://www.youtube.com/watch?v=XN48Ba9Ncr8>
- <http://www.youtube.com/watch?v=kbqO0YTUyAY>
- <http://www.youtube.com/watch?v=iimpwYBiKNg>
- <http://www.youtube.com/watch?v=5FBDqY41GjU>
- <http://www.youtube.com/watch?v=9Ek61w1LxSc>
- http://www.youtube.com/watch?v=_y_Q3_B2Vh8
- <http://www.youtube.com/watch?v=AJNDeVt9UOo>
- <http://www.youtube.com/watch?v=tC1SfxRvtmM>

17. Area

Competency 8: Makes use of a limited space in an optimal manner by investigating the area.

Competency Level 8.1: Investigates the areas of rectilinear plane figures.

Number of time periods: 06

Introduction:

Area is the space of a surface surrounded by a boundary. If dimensions of the surface are given in meters, unit of the area is in square meters (m^2) and if dimensions are given in centimeters the unit of the area is in square centimeter (cm^2).

In grade six, students have had an understanding about the area of a square and a rectangle using $1cm^2$ grid. Here, attention will be drawn to find the area of a square and a rectangle using equations.

If the length and width of a rectangle are 'a' and 'b' respectively and area is denoted as A, then $A = a \times b$. If a side of a square is 'a' and its area is A, then $A = a^2$.

Therefore, this section aims to estimate the area of a rectangle or a square and if the length of a side of the square is given, to calculate the area of the square and if the length or width of a rectangle is given with its area, to calculate the other dimension.

Area of a compound figure can be found by dividing the whole figure into squares and rectangular sections and calculating area of each section. By adding and deducting the areas of those sections, area of the compound figure is calculated.

Learning outcomes relevant to competency level 8.1:

1. Identifies the standard units of area.
2. Finds the area of a square using the formula.
3. Finds the area of a rectangle using the formula.
4. Finds the unknown dimension given the area and the length of a side of a rectangle.
5. Estimates the area of a square.
6. Estimates the area of a rectangle.
7. **Accepts that when finding the area of compound figures consisting of squares and rectangles, the figure should first be separated appropriately into squares and rectangles.**
8. **Finds the area of compound plane figures consisting of squares and rectangles.**
9. Solves problems related to the area of compound plane figures consisting of squares and rectangles.

Glossary of Terms:

Standard unit	-	සම්මත ඒකකය	-	நியம அலகு
Square	-	සමචතුරාස	-	சதுரம்
Rectangle	-	සෘජුකෝණාස්‍රය	-	செவ்வகம்
Area	-	වර්ගඵලය	-	பரப்பளவு
Compound plane figure	-	සංයුක්ත තල රූප	-	கூட்டுத் தளவுருக்கள்

Instructions to plan the lesson:

Given below is an individual activity that can be conducted in groups under the guidance of the teacher with a view to developing subject concepts relevant to the learning outcomes 7 and 8 after the establishment in students the abilities of identifying the standard units of area, finding areas of squares of rectangles and solving problems related to them relevant to the first six learning outcomes under the competency level 8.1.

Time: 40 minutes

Quality inputs :

- Sets of cardboard squares and rectangles prepared as per measurements in annex 1 (one per group)
- Copies of activity sheets

Instructions for the teacher:**Approach:**

- Asking to calculate areas of sketch diagrams on the board, emphasize that the area of a square can be calculated by squaring length of a side and for a rectangle by multiplying width by its length.
- Explain that compound plane figures are made by combining different plane figures.
- Emphasize that sides of plane figures should touch each other when compound figures are formed.
- Explain that connecting only from vertices will not result a compound plane figure.

Development of the lesson:

- Group the students appropriately.
- Distribute the sets of plane figures prepared among the groups so that each group receives one set and engage the students in the activity.
- After the activity ask the students about the results.
-

- Lead a discussion stressing that compound figures made with squares and rectangles should be separated into rectangles and squares appropriately when area of the compound plane figure is calculated.
- Then, give a few compound plane figures as those in annex 2 to students and get them to find their area.

Activity sheet for the students:

- Select two figures from the set of rectangles and squares you received.
- Find the area of two figures of them separately.
- Keep the two figures on an exercise book so that they do not overlap and draw a compound figure around them.
- Calculate the area of the compound figure you drew after dividing it into squares or rectangles as appropriate.
- Compare the sum of the areas of two figures with the area of the compound figure.
- What is the conclusion which you arrived at from it?
- Taking two figures from the plane figures given to you make more compound figures and verify your conclusion by finding the area of them.

Assessment and Evaluation:

- Assessment criteria:
 - Compound plane figures are drawn correctly using rectangles and squares.
 - Accepts that the area of the compound figure can be calculated by adding or subtracting areas of plane figures used.
 - Separate compound plane figure into squares and rectangles as appropriate when calculating the area of the compound plane figure.
 - Finds the areas of compound figures consisting of squares and rectangles.
 - Works cooperatively in the groups.
- Direct the students to do the exercises of the lesson 17th in the text book

For your attention...**Development of the lesson:**

- Plan a lesson to achieve learning outcome 9 of competency level 8.1 and implement

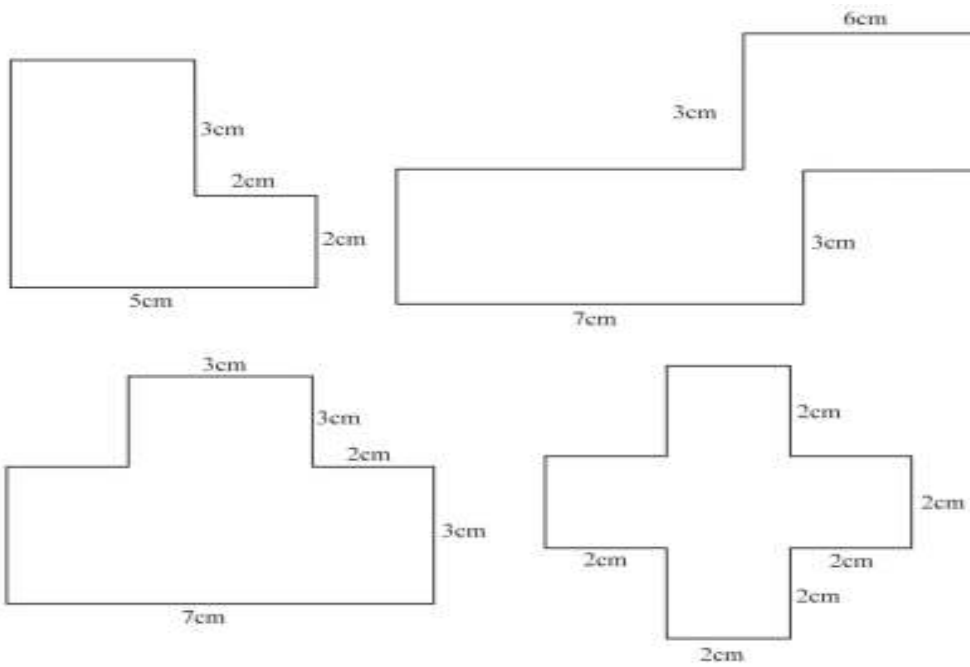
Assessment and Evaluation:

- Direct students to do the exercises of the lesson 17th in the text book.

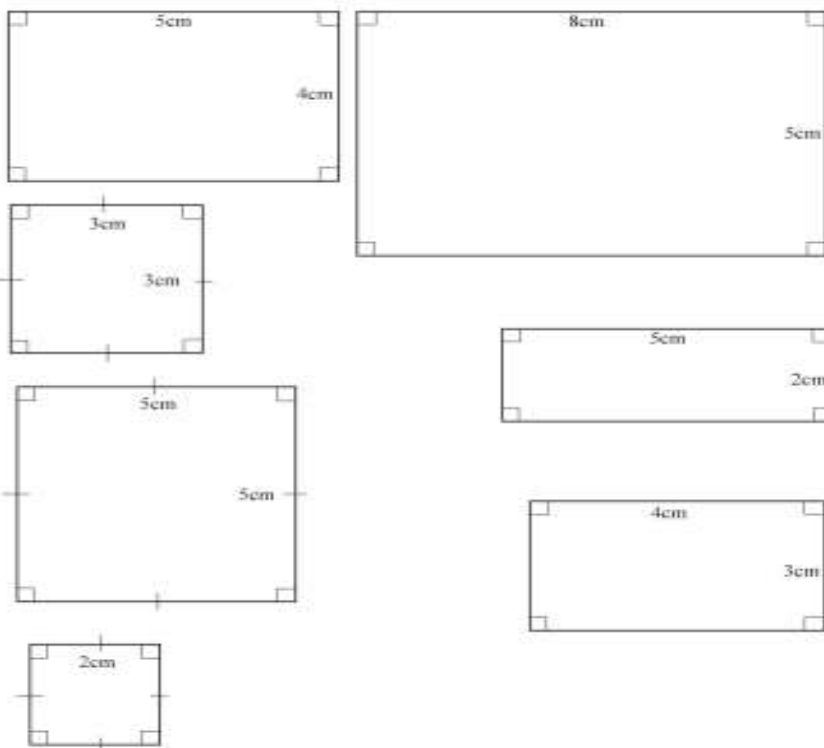
For further Reference:

- <http://www.youtube.com/watch?v=CDvPPsB3nEM>

Annex 1



Annex 2



18. Circles

Competency 24: Thinks logically to make decisions based on geometrical concepts related to circles.

Competency level 24.1: Creates designs using circles.

No. of periods: 04

Introduction

Circle is the path of a point that moves at a constant distance from a central point. The central point of a circle is called as the centre and constant distance from the centre to the perimeter is the radius of the circle.

A straight line segment that connects two points on the circle is called as the chord. The chord that goes through the centre point is the diameter of the circle. Diameter is twice large as the radius.

Different patterns can be created using circles. It is important to use the compass correctly to draw circles. Different tools and equipment can be used to draw circles according to the situation.

Learning outcomes relevant to competency level 24.1:

1. **Draws circles by accurately manipulating a pair of compasses.**
2. **Creates circular designs by using a pair of compasses.**
3. Investigates the different instruments that can be used to draw circles.
4. For a given situation, identifies the instrument that is suitable to be used to draw a circle.
5. Identifies the point right at the middle of a circle as its centre.
6. Identifies a straight line segment which joins the centre to a point on the circle as the radius of the circle.
7. Identifies a straight line segment which joins two points on a circle and passes through its centre as a diameter of the circle.
8. Engages in simple calculations by using the fact that the diameter of a circle is twice its radius.
9. Draws circles of given radii using a pair of compasses.

Glossary of terms:

Circle	- வாகை	- வட்டம்
Centre	- கைநீட்ச	- மையம்
Radius	- அரக	- ஆரை
Diameter	- விக்கமீக	- விட்டம்
Pair of compasses	- கலகடுவ	- கவராயம்

Instruction to plan the lesson:

Students have learnt to draw circles using round shaped objects. Find below the learning specimen with a teacher demonstrations including a group activities to develop skills of drawing circles using a pair of compasses correctly, to achieve learning outcomes 1 and 2.

Time: 40 minutes

Quality inputs:

- Compass kit for the teacher demonstration
- Compass for students
- Half sheets
- Colours (Pastel or Platignum)

Instructions for the teacher:**Approach:**

- Remember how circular patterns were created using objects such as coins, bangles etc in grade 6.
- Ask students about the other equipment used to draw circles.

Development of the lesson:

- Display the compass from teacher's model compass kit.
- Fix a chalk stick to the compass and keep the metal point and chalk on the table surface and emphasize that both metal point and the chalk stick should be at same level.
- Instruct students to fix a pencil to the bar of the compass.
- State that the pencil should be smaller than the metal bar of the compass.



- Demonstrate students drawing few circles on the black board.

- Give opportunity to the students to draw few circles on half sheets.
- Group the class appropriately and distribute quality inputs.
- Ask students to make a wall decoration by drawing circles using compass.
- Provide necessary instructions to colour the wall hanging.
- Display the decorations in the class and appreciate it.

Assessment and Evaluation:

- Assessment criteria:
 - Identify the compass as the recognized tool to draw circles.
 - State the facts to be concerned when compass is used
 - Correctly draw circles using compass
 - Creating different designs using circle patterns
 - Work with the group in corporation
- Direct students to the exercises of the lesson 18th in the text book

Practical situations:

- Explain students that the knowledge on circles is used in practical situations such as fashion designing, landscaping, creating different items, architectural designs. .

For your attention...

Development of the lesson:

- Bring students to the school garden and discuss on tools that can be used to prepare round shaped plots. Discuss on other instruments that can be used to draw circles.
- Discuss with the students on suitable objects to cut large circles for Vesak decorations, stage decorations etc.
- Try to get an idea by browsing internet on equipment that can be used to draw circles.
- Plan and implement lessons for learning outcomes 5, 6, 7, 8 and 9.

Assessment and Evaluation:

- Direct students to do the exercises of the lesson 18th in the text book

For further Reference:



- <http://www.youtube.com/watch?v=GwycEivqYYI>

19. Volume

Competency 10: Gets the maximum out of space by working critically with respect to volume

Competency level 10.1: Inquiries into the amount of space taken up by cubes and Cuboids

No. of periods: 05

Introduction:

The space that is occupied by a solid object is known as its volume. Different shaped objects might have same volume. Units of volume can either be desired or standards. Concrete pan used for masonry work, cup used for cooking are the situations where desired units are used. When volumes are described in desired units people use different desired units. It emerged the need of the standard units. International standard unit for volume is cubic meters.

Volume of a cube which has 1cm side length is 1 cm^3 and volume of a cube which 1 m side length is 1 m^3

Volume of a cube is length x width x height.

There are situations in our day today life to measure volume. Volume can be measured by measuring length, width and height.

Learning outcomes relevant to competency level 10.1:

1. Explains the concept of volume.
2. Expresses the volume of a cube in terms of arbitrary units.
3. Expresses the volume of a cuboid in terms of arbitrary units.
4. **Expresses the volume of a cube in terms of standard units.**
5. **Expresses the volume of a cuboid in terms of standard units.**
6. **For a given volume of a cuboid, mentions possible lengths, breadths and heights.**
7. Estimates the volume of a cube/cuboid.
8. Identifies the relationships between the volumes of cubes, cuboids as well as between the volumes of cubes and cuboids

Glossary of terms:

Cube	- ஐனகய	- சதுரமுகி
Cuboid	- ஐனகாஐய	- கனவுரு
Volume	- பரீமாவ	- கனவளவு
Desired units	- ஐகிமன லீகக	- எதேச்சை அலகுகள்
Standard units	- ஐமீமன லீகக	- நியம அலகுகள்

Instructions to plan the lesson:

An example including exploring process to reach learning outcomes 4, 5, and 6 of competency level 10.1 after establishment of subject concepts related to learning outcomes 1, 2, and 3, is as follows.

Time: 40 minutes

Quality inputs:

- Centicubes
- Copies of the activity sheet

Instructions for the teacher:**Approach:**

- Inform students that cubic meter is recognized as the SI unit to measure volume
- Explain that volume of a cube, of which length of a side is one centimeter, is one cubic centimeter and volume of a cube, of which length of a side is one meter, is one cubic meter.
- Ask each student to measure length, width and height of a centicube and to confirm that all figures are in centimeters
- Explain that the volume of a centicube is 1 cm^3
- Make cubes and cuboids from centicubes and discuss its volume with students.

Development of the lesson:

- Divide the students of the class into six groups
- Provide activity sheets to each group
- Provide centicubes 8, 12, 18, 20, 24, 27 each to the six groups
- Ask to write down information obtained according to the instructions in the activity sheet
- Lead a discussion after student presentations confirming students that volume of a cube or cuboid is length x width x height
- Point out that cubes and cuboids with different dimensions can be made from centicubes and for cuboid with a certain volume can have different lengths, widths and heights.

Activity sheet for the students:



- Make a cube or a cuboid using all centicubes received to the group
- Write down its length, width and height in the table
- Dismantle the prepared cube or cuboid and make another cube or cuboid with different dimensions.
- Write down its length, width and height in the table.
- Write down the volume by counting centicubes
- Repeat this for many times you can and write down dimensions in the table

Opportunity	No. of centicubes given			Volume by counting centicubes cm^3
	Cube or cuboid made			
	length	width	height	

- Discuss the relationship among length, width and height of a cube or a cuboid.

Assessment and Evaluation:

- Assessment criteria:
 - Make cubes and cuboids with different shapes using given centicubes
 - State the volume of the cube or cuboid made
 - Accept that there are cubes and cuboid with same volume but with different shapes
 - State that the volume of a cube or a cuboid is length x width x height
 - Accept the cubic centimeter is a SI unit of volume
- Direct students to the exercises of the lesson 19th in the text book

Practical Situations:

- Discuss that it is important to consider the volume when packing materials

For your attention...

Development of the lesson:

- Plan and implement lessons for learning outcomes 7 and 8.

Assessment and Evaluation

- Direct students to do the exercises of the lesson 19th in the text book

For further Reference:



- <http://www.youtube.com/watch?v=U2W7HPyC0cM>

20. Liquid measurements

Competency 11: Works critically with the knowledge of liquid measurements to fulfill daily needs

Competency level 11.1: Manipulates liquid measurements involving milliliters and liters under the basic mathematical operations

No. of time periods: 04

Introduction:

Simplifying liquid measurements is applied in our day today life activities. Units of liquid measurements, conversion of liquid measurements from one unit to another, adding and subtraction of liquid measurements were introduced in Grade 6.

Division and multiplication is also applicable sometimes. When a measurement is given in two units; large unit and smaller unit, and needs multiplication or division by a whole number, the measurement has to be converted either to the large unit or to the smaller unit before simplification. After simplifying the answer can be separated to the units. In such occasions, if the measurement is given in liters and milliliters, should be careful to state milliliters in three digits. In this section division and multiplication of liquid volumes by a whole number will be discussed.

Learning outcomes relevant to competency level 11.1:

1. Multiplies by a whole number, measurements of liquid volume expressed in terms of ml and l.
2. Divides by a whole number, measurements of liquid volume expressed in terms of ml and l.
3. Solves problems related to the multiplication and division of liquid volume measurements.

Glossary of terms:

Liquid measurements	-	ද්‍රව මිනුම්	-	திரவ அளவீடுகள்
Liter	-	ලීටර	-	லீற்றர்
Milliliter	-	මිලි ලීටර	-	மில்லிலீற்றர்
Units	-	ඒකක	-	அலகுகள்
Conversion	-	පරිවර්තනය	-	மாற்றுதல்

Instructions to plan the lesson:

In order to reinforce subject concepts related to learning outcomes of competency level 11.1 below example with lectures and discussions was designed.

Time: 40 minutes

Quality inputs: Copies of activity sheet

Instruction to the teacher:

Approach:

- Lead a discussion asking students about liquid measuring units
- Inquire about the relationship between liquid measuring units, litres and millilitres
- Discuss about the conversion of units. Following can be considered as examples
 $5000\text{ml} \rightarrow 5\text{l}$, $3\text{l} \rightarrow 3000\text{ml}$, $1250\text{ ml} \rightarrow 1\text{l } 250\text{ml}$, $2\text{l } 150\text{ml} \rightarrow 2\text{l } 150\text{ml}$

Development of the lesson:

- Show when a liquid measurement is multiplied by a whole number less than ten the answer would be in same units
- Explain with suitable examples multiplication with carrying in both units *l* and *ml*
- Emphasize the importance of writing liquid measurement such as $2\text{l } 25\text{ml}$ in three digits as $2\text{l } 025\text{ml}$
- Explain with examples on multiplication of liquid measurements in *l* and *ml* and involves carrying.
- Emphasize that after multiplication of a liquid measurement with a whole number, if the milliliter value has more than three digits, thousandth digit should carry to the litre column in left side and balance should leave in milliliters column.
- Direct student to do the exercises with carrying and without carrying.

Assessment and Evaluation:

- Assessment criteria:
 - Multiply correctly the liquid measurements in one unit and involves carrying with a whole number
 - Multiply correctly the liquid measurements in one unit and does not involve carrying with a whole number.
 - Multiply correctly the liquid measurements in two units and involves carrying with a whole number.
 - Multiply correctly the liquid measurements in two units and does not involve carrying with whole numbers.
 - Accept that the ability to multiply liquid measurements is useful in day today activities
- Direct students to the exercises of the lesson 20th in the text book

For your attention...

Development of the lesson:

- Plan suitable learning techniques to reinforce subject concepts relevant to learning outcomes 2 and 3 and implement
- Be conscious on situations with carrying and situation without carrying when liquid measurements with both l and ml are multiplied with a whole number

Assessment and Evaluation:

- Direct students to the exercises of the lesson 20th in the text book

For further Reference:



- <http://www.youtube.com/watch?v=xMz9WFvox9g>
- <http://www.youtube.com/watch?v=7WloKabLhII>

21. Ratio

Competency 4: Uses ratios to facilitate day to day activities

Competency level 4.1: Shares resources fairly by applying the knowledge on ratios

Number of periods: 05

Introduction:

Students have learnt in grade 6, that when dividing a quantity between two given terms or values of a and b are in same units, the ratio is written as a: b and an equivalent ratio can be written for a given ratio.

Dividing a certain quantity as a ratio of three terms, find the total quantity when relevant quantity for a term is given, and calculating the values for the other terms and applying the knowledge on ratio in practical situation is expected to achieve from this section.

Learning Outcomes relevant to competency level 4.1:

1. Divides a quantity into three according to a ratio.
2. Calculates the total quantity when the ratio and the value of one of the terms are given.
3. Calculates the values of the rest of the terms when the ratio and the value of one term are given.
4. Applies the knowledge on ratios in practical situations.

Glossary of terms:

Ratio	- அனுபாயம்	- விகிதம்
Corresponding values	- அனுரூப அளவுகள்	-ஒத்த பெறுமானங்கள்

Instructions to plan the lesson:

In order to develop subject concepts relevant to learning outcomes 1 or competency level 4.1, the below example has been designed included with group activities, lectures and discussions.

Time: 40 minutes

Quality inputs: Activity sheets – one per group

Instructions for the teacher:

Approach:

- Remember that relationship between numerical values of two different terms in same unit was learnt showing practical situations.
- Write down a ratio such as 1:2 and discuss with students to get equivalent ratios such as 2:4, 3:6, 5:10 for the above ratio

Development of the lesson:

- Group students so that one group consists of four students and distribute copies of activity sheets among groups and engage them in the activity
- After completing the table, ask a member of a group to complete the table written in the blackboard
- Discuss with groups on how they got the relevant values for the blanks in the table
- Providing an opportunity to reinforce subject concepts, discuss with students on corresponding values for two additional values
- As per the below example, write down the division of a certain amount of money among three persons and considering equivalent ratios discuss on finding relevant values for the blanks.

Eg:	A	B	C	Total
	1	2	3	6
	-	-	-	12
	-	-	-	30

- Direct students to sub divide a given quantity

Activity sheet for the students:

- A certain number of mangoes are divided between Kamal and Nimal in 2:3 ratios. Fill the blanks in the following table with the no. of mangoes that Kamal and Nimal will receive

Received quantity for Kamal	Received quantity for Nimal	Total quantity distributed
2	3	5
$2 \times 2 = 4$	$3 \times 2 = 6$	$10(5 \times 2)$
$2 \times 3 = 6$	$3 \times \dots = \dots$	$15(5 \times 3)$
$2 \times \dots = \dots$	$3 \times \dots = \dots$	$20(5 \times 4)$
$\dots \times \dots = \dots$	$\dots \times \dots = \dots$	$25(5 \times \dots)$
$\dots \times \dots = \dots$	$\dots \times \dots = \dots$	$50(5 \times \dots)$

Assessment and Evaluation:

- Assessment criteria:
 - Complete the blanks of a given table based on given information
 - Explain with reasons on how the table was completed
 - Accepts that a certain quantity can be divided between two or three as per the given ratio
 - Work cooperatively in the group
- Direct students to the exercises of the lesson 21st in the text book

Practical situations:

- Discuss with students on practical applications such as preparing 2l of soft drink by mixing different volumes of juice and water according to the mixing ratio.

For your attention...**Development of the lesson:**

- Reinforce the incidents of division according to a ratio which has three terms
- Design and implement an activity to improve skills to calculate the total value when the relevant value for a term of a ratio is given
- Plan and implement an activity to improve skills to calculate values of all the terms of a ratio when relevant value of a term is provided.
- Whenever possible use practical applications for the given examples

Assessment and Evaluation:

- Direct students to the exercises of the lesson 21st in the text book

For further Reference:



- https://www.khanacademy.org/math/pre-algebra/rates-and-ratios/ratios_and_proportions/v/introduction-to-ratios-new-hd-version

22. Percentages

Competency 5: Uses percentages to make successful transactions in the modern world

Competency level 5.1: Analyses the different ways of representing a number

Number of periods: 05

Introduction:

In our day today life we face lot of incidents to compare different variables. Percentages are used to do such comparisons easily and efficiently. Percentages are given a special place in the commercial world.

Percentage is fraction of which the denominator is 100 and hundredth is denoted as %. Accordingly, 10% means 10 hundredth and $\frac{10}{100}$. Therefore, a fraction can be written as a percentage by converting denominator of it to 100.

Learning Outcomes relevant to competency level 5.1:

1. Describes the concept of percentages.
2. Uses the symbol % to represent a percentage.
3. **Writes as percentages, fractions that have denominators which are factors of 100.**
4. Writes a decimal number of up to two decimal places as a percentage

Glossary of terms:

Percentage – பதின்மம் - சதவீதம்

Instructions to develop the lesson:

An example included with an individual exploration is shown below to develop subject concepts related to learning outcome 3 of competency level 5.1 after achieving learning outcomes 1 and 2.

Time: 40 minutes

Quality inputs:

- Poster in the annex 01
- 10 x10 grid prepared so that whole class can be seen
- Grids prepared by students according to the instructions given on previous day
- Platignum pen

Instruction to the teacher:**Approach:**

- Display 10 x10 grid on the black board
- To start the lesson, invite two students to the front and instruct them to colour $\frac{1}{4}$ and $\frac{3}{5}$ separately while explaining that total no. of squares in the grid is 100 and if 5 squares are coloured the coloured fraction is $\frac{5}{100}$ and if 20 squares are coloured the coloured fraction is $\frac{20}{100}$.
- Explain to the students to make the coloured fraction equal to $\frac{1}{4}$, total grid should be divided into four equal parts which will result 25 squares for each part and it is $\frac{25}{100}$
- Explain that $\frac{3}{5}$ is equivalent to $\frac{60}{100}$ of the grid.
- After the discussion, present the poster in attachment 1 and draw students' attention to it.
- According to the first news explain that 50% means $\frac{50}{100}$ and 50 passed from each 100 while 10% means $\frac{10}{100}$ and for each 100kg there is a 10kg increment.
- Direct the students to the activity explaining that $50\% = \frac{50}{100}$, $10\% = \frac{10}{100}$, $5\% = \frac{5}{100}$ and a percentage is a fraction with denominator 100

Development of the lesson:

- Display the activity sheet on the black board
- Instruct students to do the activity individually
- Ask to do the activity using four grids drawn in exercise book on the previous day and fill the blanks below each grid.
- After the exercise give an opportunity to present the explored facts on conversion of a fraction to a percentage
- Using students' explored facts summarize that a fraction with a denominator of a factor of 100 can be converted as an equivalent fraction with denominator 100 and it can be written as a percentage with % mark.
- Direct student to the following exercise after the brief

Fill the blanks converting following fractions to percentages

(i) $\frac{3}{10} = \frac{3 \times \dots}{10 \times \dots} = \frac{\dots}{100} = 30\%$

(ii) $\frac{2}{5} = \frac{2 \times \dots}{5 \times \dots} = \frac{\dots}{100} = \dots\%$

(iii) $\frac{3}{4} = \frac{3 \times \dots}{4 \times \dots} = \frac{\dots}{100} = \dots\%$

(iv) $\frac{4}{5} = \frac{\dots \times \dots}{\dots \times \dots} = \frac{\dots}{100} = \dots\%$

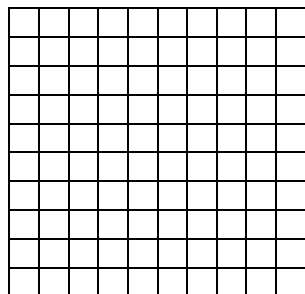
(v) $\frac{1}{2} = \frac{\dots \times \dots}{\dots \times \dots} = \frac{\dots}{100} = \dots\%$



Activity sheet for students:

- Pay your attention to the 10 x 10 grid drawn in your exercise book
- According to the instructions given under each grid in the activity sheet, fill the blanks and colour each grid.

(1)



(i) Colour $\frac{1}{2}$ of the grid

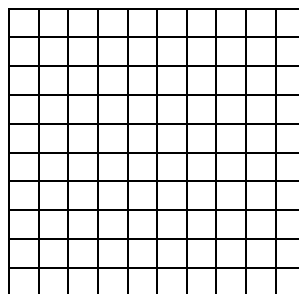
(ii) Coloured portion is $\frac{1}{2}$ from the whole diagram

Therefore,

The coloured portion = $\frac{\dots}{100}$ from whole diagram

Coloured portion = $\dots\%$ as a percentage

(2)



(i) Colour $\frac{1}{4}$ of the grid

(ii) Coloured portion is $\frac{1}{2}$ from the whole diagram

Therefore,

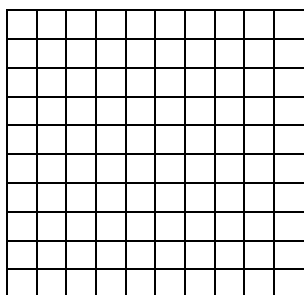
the coloured portion = $\frac{\dots}{100}$ from whole diagram

Coloured portion = $\dots\%$ as a percentage

(iii) Complete the blanks

$$\frac{1}{2} = \frac{1 \times \dots}{2 \times \dots} = \frac{\dots}{100} = \dots\%$$

(2)



(i) Colour $\frac{1}{2}$ of the grid

(ii) Coloured portion is from the whole diagram

Therefore,

The coloured portion = $\frac{\dots}{100}$ from whole diagram

Coloured portion =% as a percentage

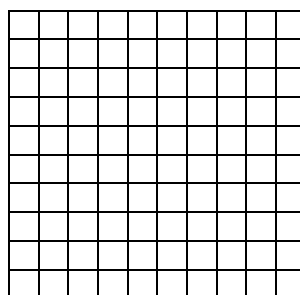
(iii) Complete the blanks

$$\frac{8}{10} = \frac{8 \times \dots}{10 \times \dots} = \frac{\dots}{100} = \dots\%$$

(iii) Complete the blanks

$$\frac{1}{4} = \frac{1 \times \dots}{4 \times \dots} = \frac{\dots}{100} = \dots\%$$

(4)



(i) Colour $\frac{3}{5}$ of the grid

(ii) Coloured portion is from the whole diagram

Therefore,

the coloured portion = $\frac{\dots}{100}$ from whole diagram

Coloured portion =% as a percentage

(iii) Complete the blanks

$$\frac{3}{5} = \frac{3 \times \dots}{5 \times \dots} = \frac{\dots}{100} = \dots\%$$

- After the activity be ready to present steps you identified on converting fraction to percentages

Assessment and Evaluation:

- **Assessment criteria:**
 - Fraction is presented as a percentage changing its form
 - Accept that equivalent fractions can be used to present a fraction as a percentage
 - Present a fraction with denominator 100 which is a percentage
 - Do the exercises with the experience gained from the activity
 - Make decision based on the information
- Direct students to the exercises of the lesson 22nd in the text book

Practical situations:

Percentages are used

- To get the expected income or profit in commercial world
- When giving dividends to the buyers, when calculating shareholder equity ratios.
- In banks

For your attention...**Development of the lesson:**

- Design and activate a lesson appropriate to achieve learning outcomes 4 of competency level 5.1

Assessment and Evaluation:

- Direct students to the exercises of the lesson 22nd in the text book

For further Reference:

- <http://www.youtube.com/watch?v=ITVQrzDSekU>

Annex 01

50% students from Flood affected "Diriya" school got through the exam Paddy harvest of Matara district is increased by 10% in this season

23. Cartesian plane

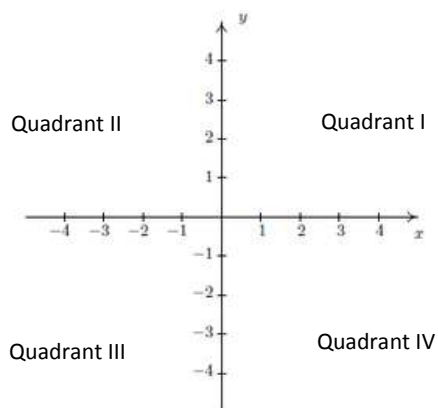
Competency 20: Easily communicates the mutual relationships that exist between two variables by exploring various methods

Competency level 20.1: Describes the location of a certain place with respect to two mutually perpendicular axes.

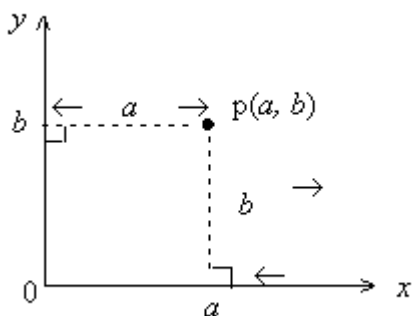
Number of Time periods: 05

Introduction:

The Cartesian plane describes a point in a plane where two perpendicular number lines intersect each other. One number line is considered the x axis and the other line is considered as the y axis. The point where the two axes intersect is called the 'origin'. These two lines divide the Cartesian plane into four sections. Those are known as quadrants.



This section discusses the locations of the first quadrant of a Cartesian plane Figure.



When a point is represented in a Cartesian plane it is assigned two numbers or an ordered pair of which the first is the distance along the x-axis and the second is the distance along the y-axis. This pair of values is known as the coordinates of that point. Accordingly the x coordinate and y coordinate of point 'p' are 'a' and 'b' respectively and the coordinates of p are (a,b). Coordinates of the origin O are (0,0) .

Learning outcomes relevant to competency level 20.1:

1. Accepts that a standard method is required to indicate the position of an object.
2. Identifies the Cartesian coordinate plane.
3. Expresses the coordinates of a point in the first quadrant of a Cartesian coordinate plane as an ordered pair.
4. Writes down the coordinates of a point in the first quadrant of a Cartesian coordinate plane.
5. **Marks a point with coordinates (x, y) where $x, y \geq 0$, on a coordinate plane.**
6. In daily activities, determines the location of an object using the knowledge of a coordinate plane

Glossary of Terms:

Coordinate planes	-	கார்டீசிய வட்டம்	- தெக்காட்டின் தளம்
Quadrant of a circle	-	வட்டக் கோணம்	- கால்வட்டப் பகுதி
x- coordinate	-	x - அச்சம்	- x ஆள்கூறு
y- coordinate	-	y-அச்சம்	- y ஆள்கூறு
x-axis	-	x அச்சம்	- x அச்சம்
y-axis	-	y அச்சம்	- y அச்சம்
Origin	-	ஆதி மையம்	- உற்பத்தி
Coordinates of a point	-	ஒரு புள்ளியின் ஆள்கூறுகள்	- புள்ளியொன்றின் ஆள்கூறுகள்
Ordered pair	-	ஒரு ஆள்கூறு	- வரிசைப்பட்ட சோடி

Instructions to plan the lesson:

Given below is a specimen lesson plan based on an individual activity that can be done within the group to develop in student the learning outcome 5 after consolidating in them the learning outcomes from 1 to 4 to the expected level.

Time: 40 minutes

Quality inputs:

- 1cm^2 grid sheets (Sheets of the grade 1 mathematics book can be used)
- Activity sheets – one per group
- Colour pencils or pastel

Instructions for the teacher:

Approach:

- In order to make sure that students understand the Cartesian Plane, display a Cartesian plane and lead a discussion with students on how to mark points on it.
- Get a few students to mark several points on it.

Development of the lesson:

- Group students appropriately and distribute one activity sheet and 1cm^2 square sheet per group. After marking and connecting the points display and appreciate students' work.



Activity sheet for the students:

- Draw a Cartesian plane on the grid given to you.
- Select one set of ordered pairs out of the following four pairs.
 - (i) After marking and joining the points $(1,5), (4,6), (5,7), (7,7), (8,5), (8,4), (9,3), (6,2), (5,3), (2,4), (1,5), (3,1)$ mark $(8,5), (7,3), (6,5), (6,6), (7,7)$ and join them.
 - (ii) $(1,3), (4,5), (7,3), (9,4), (8,3), (9,2), (7,3), (4,1), (1,3)$
 - (iii) $(1,1), (1,5), (0,5), (1,7), (7,7), (8,5), (7,5), (7,1), (1,1)$
 - (iv) $(2,4), (5,1), (9,5), (11,7), (10,5), (10,4), (11,2), (9,4), (5,1), (2,4)$
- Mark the ordered pairs in an order in your Cartesian plane name them as A, B, C, D etc. and connect those points in an order to get a closed figure
- Colour the figure.
- Show your diagram to the others.

Assessment and Evaluation:

- Assessment criteria:
 - Calibrates the Cartesian plane correctly.
 - Marks the corresponding points for the given coordinates on the Cartesian plane.
 - Accepts that order is more important for getting the figure.
 - Presents an artistic creation.
 - Acts cooperatively in the group.
- Direct students to do the exercises of the lesson 23rd in the text book

For your attention....**Development of the lesson:**

- Lead a discussion with students on how to apply the knowledge on Cartesian planes for day today activities.

Assessment and Evaluation:

- Direct students for the exercise of the lesson 23rd in the text book

For further reference:

- <http://www.youtube.com/watch?v=Lvr2YsxG10o>
- <http://www.youtube.com/watch?v=Mokl3Fi8jpc>
- http://www.youtube.com/watch?v=FaDtge_vkbg
- <http://www.youtube.com/watch?v=Hkwfibux88s>
- <http://www.youtube.com/watch?v=-gB1y-PMWfs>
- <http://www.youtube.com/watch?v=MkpbtCRwcCE>
- <http://www.youtube.com/watch?v=T4JKO0OGjpQ>

24. Construction of plane figures

Competency 27 : Analyzes according to geometric laws, the nature of the locations in the surroundings

Competency level 27.2 : Constructs rectilinear plane figures

Number of periods : 05

Introductions:

It is very important to draw correct figures when drawing scale diagrams, creating patterns and making geometric designs. Students should have skills to use the straight edge and the pair of compasses to draw these figures. That skill should be gained by practical training. To lay the foundation for this attention has been paid here to a few simple designs giving due consideration to measurement. This lesson aims to give the students knowledge and skills required to draw straight line segments, equilateral triangles and regular hexagons.

Learning outcomes relevant to competency level 27.2:

1. Constructs a straight line segment of given length using the straight edge and the pair of compasses
2. Constructs an equilateral triangle with a side of given length using the straight edge and the pair of compasses.
3. Constructs a regular hexagon by means of an equilateral triangle.
4. Constructs a regular hexagon by means of a circle.
5. Engages in creations using of equilateral triangles and hexagons.

Glossary of Terms:

Construction	-	நிர்மாணம்	- அமைப்பு
Pair of compasses	-	கலகவலை	- கவராயம்
Straight edge	-	சரல் டாரம்	- நேர் விளிம்பு
Line segment	-	சரல் லைன்	- நேர்கோட்டுத் துண்டம்
Equilateral triangle	-	சமபக்க திரகோணம்	- சமபக்க முக்கோணி
Regular hexagon	-	சீரடி ஆறுபக்கம்	- ஒழுங்கான அறுகோணி

Instructions to plan the lesson

This lesson is planned as an individual activity to achieve learning objective 3 of competency level 27.2. Following the establishment of subject concepts in students relating to the learning outcomes 1 and 2 under the competency level 27.2.

Time : 40 minutes

Quality inputs:

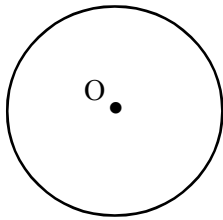
- Circular laminae of 6cm radius cut from paper (one for each student).
- An enlarged copy of the student activity sheet

Instructions for the teacher:

Approach:

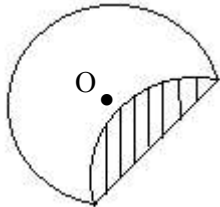
- Give one circular lamina to each student.
- Engage students on following activity with along with the teacher demonstration.

Step 1



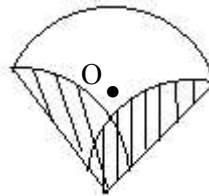
Mark the centre of the circle

Step 2



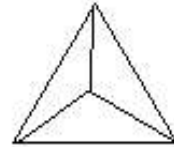
Fold as shown above so that edge of lamina "B" touches the centre of the circle. AB is the folding line.

Step 3



Fold through B as in step A. BC is the folding line.

Step 4

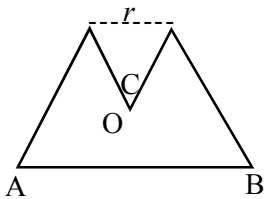


Fold again so that AC is the folding line'

Development of the lesson:

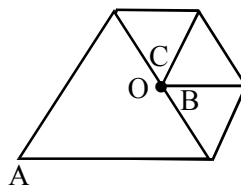
- Discuss about the shape of the figure obtained in step 4 and let the students understand that it is an equilateral triangle.
- While demonstrating, give instruction to fold the above triangle lamina as described in steps 5, 6 and 7.

Step 5



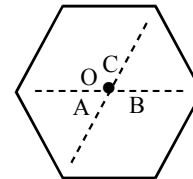
Place vertex C on the centre and fold.

Step 6



Fold so that vertex B is placed on the centre.

Step 7



Fold vertex A as before.

- Discuss with students about the shape of the figure obtained and explain that it is a regular hexagon.
- Give direction to find the relationship between the length of a side of the equilateral triangle and the length of a side of the regular hexagon obtained from it and show that the side of the hexagon is the $\frac{1}{3}$ the side of the equilateral triangle.

- Using the relationship discovered earlier, engage students in the following individual activity. For this, display an enlarged copy of the student instruction sheet.
- Also demonstrate that a regular hexagon can be constructed by constructing six equilateral triangles of side 4cm around a point.
- At the end of the activity lead a summary discussion reviewing the steps of constructing a regular hexagon.



Activity sheet for the Students:

- You have been assigned to draw a regular hexagon of side 4cm. What is the length of a side of an equilateral triangle to be constructed for this?
- Construct the above equilateral triangle.
- Mark with points 4cm segments on the sides of the equilateral triangle using a pair of compasses.
- Connect all the points marked to get a regular hexagon.
- Plan another method to construct a regular hexagon of 4cm side using equilateral triangles and construct the hexagon.
- Be ready to present your work.

Assessment and Evaluation:

- Assessment criteria:
 - States that a regular hexagon can be drawn by constructing equilateral triangles.
 - Draws a regular hexagon by constructing equilateral triangles.
 - **Handles** the straight edge and the pair of compasses correctly, during the construction.
 - Work as per the teacher's instructions with self-effort to achieve targets.
 - Accepts that the understanding of geometric relationships and concepts are important in design.
- Direct students to do the exercises of the lesson 24th in the textbook.

For your attention...**Development of the lesson:**

- Plan and implement creative activities to achieve learning outcomes 4 and 5. Hold an exhibition to display students' creations and provide an opportunity to improve students' creativity and attitudes.

Assessment and Evaluation:

- Hold an exhibition with the students' creations
- Direct students to do the exercises of the lesson 24th in the textbook

For further reference:

- <http://www.youtube.com/watch?v=JcqCf762y9w>

25. Solid objects

Competency 22: Engages in creations by exploring various solids.

Competency level 22.1: Engages in the creation of models of square pyramids and triangular prisms

Competency level 22.2: Investigates the relationships between the properties of solids

Number of periods: 05

Introduction:

Solids take a certain space. Pyramid is a solid object which has a polygon base and triangle faces with a common vertex. Square pyramid is a solid objects that has a square base and four identical triangles with a common vertex. A square pyramid has 8 edges, 5 faces and 5 vertices.

A triangular prism is a solid object which has three rectangular faces and two parallel triangular faces. A traingular prism has 9 edges, 5 faces and six vertices.

Of a multi plane solid has E edges, F faces and V vertices the relationship among them is given by $V+F=E+2$. This relationship was discovered by the mathematician Euler. Threfore this is called Euler relationship.

Learning outcomes relevant to the competency level 22.1:

1. Recognizes a square pyramid..
2. Draws the net of a square pyramid on a square ruled piece of paper.
3. Creates a model of the square pyramid.
- 4. Prepares various nets to make models of square pyramids.**
5. Identifies the shapes of the faces of a square pyramid, the faces with identical shapes and the edges of equal length.
6. Recognizes a triangular prism.
7. Draws the net of a triangular prism on a square ruled piece of paper.
8. Creates a model of a triangular prism.
9. Prepares various nets to make models of triangular prisms.
10. Identifies the shapes of the faces of a triangular prism, the faces with identical shapes and the edges of equal length.
11. Determines the number of edges, vertices and faces that various square pyramids have.

12. Determines the number of edges, vertices and faces that various triangular prisms have.

Glossary of Terms:

Solids	-	ஊத வசீது	-	தரினமங்கள்
Pyramid	-	பிரமீத	-	கூம்பகம்
Square pyramid	-	சமவதுரஊ பிரமீத	-	சதுரக் கூம்பகம்
Prism	-	பிரிசீத	-	அரியம்
Triangular prism	-	திரகோண பிரிசீத	-	முக்கோண அரியம்
Face	-	புதுணை	-	முகம்
Edge	-	டூர்	-	விளிம்பு
Vertex	-	கூர்ண	-	உச்சி
Euler's relationhsip	-	ஊயிலரின் சமநைதவ	-	ஊயிலரின் தூடர்பு

Instructions to plan the lesson:

A exemplar lesson plan based on exploration that can be implemented in relation to the learning outcome 4 after the establishment of subject concept relevant to the learning outcomes 1 ,2 and 3 through appropriate activities is given below.

Time: 40 minutes

Quality inputs:

- A Square pyramid and the block used to make it
- A cutter knife or razor blades
- Bristol boards, pairs of scissors
- Cellotape
- An enlarged poster as per annex 1

Instruction for the teacher:

Approach:

- Remind student to bring the square pyramid they made before.
- Showing the teacher demonstration square pyramid and its block, recall how the solid object was made using that block.

Development of the lesson:

- Show a square pyramid and separate its faces with the cullter knife. (Explain students that no pasting margins are left)
- Place the faces obtained on the block used to make it and show it to the students.
- Using all the faces, explain that various blocks can be used to make the square pyramid.

- Divide students into group as appropriate and distribute the quality inputs.
- Emphasize that everyone should take part in the activity should draw a block different from the one shown to them.
- Give an opportunity to students to find whether it is possible to get the relevant solid by folding and cutting along the edges without leaving a margin to paste.
- Provide an opportunity to present students' findings.
- Paste different blocks prepared by students on the display board, one at a time.
- If students had any omission, teacher has to explain and demonstrate it.
- Display all options in annex 1.

Assessment and Evaluation:

- Assessment criteria :
 - Creates different blocks for square pyramids using faces.
 - Cuts and separates the blocks correctly.
 - Separates the blocks which can be used to make square pyramids from others.
 - Inquires into all the possibilities of making square pyramids from others.
 - Complete the task within the given time.
- Direct the students to do the exercises of the lesson 25th in the textbook.

For your attention...

Development of the lesson:

- Plan and implement a suitable methodologies to establish subject concepts related to the learning outcomes 5 to 12 of competency level 22.1
- Plan lessons appropriately using the solid objects made to make the students understand the subject concepts of the Euler relationship related to the competency level 22.2.

Assessment and Evaluation:

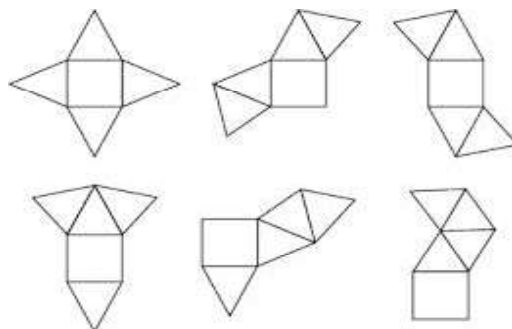
- Direct the students to do the exercises of the lesson 25th in the textbook.

For further reference:



- <https://www.mathsisfun.com/geometry/eulers-formula.html>
- <https://people.math.osu.edu/fiedorowicz.1/math655/Euler.html>

Annex 1



26. Representation and Interpretation of data

Competency 28: Investigate the various methods of representing data to facilitate daily work.

Competency level 28.1: Represents data appropriately by bar graphs and by multi-bar graphs.

Competency 29: Makes predictions after analyzing data by various methods to facilitate daily activities.

Competency level 29.1: Analyses information using bar graphs and multi-bar graphs.

Number of periods: 08

Introduction:

Students have learnt that pictographs are used to represent data. When data are represented by horizontal or vertical bars, they are called bar graph. In a bar graph data are represented by bars of equal width. The length or height of the bar represents the number. If data relating to two or more categories are represented in the same graph so that the bars corresponding to the respective categories touch one another, they are called multi-bar graphs. The data depicted by bar graphs can easily be compared.

Learning outcomes relevant to the competency level 28.1:

1. States that bar graphs are drawn using bars of equal width.
2. Expresses that bar graphs can be drawn using either vertical or horizontal bars.
3. Expresses that the length of a bar represents the relevant number of data
4. Represents a given set of data by a bar graph.
5. Provides examples of occasions when data of no more than three types are represented in one graph.
6. Expresses that when multi-bar graphs are used to represent data, for each occasion, the bars representing the different types are drawn adjoining each other.
7. Represents by multi-bar graphs, given data of no more than three types
8. Represents data graphically by selecting the appropriate method from bar graphs and multi-bar graphs.
9. Confirms the suitability of the method that is selected from bar graphs and multi-bar graphs to represent given data.

Glossar of terms:

Bar graph	-	தீர் பூசீதார்	- சலாகை வரைபு
Multi-column graph	-	பெறுதீர் பூசீதார்	- கூட்டுச் சலாகை வரைபு
Data	-	தீதீ	- தரவுகள்
Information	-	தாரதூர்	- தகவல்கள்
Category	-	பூபீதத	- வகைகுறி

Instructions to plan the lesson:

Given below is a specimen lesson plan based on individual activities and lecture discussions designed to develop subject concepts relevant to learning outcomes 1, 2, 3, and 4 of the competency level 28.1.

Time: 40 minutes

Quality inputs:

- Squared papers - one per student
- Enlarged copies of pictographs and bar graphs collected from papers.

Instructions for the teacher:**Approach:**

- Refresh memory on occasions where data were represented by pictographs
- Displaying examples collected in advance in the classroom, state that data can also be represented as bar graphs.

Development of the lesson:

- Displaying again the bar graphs showed at the beginning, introduce bar graphs as a way of representing data.
- Display following information in the classroom telling that these were the items and their quantities sold by a retail shop within an hour.

Material	Dhal	Sugar	Rice	Flour	Onion
Quantity (kg)	2	5	8	4	3

- Provide squared sheets one per student.
- While explaining with demonstration, instruct students to mark vertical and horizontal axes in the sheet so that quantity is represented by one axis and material is represented by the other axis.
- Explain with demonstration that the quantity of dhal sold can be represented by one bar and 2kg corresponding to two squares.
- Instruct to draw bars with same width to represent other data as well.
- Instruct to colour the bars of the bar graph.
- Call few students one by one and direct them to complete the other bars in the teacher's demonstration.
- After completing the bar graph, lead a discussion asking about the important factors that should be considered when drawing a bar graph.
- Direct students to draw a bar graphs using other data provided to them.

Assessment and Evaluation -

- Assessment criteria :
 - Follows teacher instructions properly.
 - States that bar graphs are drawn using bars of equal width.
 - Accepts that bar graphs can be drawn using both vertical or horizontal bars.
 - States that the length of the bar represents the corresponding value.
 - Represents a given set of data by a bar graph.
- Direct the students to do the exercises of the lesson 26th in the textbook.

Practical situations:

- Discuss about the possibility of representing students' marks, number of **students** passed, information in offices and the paddy harvest in various seasons by bar graphs and its usefulness.

For your attention...**Development of the lesson:**

- Follow a suitable method to develop the skill of drawing bar graphs in students using vertical and horizontal bars.
- Design and implement a suitable activity to enable students to draw multi-bar graphs.
- Plan suitable bar graphs for eliciting and comparing information and adopt a suitable method to develop this skill in students.

Assessment and Evaluation:

- Direct students to do the exercises of the lesson 26th in the textbook.

For further reference

- <http://www.youtube.com/watch?v=woUQ9LLaes>
- <http://www.youtube.com/watch?v=9YjXGLWMvCM>
- <http://www.youtube.com/watch?v=kiQ6MUQZHSs>
- <http://www.youtube.com/watch?v=gnyHsgTFXIY>
- <http://www.youtube.com/watch?v=DGZNaKnBQo0>

27. Scale Diagrams

Competency 13: Uses scale diagrams in practical situations by exploring various methods.

Competency level 13.1: Represents rectangular and square shapes observed in the environment by scale diagrams.

No. of periods: 06

Introduction:

A lot of the creations in our world are ideas emerged in the inventors' minds. Mostly they sketch it in a paper and develop it later as a picture of a design.

e.g. Plan of a house

Those diagrams are scale diagrams. Size of a scale diagram can be larger or smaller than the object or the figure. But the shape of it remains unchanged. Since it is not possible to draw a house floor in actual size, it is drawn in a paper to a scale. In such occasions, scale has to be prepared so that a certain actual length is represented by a smaller length of the scale diagram.

e.g. 1cm represents 10m

This is a description of a scale. It can be shown as a ratio as well.

1cm \longrightarrow 10m

1cm \longrightarrow 10 x 100cm (in the same unit)

As a ratio it is 1 : 1000.

According to this scale, a true length of 80m is represented by 8cm in the paper. According to the same scale 2.5cm of a scale diagram represents 25m (2.5 x 10m) in the actual floor.

Learning outcomes relevant to the competency level 13.1:

1. Proposes suitable scales to draw a plane figure obtained from the environment with measurements.
2. Describes various ways of representing a scale.
3. States that an actual length of x is represented by a length of 1cm in a scale diagram drawn to the scale 1: X.
4. **Makes a scale diagram of a rectangular shape in the environment using a suitable scale.**
5. Makes a scale diagram of a square shape in the environment using a suitable scale.
6. Calculates the actual lengths using the scale and the lengths in a scale diagram.

Glossary of Terms:

scale	-	පරිමාණය	-	அளவிடை
scale diagram	-	පරිමාණ රූපය	-	அளவிடைப்படம்

Instructions to plan the lesson:

Given below is a specimen lesson plan with a group activity designed to develop instudents the subject concepts relevant to the learning outcome 4 after affirming the learning out-comes 1, 2 and 3 under the competency level 13.1.

Quality inputs:

- The picutre in annex 1 with the faces of five cents coin different sizes along with the real size.
- A 50cm x 30cm or a suitable size.
- A half sheet with 1cm x 1cm squares.
- Copies of the activity sheet

Instructions for the teacher:**Approach:**

- Start a discussion showing the pictures of five cent coins. Surface following facts during the discussion. The face of the coin has been obtained in different sizes. The characters in the enlarged picture are clearer while those in the minimized one are less clear. The extent of enlargement or minization of the face of the coin can be obtained by measuring the side of the each picture. This gives rise to a scale.
- Showing the 50cm x 10 cm picture discuss about the difficulties of drawing it in the book and the suitable scales for drawing it. Show that when $1\text{cm} \equiv 10\text{cm}$ is chosen, 5cm is equivalent to 50cm while 3cm is equivalent to 30cm.
- Ask students what steps should be followed to draw the floor area of the class room in the exercise book. Direct students to the group activity to experience such occasions.

Development of the lesson:

- Divide the whole class into groups of four students.
- Distribute an activity sheet and a half sheet with 1cmx1cm square **each** to the groups.
- Assign the relevant part of the activity to students and let them proceed with it.
- Give opportunity to display the students' works and present their findings to the class.
- In the light of the students' findings and creations make a review to highlight the following.
 - ★ Various shapes seen in the environment cannot be drawn on a paper in

the same size.

- ★ To draw a scale diagram, a suitable scale should be selected based on the actual dimensions of the figure.
- ★ Dimensions of the actual figure should be converted to the dimensions of the scale diagram based on the selected scale.
- ★ The rectangle should be drawn according to the dimensions of scale diagrams to get correct angles at vertices.

Activity sheet for the students:



- Of following four situations, pay your attention to the given task assigned to your group.
- ★ 1st situation
Length of a school building = 30 m
width = 6 m
- ★ 2nd situation
Length of a sports pavilion = 70 m
width = 20 m
- ★ 3rd situation
Length of a Volleyball court = 18 m
width = 9 m
- ★ 4th situation
Length of a rectangular play ground = 600 m
width = 400 m
- Ask whether it is possible to draw the figures for the above in your exercise book.
- Suggest a scale to draw the scale diagram without changing its real shape.
- Fill the blanks with given information.
Scale - 1cm representsm

Measurement	In actual floor	In scale diagram
Length	.....m	.....cm
Width	.....m	.....cm

- According to the measurements in the 3rd column of above table, draw the scale diagram in the given sheet.
- Draw scale diagram of the given building or land in your exercise book according to the above scale indicating angles correctly.
- Indicating the scale correctly, display the scale diagram you have drawn in the square sheet in the classroom
- Be ready to present facts found when drawing the scale diagram to the whole class.

Assessment and Evaluation-

- Assessment criteria :
 - States a suitable scale to draw the scale diagram of a given rectangle
 - Shows that the selected scale should be suitable for a scale diagram.
 - Prepares measurements essential to draw the scale diagram according to the selected scale.
 - Draw the rectangular scale diagram according to the selected scale.
 - Creates works that shows communication skills.
- Direct students to do the exercises of lesson 27th in the textbook.

For your attention.....**Development of the lesson:**

- Plan and implement lessons adopting suitable methods to achieve learning outcomes 3 and 6 under the competency level 13.1.

Assessment and Evaluation:

- Direct the students to draw a scale diagram of the building in which the classroom is located obtaining the measurements of it and locations of the classrooms.
- Direct the students to do the exercises of the lesson 27th in the text book.

For further reference:

- <https://www.khanacademy.org/math/basic-geo/basic-geo-area-perimeter/basic-geo-scale-drawings/v/scale-drawings-example>



Annex 1

28. Tessellation

Competency 26: Investigates the methods of organizing various geometric shapes and uses them to enhance beauty.

Competency level 26.1: Engages in creation using tessellation.

Number of periods: 05

Introduction:

Tiles in different shapes are used nowadays for floors, walls and gardens in houses and religious places to make them more beautiful. In the same way different shapes are used for printing fabrics as well. Most them are geometric shapes, modified geometric shapes and non-geometric shapes.

The process of creating a two dimensional plane, using different or same shape repeatedly in an organized manner without overlapping or leaving gaps is called tessellation. Tessellation using only one geometric or other shape is called pure tessellation. It is important to identify plane figures that can be created by pure tessellation. Tessellation using two or more geometric or other shapes is called as semi-pure tessellation. It is important to direct students to identify shapes suitable for semi-pure tessellation and do creations using those shapes.

Beehive made out of hexagons, is a wondrous natural example of pure tessellation. Tessellation is a section of mathematics that can be learnt with interest by students.

Learning outcomes relevant to competency level 26.1:

1. Recognizes tessellation as the process of creating a two dimensional plane by methodically and repeatedly using shapes, ensuring that there are neither overlaps nor gaps between the shapes.
2. Identifies tessellations using just one plane figure as pure tessellations.
3. Engages in pure tessellation by using any triangle/any quadrilateral.
4. Identifies the plane figures that can be used in a pure tessellation and engages in tessellation.
5. Identifies tessellations using two or more plane figures as semi-pure tessellation
6. **Engages in semi-pure tessellation using triangles and quadrilaterals.**
7. **Identifies various plane figures that are suitable for semi-pure tessellation and engages in semi-pure tessellation .**
8. Cuts a given square shaped lamina into pieces and organizes the pieces to form a plane figure that is suitable for pure-tessellation
9. Engages in creations using tessellation.

Glossary of Terms:

Tessalation	- வெசலாகரணம்	- தெசலாக்கம்
Pure tessalation	- ஒரே வெசலாகரணம்	- தூய தெசலாக்கம்
Semi - pure tessalation	- அரை வெசலாகரணம்	- அரைத் தூய தெசலாக்கம்
Shapes	- வடிவங்கள்	- வடிவங்கள்

Instructions to plan the lesson:

Given below is a specimen lesson plan with a group activities designed to make students achieve the learning outcomes 6 and 7 after the achievement of learning outcomes from 1 to 5 relevant to the competency level 26.1.

Time: 40 minutes

Quality inputs:

- Copies of the activity sheet (one per group)
- A4 papers of different colours, gum, pairs of scissors, demy papers.
- An enlarged copy of annex 2 depicting a few semi-pure tessellation

Instruction for the teacher:**Approach:**

- Colour the sheet in annex 2 containing semi-pure tessellations as appropriate and show it to the students. Discuss with students that in semi-pure tessellation not only two geometric shapes but two various shapes such as those of animals can also be used.

Development of the lesson :

- Group students on the day before the lesson.
- Instruct every group to bring 60 polygons comprising 20 polygons each of the three polygon shapes depicted in annex 1.
- Give students the colour A4 sheets required for this.
- Explain that it is better if one shape is of one colour.
- Give an activity sheet and a demy paper to each group on the day of the lesson.
- Using the polygons brought by students let them make creations by semi-pure tessellation.
- Afterwards, display the students' works and give an opportunity for appreciation.



Activity sheet for the students:

- Examine well the polygonal shapes cut from coloured A4 sheets, 20 copies from each.
- Selecting only triangular and square shapes of them appropriately, make a tessellation on the demy paper.
- Using either the square or the triangle along with the hexagon which means using two polygon shapes with hexagon make another tessellation
- Display your tessellation to the class

Assessment and Evaluation:

- Assessment criteria:
 - Explains the characteristics of a semi-pure tessellation.
 - Engages in semi-pure tessellation using two geometric shapes.
 - Designs various patterns according to the occasion.
 - Accepts that tessellation can be used to beautify the environment.
 - Engages in the activity with composure.
- Direct students to do the exercises of the lesson 28th in the textbook

For your attention...

Development of the lesson:

- involve students in creating tessellations identifying other polygon or non-polygon plane figures that can be used for semi-pure tessellation.

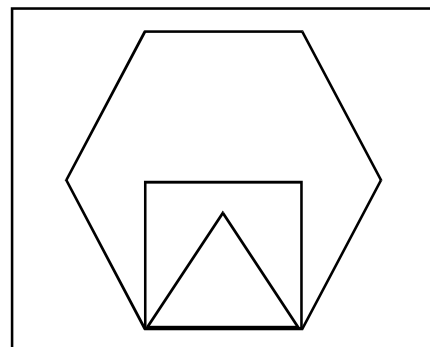
Assessment and Evaluation -

- Direct students to do exercises of the lesson 28th in the textbook.

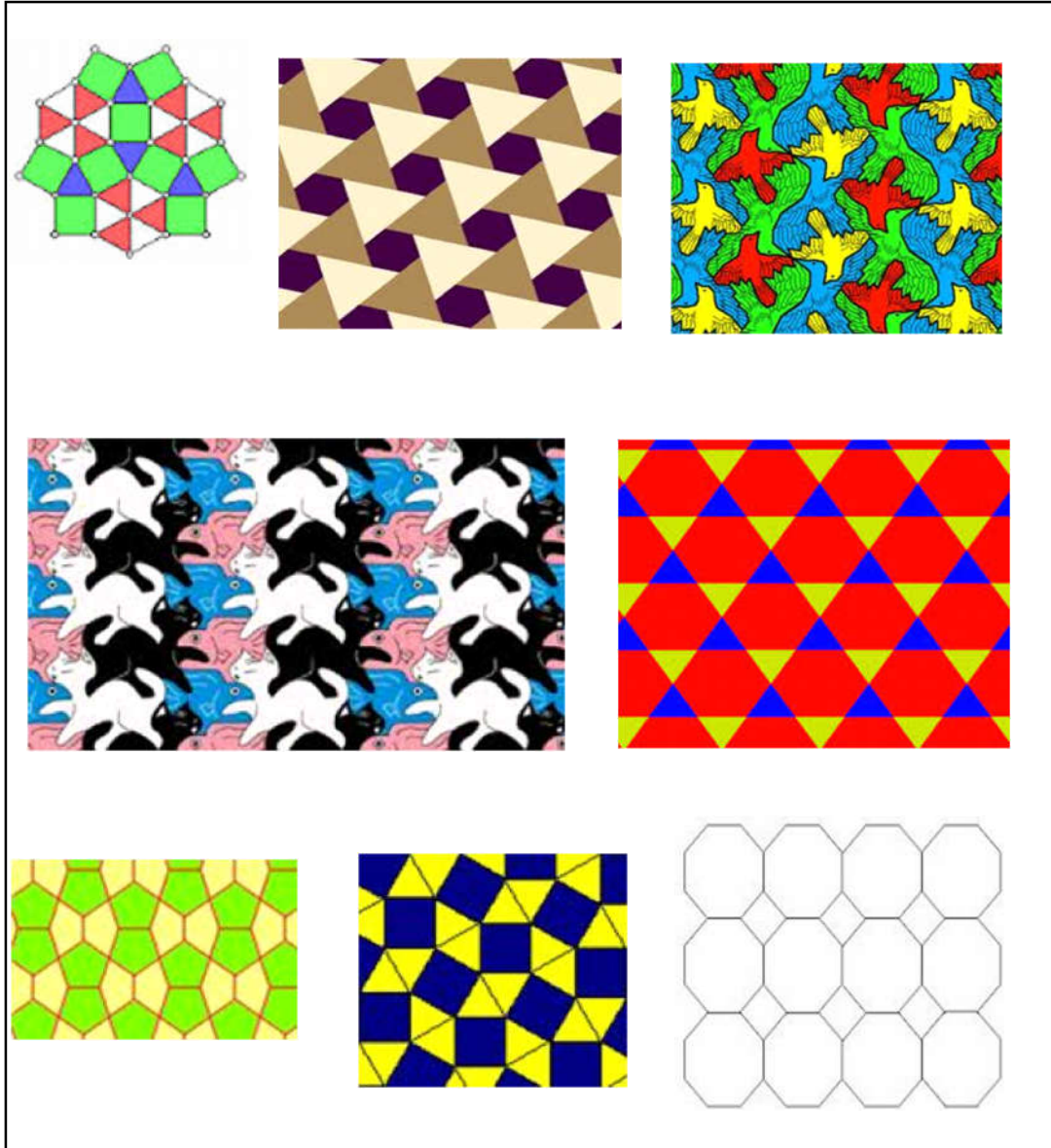
For further reference:

- <https://www.youtube.com/watch?v=5-3tOa9CPb0>
- <https://www.youtube.com/watch?v=tJYtBF6gt4c>
- <https://www.youtube.com/watch?v=n5FYehNOIYA>

Annex 1



Annex 2



29. Likelihood of an Event

Competency 31: Analyzes the likelihood of an event occurring to predict future events.

Competency level 31.1: Groups events based on the likelihood of occurrence.

Competency level 31.2: Decides on the nature of an experiment related to an event.

Number of periods: 06

Introduction:

Events can be grouped into three categories based on the likelihood.

Events that definitely occur

Events that definitely do not occur

Events that may occur at times

When analysing events that may occur at times, the factor affecting the occurrence of the event is whether there was an opportunity to occur that event. Analysing frequency of occurrence and time period, will help to make decisions on the possibility of occurring such events in the future. To make such decisions it is important to know that the possibility of occurring all the incidents of that event is equal (unbiased).

Learning outcomes relevant to the competency level 31.2:

1. Describes the outcomes of an experiment.
2. Provides examples of experiments with equally likely outcomes.
3. Provides examples of experiments of which the outcomes are not equally likely.
4. **States that the objects used in experiments with equally likely outcomes are unbiased.**
5. **States that the objects used in experiments of which the outcomes are not equally likely are biased.**
6. Distinguishes given experiments as those with biased objects and those with unbiased objects.

Glossary of Terms:

Probability	- සම්භාවිතාව	- நிகழ்தகவு
Events that certain to happen	- ස්ථිර ව සිදු වන සිද්ධි	- நிச்சயமாக நடைபெறும் நிகழ்வு
Events that cannot happen	- ස්ථිර ව සිදු නොවන සිද්ධි	- நிச்சயமாக நடைபெறாத நிகழ்வு
Random event	- අහඹු සිදුවීම්	- எழுமாற்று நிகழ்வு
Event	- සිද්ධි	- நிகழ் ச்சி
Experiment	- පරීක්ෂණ	- பரிசோதனை
Biased	- නැඹුරු	- சமநேர்தகவற்ற
Unbiased	- නොනැඹුරු	- சமநேர்தகவுடைய
Occurrence	- සිදුවීම	- நிகழ்வு /நேர்கை
Equally likely	- සමාන හැකියාවෙන් යුත්	- சமவாய்ப்பு / சமநேர்தகவு

Instructions to plan the lesson:

Given below is a specimen lesson plan based on a group activity designed to develop in students the subject concepts relevant to the learning outcomes 4 and 5 after the achievement of the learning outcomes 1, 2 and 3 relevant to the competency level 31.2 and learning outcomes relevant to competency level 31.1 by the students.

Time : 40 minutes

Quality inputs:

- Copies of the Activity sheet
- Demy papers
- Marker pens
- A coin
- A Dice (marked 1-6)
- A solid triangular prism (made out of wood or plastic)
- A new eraser (with numbers on faces)

Instructions for the teacher:**Approach:**

- Lead a discussion recalling the toss used in cricket matches for electing the option. Through it, discuss the nature of the likelihood of an event and its importance.

Development of the lesson:

- Group the class as appropriate and to each group give a copy of the activity sheet, and one solid object of the coin, dice, triangular prism, and the eraser.
- Engage students in the activity.
- After the activity, let the students to present collected data to the class.
- After the presentation of data, lead discussion with students to make decisions about the biased and unbiased nature of each experiment.
- During the discussion, highlight the fact that during an experiment attention should be paid to the factors such as the symmetry, weight, area of surfaces of the object which affect the biased/unbiased nature of an experiment.

Activity sheet for the students:

- Identify well the solid object and its surfaces provided to your group.
- Discuss about the symmetry of that solid object within your group.
- Get each member of the group to flip the object 50 times and mark the results in the table below.

Solid object used for the test	Results					
Coin						
Dice						
Triangle prism						
New Eraser (with numbered surfaces)						

- Present the result sheet to the class.
- Present the decision on bias and un-bias of the test according to the nature of the object used for the test.

Assessment and Evaluation:

- Assessment criteria:
 - Groups tests according to bias/ un-bias.
 - Name the factors affecting the bias/un-bias of a test.
 - Explains results considering the bias of a test.
 - Inclines to predict events according to bias/un-bias.
 - Inquires logically into experiencing in life.
- Direct students to do the relevant exercises of the lesson 29th in the textbook.

For your attention...**Development of the lesson:**

- Plan and implement a suitable strategy to achieve learning outcome 6 of the competency level 31.2.

Assessment and Evaluation:

- Direct students to do the relevant exercises of lesson the lesson 29th in the textbook.

For further reference:

- <https://www.youtube.com/watch?v=BLGIB4MZEPY>