هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

# Learning Outcomes Document for National Assessment in the Areas of: Reading - Mathematics – Sciences

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## Introduction

The Specialized learning outcomes document is a practical application of the reference framework for national assessment, which the Education and Training Evaluation Commission developed in coordination with the Ministry of Education. Its second issuance was approved by the Commission's Board of Directors in its fourth meeting on 10/11/2020, based on the Council of Ministers Resolution No. (108), 14/2/1440 AH, which includes paragraphs (2 and 6) of Article 4. " Evaluating the performance of schools, higher education institutions and training institutions, and periodically accrediting them according to the standards approved by the Council, also constructing and implementing scales, educational measures and standardized tests, such as university admission assessments, national assessment in general education stages related to the evaluation of general education, training, professional, linguistic, and cognitive assessments etc.

This document directs the preparation of large-scale assessments, measures, and the accompanying tools, along with their application guides. It also covers the production of reports and studies at each stage of the preparation and application process. The goal is to ensure alignment with the purposes and requirements of school performance evaluation and provide reliable cumulative data for decision-makers. The data relates to the level of learners and schools achieving the targeted learning outcomes in the national evaluation of specialized learning outcomes. It provides comparable performance indicators at the national level and monitors progress over successive periods for learning outcomes in the targeted areas for 2023 in reading, mathematics, and natural sciences, along with comparing their results with relevant international studies, which is a vital source to support the development of teaching and learning practices in schools and improving learners' learning.

This document was prepared by utilizing the results of the national tests, measures, and accompanying tools that the Commission implemented for the years 2022-2025 and analyzing international practices that focused on the quality of education outputs and learning outcomes to prepare the learners for life and future jobs. This was based on national evaluation results according to scientific methodologies that determine by learners' knowledge and skills, as well as their ability to achieve them in the targeted areas (reading, mathematics, natural sciences), and to employ them to solve the problems and face challenges in a rapidly changing era shifting towards a knowledge economy and competing in it.

## Target group:

National assessments are applied to a representative grade sample in the targeted schools, representing the end of each academic stage learning levels, in line with their distinctive characteristics, learners' needs and abilities. Moreover, it covers all public, private, and international schools in Saudi Arabia as follows:

01 A representative sample of third-grade learners in the targeted schools: The national evaluation covers the measurement of knowledge and cognitive skills learning outcomes that learners have learned in reading and mathematics areas for grades (1-3).

02 All sixth-grade learners in the targeted schools: The national evaluation covers the measurement of knowledge and cognitive skills learning outcomes that learners have learned in the reading, mathematics, and science areas for grades (6-4).

03 All ninth-grade intermediate learners in the targeted schools: The national evaluation covers the measurement of knowledge and cognitive skills learning outcomes that learners have learned in the reading, mathematics, and science areas for grades (7-9).

## Goals:

This document was prepared for national tests purposes in the areas of reading, mathematics, and natural sciences, to achieve the following objectives:

01 Monitor the level of achievement in the performance of learners and schools in the reading, mathematics, and natural science areas at different stages of education in the Kingdom of Saudi Arabia periodically.

02 Expose learners' achievement of basic learning outcomes in the reading, mathematics, and natural sciences areas in line with the national standards to support the principle of learning for all according to a scientific methodology.

03 Employ the national assessment results in the areas of reading, mathematics, and natural sciences in evaluating general education schools., as a standardized indicator for evaluating the schools' performance.

## Scope:

This document covers the learning outcomes in the reading, mathematics, and natural sciences areas. It is used to guide the measurement processes of achievement levels of the outcomes among learners in the target grades. It applies large-scale assessment, and the accompanying measures, and assessment tools, then analyzes their results and related studies. It primarily focuses on designing large-scale national assessments for measuring learning outcomes that represent a description of what the learner should know, understand, and be able to do at the end of each class of the target learning levels.


READING AREA

# Reading area

## Designing the national tests content

This section of the document describes the content design of the national reading assessments and clarifies the targeted cognitive levels as follows:

### 1 ◆ Reading Content at the End of Grade (3)

The national reading assessments at the end of Grade 3 focus on measuring the learner's reading proficiency in:

**01** Identifying the meanings of vocabulary words in a text, including synonyms and antonyms, classifying them according to their meaning and type (number and gender), and using them in meaningful sentences and new contexts.

**02** Identifying the explicit ideas of the text, inferring its facts, interpreting and analyzing them, and recognizing the text type.

**03** Distinguishing between phrases in the text, expressing opinions about different viewpoints, inferring values, and suggesting alternatives.

# Reading area

## Targeted Levels in the Reading Domain

## Table (1): Third Grade Reading Learning Outcomes and Indicators

| Reading – Grade Three (3) | |
|---|---|
| Learning Outcomes | Indicators |
| 1. Domain: Reading | |
| 1.1 Sub-Domain: Vocabulary Acquisition and Use of Verbal Semantics | |
| By the end of third grade (3), the learners will demonstrate proficiency in: | |
| 3.2.1.1.1 Identifying vocabulary meanings in the text, their synonyms, and antonyms, classifying them according to meanings and types in terms of number and grammatical categories, and using them in meaningful sentences and new contexts. | 1. Identifying the synonyms and antonyms of vocabulary mentioned in the text and clarifying their meanings. |
| | 2. Classifying vocabulary according to meanings, grammatical categories (masculine-feminine), (noun-verb-letter), and number (singular-two-plural). |
| | 3. Using vocabulary in meaningful sentences and new linguistic contexts. |
| 2. Reading | |
| 2.1 Sub-Domain: Reading Comprehension | |
| 3.2.1.1.2 Identifying explicit ideas in the text, derive facts, interpreting and analyzing them, and determining text type. | 1. Determining the goal of the text and identifying the main idea in a paragraph. |
| | 2. Extracting information directly from the read text and determining its type. |
| | 3. Identifying the components and elements of the text, and arranging events, ideas, or information according to their occurrence. |
| | 4. Determining causes, results, and relationships, and describing motives and actions of the characters in a text. |
| | 5. Inferring similarities and differences in the text and linking causes to results. |
| 3.2.1.1.3 Distinguishing between multiple expressions, expressing opinion about points of view, and proposing alternatives. | 1. Distinguishing between given phrases in the read text, identifying phrases and aesthetic expressions and expressing his/her opinion about them. |
| | 2. Expressing his/her opinion and points of view on the subject of the read text with appropriate justifications. |
| | 3. Assessing the probability of the events described by the writer and the possibility of their occurrence. |
| | 4. Inferring the values and attitudes contained in the read text and evaluating them. |
| | 5. Suggesting a title, an ending different from the end of the read text, and solutions to problems or issues appeared within. |

# Reading area

## 2 ◆ Reading Domain Content at the End of Grade (6)

The national assessments at the end of Grade Six focus on measuring the learner's level of proficiency in the reading domain through the following:

01 Inferring the meanings and synonyms of vocabulary presented in the reading text, distinguishing between words with similar meanings with appropriate examples, and using vocabulary along with its synonyms and antonyms in meaningful sentences.

02 Identifying the main and supporting ideas of the reading text, inferring its facts, interpreting and analyzing them, and determining the text type and its purpose.

03 Expressing opinions regarding the author's viewpoint, values, and attitudes, proposing alternatives and solutions, and employing persuasion and justification strategies.

# Reading area

Table (2) below illustrates the targeted learning outcomes for the reading domain at the end of Grade (6). At the end of Grade (6) in the reading domain, the student will be able to:

Table (2): Learning Outcomes Targeted by the end of Grade (6) and its detailed indicators and classification in the Reading Domain (2)

| Reading Domain (2) – Grade Six (6) | |
|---|---|
| Learning Outcomes | Indicators |
| 1.Domain: Reading | |
| 1.1 Sub-Domain: Vocabulary Acquisition and Use of Verbal Semantics | |
| By the end of grade (6), the learners will demonstrate proficiency in: | |
| 6.2.1.1.1 Inferring synonyms and meanings of vocabulary mentioned in the read text, distinguishing vocabulary that is similar in meaning, giving examples, and using vocabulary, synonyms and antonyms in meaningful sentences. | 1. Inferring synonyms of vocabulary mentioned in the text and explaining the meanings of vocabulary which connotations have changed with context. |
| | 2. Distinguishing vocabulary similar in meaning and giving examples in meaningful sentences and different reading contexts. |
| | 3. Classifying synonyms and antonyms that are similar in meaning according to their purpose in the text. |
| | 4. Using vocabulary, their synonyms and antonyms in meaningful sentences and different reading contexts. |
| 2. Domain: Reading | |
| 2.1 Sub-Domain: Reading Comprehension | |
| 6.2.1.1.2 Distinguishing the main and sub-ideas of the read text, inferring its facts, interpreting, and analyzing it, and determining its type, purpose, and function. | 1. Answering questions about direct information and facts within a text and Distinguishes the text type (poetry/prose- nonfiction/fiction), its purpose, topic, and function. |
| | 2. Extracting direct information and facts mentioned in the text, distinguishes the type of text (poetry/prose - realistic/fictional/ (story - biography - dialogue - news advertisement - commercial advertisement - report - press release - literary topic - scientific topic - descriptive topic), and determining its purpose (guidance - infor-mational - advertising - descriptive - scientific - persuasive) and its subject. |
| | 3. Comparing two or more concepts in the read text, and inferring the similarities and differences between them. |
| | 4. Describing characters and events in the text, distinguishing relationships be-tween characters, and arranging and rearranging events. |
| | 5. Explaining the relationship (explanatory - causal - result...) between the para-graphs, sentences and phrases of the read text, and inferring from the text the Interpretation of phenomena and events and linking them to reality. |
| 6.2.1.1.3 Expressing an opinion about the au-thor›s point of view, values and attitudes, pro-posing alternatives and solutions, and using means of persuasion and reasoning. | 1. Identifying phrases and aesthetic expressions of the read text, expressing opinion about them, and describing the writer's emotion. |
| | 2. Expressing opinion on the completeness or clarity of the information mentioned in the text. |
| | 3. Inferring the values and attitudes mentioned in the read text, evaluating them, expressing opinion about them with justification, and identifying the writer's point of view. |
| | 4. Suggesting a title, beginning, or conclusion that differs from the text, rephrasing the text or a paragraph of it in his own language and style, and organizing the text's information into graphic organizers. |
| | 5. Using methods of persuasion and reasoning to support another idea or opinion, and employing the meaning and ideas of the text in proposing solutions to school, life, or community problems. |

# Reading area

## 3 ◆ Reading Content at the End of Grade 9:

National tests at the end of Grade 9 focus on measuring the learner's reading proficiency in:

**01** Inferring and classifying the meanings of terms, and clarifying vocabulary meanings through explanation, definition, synonymy, antonymy, context, classification, representation, and reasoning about vocabulary definitions from the text.

**02** Analyzing the text by extracting main and sub-ideas, inferring implicit ideas, and interpreting relationships and connections.

**03** Evaluating and critiquing the text, distinguishing between different texts, clarifying the author's point of view, applying the text's information to different life situations, and summarizing it.

# Reading area

Table (3) below illustrates the targeted learning outcomes at the end of Grade 9 in the area of reading:

Table (3): Learning Outcomes Targeted by the end of Grade (9) and its detailed indicators and classification in the Reading Domain (2)

| Reading – Grade Nine (9) | |
|---|---|
| Learning Outcomes | Indicators |
| 1.Domain: Reading | |
| 1.1 Sub-Domain: Vocabulary Acquisition and Use of Verbal Semantics | |
| By the end of grade (9), the student will demonstrate proficiency in: | |
| 9.2.1.1.1 Inferring and classifying the semantics of vocabulary, through synonymy, antonymy, context, interpretation, definition, classification, representation, and using them in new contexts. | 1. Inferring the meanings of vocabulary through employing previous experiences (synonymy, antonymy, context, interpretation, definition, classification, and representation). |
| | 2. Inferring the definitions of new terms mentioned in the read text. |
| | 3. Classifying vocabulary and the relationship between them according to their meanings. |
| | 4. Distinguishing between the different vocabulary words mentioned in the read text. |
| | 5. Employing new vocabulary and vocabulary with diverse meanings in different reading contexts and situations to solve problems. |
| 2.1 Reading Comprehension | |
| 9.2.1.1.2 Eliciting the main and sub-ideas of a long and complex text, deducing implicit ideas, distinguishing, interpreting, and analyzing them. | 1. Extracting the main and sub-ideas from the text or a paragraph, and analyzing the read texts in terms of (chronological and spatial order, importance, comparison, contrast, general issue, and supporting evidence). |
| | 2. Extracting indirect information from the text, identifying its subject, inferring implicit ideas, and posing questions (explanatory, explanatory, inferential, analytical, or critical). |
| | 3. Identifying points of similarity and difference in the read text, and comparing two or more texts that deal with one issue or different issues, in terms of (the type of examples, the strength of the evidence, the language, and the style). |
| | 4. Distinguishing between facts, opinions, and direct and indirect expressions mentioned in one text or more. |
| | 5. Interpreting the relationships and connections between the parts of one or more texts, inferring from the text some phenomena or events, linking and comparing them to real-life situations. |
| 9.2.1.1.3 Evaluating, and criticizing the read text, expressing an opinion on the writer's point of view, values and attitudes, proposing alternatives, using means of persuasion and reasoning, summarizing it, and applying data of the text in different life situations. | 1. Distinguishing between phrases, sentences, ideas and paragraphs of the read text, and identifying the use of specific structure for certain expressions and enriching the text with expressions of his/her own creation. |
| | 2. Showing his/her point of view on the events, information or ideas contained in the text, and judging the credibility of the information contained in the texts from his/ her experiences. |
| | 3. Expressing his/her opinion on the values and attitudes mentioned in the read text, explaining their impact on individual and society, linking them to his/her reality, and proposing alternatives and solutions. |
| | 4. Deducing arguments and proofs from the text, evaluating opinions and viewpoints, and supporting reasoning with arguments and proofs from outside the text. |
| | 5. Summarizing the text in short phrases, rephrasing it, and organizing its information and ideas in own style or using various graphic organizers. |
| | 6. Providing examples of a problem from own experience that was mentioned in the read text, and using own data to solve individual, family, or community problems in scientific or creative ways. |

## Cognitive Levels:

**National tests emphasize measuring cognitive levels in reading. These levels represent a set of organized and interconnected mental processes that are assessed in this test. They reflect the level of knowledge and skills that learners have acquired and can perform in the targeted grade levels, based on three cognitive levels. Each level includes a set of mental processes that learners are required to master:**

01 Knowledge and Comprehension: This refers to the ability to understand knowledge, concepts, ideas, and meanings in the field of reading. This level includes a set of mental processes such as comprehension, identification, differentiation, classification, and inference.

02 Application: This refers to the ability to use knowledge, concepts, ideas, and meanings in the field of reading and apply them in new situations and different contexts. This level includes a set of mental processes such as organization and application.

03 Reasoning: This refers to the ability to think deeply about knowledge, concepts, ideas, and meanings in the field of reading, going beyond the levels of mere knowledge and application. This level encompasses a range of mental processes, such as analysis, synthesis, appreciation, and evaluation at various levels.

These mental processes are linked to learners' ability to acquire reading skills, which vary in their delivery according to the targeted levels and grades: (1) Vocabulary acquisition, which includes (comprehending vocabulary, identifying vocabulary meanings, distinguishing between vocabularies, classifying vocabularies, and using vocabularies in different linguistic situations), and (2) Reading comprehension, analysis, and evaluation, which includes (reading comprehension, reading analysis, drawing inferences from reading, appreciating reading, evaluating reading, and using reading to solve problems).

# MATHEMATICS AREA

# Mathematics area

## Second: Design of National Assessment Content

This section of the document presents a description of the design of the national assessment content for the mathematics domain and clarifies the targeted cognitive levels, as follows:

### 1 ◆ Mathematics content at the end of third grade

At the end of third grade, National tests focus on measuring the learner's level of proficiency in mathematics, including:

**01** Describing numbers up to four place values, performing addition and subtraction, estimating results, constructing multiplication and division facts, distinguishing fractions, identifying equivalent fractions, and representing them.

**02** Identifying and constructing numerical and non-numerical patterns, and understanding the properties of arithmetic operations and the relationships among them.

**03** Describing two-dimensional and three-dimensional geometric shapes, Distinguishing their properties, and classifying them.

**04** Describing, finding, and estimating the perimeter and area of two-dimensional shapes; and distinguishing lengths, masses, capacities, currency denominations, and units of time.

**05** Collecting data from the environment, organizing and representing it, reading and interpreting these representations.

# Mathematics area

## Table (4): Third Grade Mathematics Learning Outcomes and Indicators

| Mathematics (4) – grade (3) | |
|---|---|
| Learning Outcomes | Indicators |
| By the end of third grade (3), the student will demonstrate proficiency in: | |
| 1- Numbers and operations | |
| 1-1 Numbers and sets | |
| 3-4-1-1-1 Understanding the place value of numbers up to four digits and using it to represent numbers, read, write, compare, order, and round them. | 1. Identifying the place value of a digit in whole number up to four digits, representing numbers using models, diagrams, number line, and rounding them to the nearest ten, hundred, or thousand. |
| | 2. Reading and writing numbers up to four digits in standard, verbal, and expanded forms. |
| | 3. Counting numbers in ascending, descending, and jumping of (two, five, ten, hundred, and thousands), and determining even and odd numbers. |
| | 4. Comparing numbers up to four digits using symbols (>, <, =) and ordering them in ascending and descending order. |
| 3-4-1-1-2 Understanding fractions, representing, reading, writing, comparing, and ordering them. | 1. Distinguishing fractions (with numerators or denominators not exceeding 12) as parts of a whole or as parts of a set, and represent them using models and diagrams. |
| | 2. Reading and writing fractions (with numerators or denominators not exceeding 12). |
| | 3. Comparing fractions (with numerators or denominators not exceeding 12) using models, graphs, number, and symbols (>, <, =) and ordering them in ascending and descending order. |
| | 4. Distinguishing and finding equivalent fractions for a given fraction (with numerators or denominators not exceeding 12). |
| 1-2 Number sense and operations | |
| 3-4-1-2-1 Finding and estimating the results of addition and subtraction of whole numbers up to three digits, and solving mathematical problems including real-life applications. | 1. Adding and Subtracting whole numbers up to three digits (with and without regrouping) by using place value strategies. |
| | 2. Estimating the results of addition and subtraction of whole numbers up to three digits by rounding to an appropriate place value or using compatible numbers, and using estimation to check the reasonableness of the result. |
| | 3. solving mathematical problems including real- life applications with one or two steps using addition and subtraction of whole numbers up to three digits, and explaining their solution. |
| 3-4-1-2-2 Understanding the operations of multiplication and division, representing them using models, forming fact family, finding their results, and solving mathematical problems including real-life applications. | 1. Distinguishing multiplication as repeated addition and constructing multiplication facts up to (10x10) by using models and drawings. |
| | 2. Distinguishing division as equal sharing and constructing division facts related to multiplication facts up to (10 × 10) by using models and drawings. |
| | 3. Finding multiplication facts up to (10 × 10) and the corresponding division facts. |
| | 4. solving mathematical problems including real- life applications with one or two steps using the four operations and explaining their solution. |

# Mathematics area

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|---|---|
| 2- Algebra and analysis | |
| 2-1 Patterns, Relationships and Functions | |
| 3-4-2-1-1 Describing non-numerical patterns, numerical patterns, and growing geometric patterns, completing and expanding them. | 1. Describing non-numeric patterns in words using up to three attributes (color, size, shape, or direction), completing missing elements, and extending them. |
| | 2. Describing numeric patterns in words that follow a single arithmetic rule (addition, subtraction, or multiplication), completing missing elements, and extending them. |
| | 3. Describing growing geometric patterns in words (increasing or decreasing by a constant amount), completing missing elements, and extending them. |
| 2-2 Algebraic structures and mathematical expressions | |
| 3-4-2-2-1 Distinguishing the characteristics of four operations, and using them to find the results and verify their correctness. | 1. Distinguishing the properties of addition and subtraction with zero, multiplication and division with one, and multiplication with zero, and applying them to find results |
| | 2. Distinguishing the commutative property of addition and multiplication and using it to find the results and verify their correctness. |
| | 3. Distinguishing the associative property of addition and multiplication and using it to find the result of adding three numbers within 2-digit, and the result of multiplying several numbers of 1-digit mentally. |
| | 4. Distinguishing the distributive property of multiplication over addition to find the result of multiplying two numbers of 1-digit mentally. |
| 3-4-2-2-2 Distinguishing the relations between the four operations, and using them to find the results and verify their correctness. | 1. Distinguishing the relationship between addition and subtraction for numbers up to three digits, and using it to find results and verify their correctness. |
| | 2. Distinguishing the relationship between multiplication and addition, and using it to find the result and verify its correctness. |
| | 3. Distinguishing the relationship between division and subtraction, and using it to find the quotient and verify its correctness. |
| | 4. Distinguishing the relationship between multiplication and division, and using it to find results and verify their correctness. |
| | 5. Formulating and solving numerical sentences using the four operations. |
| 3- Geometry and measurement | |
| 3-1 Geometric shapes | |
| 3-4-3-1-1 Understanding the properties of two-dimensional and three-dimensional geometric shapes, and using them to classify and compare them. | 1. Describing and classifying two-dimensional geometric shapes (triangle, square, rectangle, circle, parallelogram, trapezoid, pentagon, hexagon), and comparing them based on the number of sides, the number of vertices, and the congruence of sides. |
| | 2. Distinguishing shapes with symmetry, identifying axes of symmetry in shapes, drawings, and pictures, and drawing or completing shapes that are symmetric about a given axis. |
| | 3. Describing and classifying three-dimensional geometric shapes (cube, sphere, cone, cylinder, pyramid, and rectangular prism), and comparing them based on the number of faces and shapes, the number of vertices, and the number of edges. |

# Mathematics area

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|---|---|
| 3-2 Measurement and its units | |
| 3-4-3-2-1 Understanding the perimeter and area of a shape, estimating, and finding them. | 1. Distinguishing the perimeter of a polygon, estimating, and finding it by using a grid of squares and appropriate metric units of length. |
| | 2. Distinguishing the area of a polygon, estimating and finding it by using models and a grid of squares. |
| | 3. Finding the area of a square and a rectangle by using a grid of squares. |
| 3-4-3-2-2 Understanding length, mass, and capacity, estimating, measuring, comparing, and ordering them. | 1. Estimating and measuring lengths by using appropriate metric units (millimeter, centimeter, meter, and kilometer), and comparing and ordering them. |
| | 2. Estimating and measuring masses by using appropriate metric units (gram and kilogram), and comparing and ordering them. |
| | 3. Estimating and measuring capacities by using appropriate metric units (milliliter and liter), and comparing and ordering them. |
| 3-4-3-2-3 Distinguishing currency denominations, using them for counting, representing amounts, and comparing them, and solving mathematical problems including financial applications. | 1. Distinguishing the types of coins and banknotes and using them to count amounts up to 9999 riyals. |
| | 2. Representing amounts up to 9999 riyals by using money categories in a variety of ways, and comparing them. |
| | 3. Solving mathematical problems that including financial applications on money up to 9999 riyals, and explaining their solution. |
| 3-4-3-2-4 Estimating and measuring time using appropriate units of time, reading and writing time, and solving mathematical problems including time applications. | 1. Selecting the suitable units of time (seconds, minutes, hours) to estimate the duration of an event. |
| | 2. Reading and writing the time accurately (full hours, half an hour, quarter of an hour, to the nearest five minutes, or to the nearest minute) by using both traditional and digital clocks, and specifying if it's in the morning or evening. |
| | 3. Solving mathematical problems including time applications to estimate the duration between two events, calculating it in hours and minutes, and explaining their solution. |
| 4- Statistics and probabilities | |
| 4-1 Statistics and graphic representations | |
| 3-4-4-1-1 Collecting and organizing data from the environment, representing and reading them using bar graphs and symbols, and interpreting them. | 1. Collecting data from the environment and organizing it into multiple categories by using frequency tables. |
| | 2. Representing data with vertical and horizontal bar graphs, symbols. |
| | 3. Reading and interpreting data represented by bar graphs, symbols. |

# Mathematics area

## 2 ◆ Mathematics Domain Content at the End of Grade Six

The national assessments at the end of Grade Six focus on measuring the learner's level of proficiency in the mathematics domain through the following:

01 Describing multi-digit numbers, performing the four operations on them, and finding factors, multiples, and powers.

02 Distinguishing Proper fractions, decimal fractions, and mixed numbers; performing the four operations on them; and finding ratios, rates, and proportions.

03 Distinguishing relationships and numerical and algebraic expressions, finding their values, and solving linear equations.

04 Distinguishing basic geometric concepts and the properties of polygons, triangles, quadrilaterals, circles, and prisms, and drawing them.

05 Finding perimeter, area, volume, and surface area of two-dimensional and three-dimensional shapes, and converting between metric units of measurement.

06 Collecting real-word quantitative and qualitative data, organizing and representing them, reading and interpreting representations, analyzing data using measures of central tendency, counting outcomes of a random experiment, and finding the probability of an event.

# Mathematics area

Table 5 below illustrates the targeted learning outcomes for the mathematics domain at the end of Grade Six.

At the end of Grade Six in the mathematics domain, the student will be able to:

| Mathematics (4) - grade (6) | |
|---|---|
| Learning Outcomes | Indicators |
| By the end of grade six, the student will demonstrate proficiency in: | |
| 1- Numbers and operations | |
| 1-1 Numbers and sets | |
| 6-4-1-1-1 Understanding and representing the place value of numbers up to 12 digits, reading, writing, comparing, Ordering, rounding them. | 1. Identifying place value of numbers up to 12-digit numbers, representing through a number line, and rounding to specified places. |
| | 2. Reading and writing numbers up to 12 digits in standard, verbal, and analytical forms. |
| | 3. Comparing and Ordering numbers up to 12 digits by using symbols (>, <, =) in ascending and descending order. |
| 6-4-1-1-2 Distinguishing Proper fractions, mixed numbers, and improper fractions, representing, reading, writing, comparing, ordering, and rounding them. | 1. Distinguishing Proper fractions, representing them by using models, diagrams, and number lines, and reading and writing them. |
| | 2. Finding equivalent fractions, converting them to their simplest form, and rounding them to the nearest whole, half, or one. |
| | 3. Distinguishing mixed numbers, representing them by using models, diagrams, and number lines, and reading and writing them. |
| | 4. Distinguishing an improper fraction and converting it to mixed numbers and vice versa. |
| | 5. Comparing and ordering Proper fractions and mixed numbers in ascending and descending order. |
| 6-4-1-1-3 Understanding and representing decimal fractions, recognizing the place value of a digit in it, reading, writing, comparing, ordering, and rounding them, and converting between decimal fractions, Proper fractions and mixed numbers. | 1. Distinguishing decimal fractions, representing them by using models, diagrams, and number lines, identifying the place value of digits, and rounding them to the nearest whole number or to a given place value. |
| | 2. Reading decimal fractions and writing them in standard, verbal, and expanded forms. |
| | 3. Comparing decimal fractions, ordering them in ascending and descending order, and converting between decimal fractions, Proper fractions, and mixed numbers. |
| 1-2 Number sense and operations | |
| 6-4-1-2-1 Adding and subtracting whole numbers up to seven digits, multiplying numbers up to three digits, dividing numbers of up to four digits by numbers of up to two digits, and solving mathematical problems including real-life applications. | 1. Adding and subtracting numbers up to seven digits, with and without regrouping. |
| | 2. Multiplying numbers up to three digits by numbers up to two digits, with and without regrouping, using place value–based strategies. |
| | 3. Dividing numbers of up to four digits by numbers of up to two digits, with and without remainder, using place value–based strategies. |
| | 4. Solving mathematical problems up to three steps, including real-life applications on all four operations, and explaining their solutions. |

# Mathematics area

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|---|---|
| 6-4-1-2-2 Distinguishing the factors and multiples of a number, representing and finding them, and solving mathematical problems including real-life applications. | 1. Determining the factors of a number and representing them using models and diagrams. |
| | 2. Determining the multiples of a number and representing them using models and diagrams. |
| | 3. Distinguishing prime and non-prime numbers, and representing them using models and diagrams. |
| | 4. Factoring a number into its prime factors, and using prime factorization to find the greatest common divisor and the least common multiple of two numbers or more. |
| | 5. Solving mathematical problems including real-life applications of the greatest common divisor and the least common multiple, and explaining their solutions. |
| 6-4-1-2-3 Understanding powers of whole numbers, representing and finding them, finding values of numerical expressions included it, and solving mathematical problems including real-life applications. | 1. Distinguishing a power of a whole number (with a whole-number exponent) as repeated multiplication and finding its value. |
| | 2. Distinguishing and writing numerical expressions, and finding their values including powers and parentheses using the order of operations. |
| | 3. Solving mathematical problems including real-life applications of numerical expressions with powers of whole numbers, and explaining their solution. |
| 6-4-1-2-4 Understanding and finding ratios, rates, percentages, and proportions, distinguishing between them, and solving mathematical problems including real-life applications. | 1. Distinguishing and finding ratios and rates, and expressing them as Proper fractions in simplest form. |
| | 2. Distinguishing and finding percentages, representing them using models and diagrams, and expressing them as decimal or Proper fractions in simplest form. |
| | 3. Distinguishing and solving proportions, and identifying proportional quantities. |
| | 4. Solving mathematical problems including real-life applications that involve ratio, rate, percentage, and proportion and explaining their solutions. |
| 6-4-1-2-5 Performing the four operations on Proper fractions and mixed numbers and solving mathematical problems including real-life applications | 1. Adding and subtracting like and unlike Proper fractions, and writing the result in simplest form. |
| | 2. Adding and subtracting mixed numbers, and writing the result in simplest form. |
| | 3. Multiplying and dividing Proper fractions, and writing the result in simplest form. |
| | 4. Multiplying and dividing mixed numbers, and writing the result in simplest form. |
| | 5. Solving mathematical problems up to three steps that including real-life applications on the four operations on fractions and mixed numbers, and explaining their solutions. |
| 6-4-1-2-6 Performing the four arithmetic operations on decimal fractions, numbers and solving mathematical problems including real-life applications. | 1. Adding and subtracting decimal fractions up to a thousand place. |
| | 2. Multiplying and dividing decimal fractions up to the hundredths place. |
| | 3. Solving mathematical problems up to three steps that involve real-life applications of the four operations on decimal fractions and explaining their solutions. |
| 6-4-1-2-7 Estimating the results of the four arithmetic operations on whole numbers, Proper fractions, and decimal fractions, and using mental calculation strategies to find results, and verifying the plausibility and accuracy of the results. | 1 Estimating the results of the four arithmetic operations on whole numbers, Proper fractions, mixed numbers, and decimal Proper by using rounding. |
| | 2. Using mental calculation to find the results of multiplying and dividing a two-digit number by multiples of (10, 100, 1000). |
| | 3. Applying the distributive property to multiply a two-digit number by a one-digit number mentally. |
| | 4. Using mental calculation to find the results of multiplying and dividing decimal fractions by multiples of (10, 100, 1000). |
| | 5. Verifying the plausibility and accuracy of the results of the four operations on whole numbers, Proper fractions, mixed numbers, and decimal fractions by using approximation or mental calculation. |

# Mathematics area

| | |
|---|---|
| 2- Algebra and analysis | |
| 2-1 Patterns, Relationships and Functions | |
| 6-4-2-1-1 Distinguishing growing numerical and geometric patterns, generating and generalizing them, exploring relationships from data tables, and solving mathematical problems including real-life applications. | 1. Distinguishing growing numerical patterns (whose rules involve no more than two arithmetic operations), representing, expanding, completing missing elements, generating, and generalizing them. |
| | 2. Distinguishing growing geometric patterns (increasing or decreasing by a non-constant amount), extending them, completing missing elements, generating them, and generalizing them. |
| | 3. Expressing the relationship between two sets of data in input–output tables using words, symbols, and ordered pairs, and representing them on the coordinate plane. |
| | 4. Completing data in input–output tables, expanding them, and constructing tables according to a given rule (involving no more than two arithmetic operations). |
| | 5. Solving mathematical problems including real-life applications of patterns and input–output tables, and explaining their solutions. |
| 2-2 Algebraic structures and mathematical expressions | |
| 6-4-2-2-1 Distinguishing and writing algebraic expressions, finding their values, solving simple linear equations, and solving mathematical problems including real-life applications. | 1. Distinguishing algebraic expressions, writing them by using parentheses, and finding their values by applying the order of operations. |
| | 2. Distinguishing and writing simple one-step linear equations, and solving them mentally and by using models. |
| | 3.Solving mathematical problems including real-life applications of algebraic expressions and simple linear equations, and explaining their solutions. |
| 3- Geometry and measurement | |
| 3-1 Geometric shapes | |
| 6-4-3-1-1 Distinguishing basic geometric concepts, identifying types of angles, relationships between lines, and relationships between angles. | 1. Distinguishing points, lines, rays, and line segments, and identifying them on geometric figures. |
| | 2. Distinguishing angles (right, acute, obtuse, and straight), and estimating and finding their measures. |
| | 3. Distinguishing intersecting, parallel, and perpendicular lines, and identifying them on geometric figures. |
| | 4. Distinguishing vertically opposite, adjacent, complementary, and supplementary angles, identifying them on geometric figures, and using them to find the measures of unknown angles. |
| 6-4-3-1-2 Understanding the properties of two-dimensional and three-dimensional geometric shapes and using them to identify and classify the shapes. | 1. Distinguishing polygons, classifying them into regular and irregular polygons, and naming them. |
| | 2. Distinguishing triangles and circles, identifying and naming their elements, and classifying triangles according to the lengths of their sides and the measures of their angles. |
| | 3. Distinguishing quadrilaterals (parallelogram, rectangle, rhombus, square, and trapezoid), identifying and naming their elements, and classifying them according to the properties of their sides and angles. |
| | 4. Distinguishing prisms (triangular, quadrilateral) and cubes, identifying their vertices, edges, faces, and bases, and drawing their nets. |
| | 5. Identifying the sum of the interior angles of a triangle and a quadrilateral, and using them to find the measures of unknown angles. |

# Mathematics area

| | |
|---|---|
| 3-2 Coordinates and Geometric Transformations | |
| 6-4-3-2-1 Using the coordinate plane to name and locate points, and identifying and performing geometric transformations. | 1. Distinguishing the elements of the coordinate plane (first quadrant), naming and locating points using ordered pairs, and drawing polygons given the coordinates of their vertices. |
| | 2. Distinguishing translations on the coordinate plane (first quadrant) and drawing the image of a figure under a given translation. |
| | 3. Distinguishing reflections across an axis on the coordinate plane (first quadrant) and drawing the image of a figure under a given reflection. |
| | 4. Distinguishing rotations about a point on the coordinate plane (first quadrant) and drawing the image of a figure under a given rotation. |
| 3-3 Measurement and its units | |
| 6-4-3-3-1 Distinguishing relationships between units of length, mass, capacity, and time, and using them to convert between units. | 1. Identifying the appropriate unit of length, distinguishing relationships between metric units of length (cm, mm), (m, cm), (km, m), and using them to convert between units. |
| | 2. Identifying the appropriate unit of mass, distinguishing relationships between metric units of mass (g, mg), (kg, g), (ton, kg), and using them to convert between units. |
| | 3. Identifying the appropriate unit of capacity, distinguishing relationships between metric units of capacity (l, ml), and using them to convert between units. |
| | 4. Distinguishing relationships between units of time (second, minute), (minute, hour), (hour, day), (day, week), (month, year), and using them to convert between units. |
| 6-4-3-3-2 Distinguishing formulas for the perimeter and area of two-dimensional shapes, using them to find perimeter and area, and solving mathematical problems including real-life applications. | 1. Distinguishing formulas for the perimeters of the rectangle, square, and circle, and using them to find the perimeter. |
| | 2. Distinguishing formulas for the areas of the rectangle, square, parallelogram, and triangle, and using them to calculate their areas and the areas of composite shapes formed from them. |
| | 3. Solving mathematical problems including real-life applications of the perimeters and areas of geometric shapes, and explaining their solutions. |
| 6-4-3-3-3 Understanding volume and surface area and their units, distinguishing the formulas for a right rectangular prism, and applying them to find volume and solving mathematical problems including real-life applications. | 1. Estimating volume and measuring it by using the appropriate metric unit (ml3, cm3, and m3). |
| | 2. Distinguishing the formula for the volume of a right rectangular prism and using it to calculate its volume. |
| | 3. Distinguishing the formula for the surface area of a right rectangular prism and using it to estimate and calculate the surface area. |
| | 4. Solving mathematical problems including real-life applications of the volume and surface area of a right rectangular prism, and explaining their solutions. |
| 4- Statistics and probabilities | |
| 4-1 Statistics and graphic representations | |
| 6-4-4-1-1 Collecting real-word quantitative and qualitative data, organizing, representing, reading, and interpreting them. | 1. Collecting real- word quantitative and qualitative data, organizing them in frequency tables, and representing them using dot plots, line graphs, and bar graphs. |
| | 2. Reading and interpreting data represented by dot plots, line graphs, bar graphs, and pie charts. |
| | 3. Comparing different data representations and determining the most appropriate representation for given data. |

# Mathematics area

| | |
|---|---|
| 4-2 Data analysis and interpretation | |
| 6-4-4-2-1 Understanding measures of central tendency and range, distinguishing between them, and finding and interpreting them. | 1. Distinguishing the mean, median, mode, and range, finding them for a set of individual data values, and interpreting them in context. |
| | 2. Finding the mean, median, mode, and range for represented data by dot plots and , line graphs, and interpreting them. |
| | 3. Identifying outliers in a data set and describing their effect on the mean. |
| 4-3 Calculate Probabilities | |
| 6-4-4-3-1 Understanding a random experiment, determining its outcomes, expressing the probabilities of their occurrence, and solving mathematical problems including real-life applications. | 1. Finding all possible outcomes of a random experiment and their number by using tables, organized lists, tree diagrams, and the counting principle. |
| | 2. Distinguishing an event and expressing the probability of its occurrence using words, Proper fractions, decimal fractions, and percentages. |
| | 3. Solving mathematical problems including real-life applications of probability, explaining their solutions, and using probability to make predictions. |

## 3 Mathematics Domain Content at the End of Grade Nine

National assessments at the end of Grade Nine focus on measuring learners' proficiency in mathematics through the following:

**01**
Describing integers and rational numbers, performing the four arithmetic operations on them, and distinguishing square roots and real numbers.

**02**
Finding ratios, unit rates, and percentages, distinguishing proportional relationships, and solving proportions.

**03**
Distinguishing arithmetic sequences and functions, writing algebraic expressions, simplifying them, finding their values, factoring them, solving linear equations and systems of equations, and solving inequalities.

**04**
Distinguishing relationships between angles, the Pythagorean Theorem, trigonometric ratios, congruent, similar, and symmetric shapes, and using them to draw figures, find measurements, and perform geometric transformations on the coordinate plane.

**05**
Finding the perimeter, area, and volume of composite shapes, and converting between metric and customary (English) units of measurement.

**06**
Collecting data from survey studies, organizing and representing it, comparing different data representations, interpreting and analyzing data using measures of central tendency and dispersion, writing the sample space, finding the number of outcomes, distinguishing types of events, and calculating their probabilities.

# Mathematics area

## Table (6): Ninth Grade Mathematics Learning Outcomes and Indicators

| Mathematics (4) - ninth grade (9) | |
|---|---|
| Learning Outcomes | Indicators |
| By the end of ninth grade, the student will demonstrate proficiency in: | |
| 1- Numbers and operations | |
| 1-1 Numbers and groups of numbers | |
| 9-4-1-1-1 Understanding integers and rational numbers, reading, writing, representing, comparing, and ordering them. | 1. Distinguishing integers numbers, using them to represent opposite situations, reading and writing them, and representing them on the number line. |
| | 2. Comparing integers numbers and ordering them in ascending and descending order. |
| | 3. Finding the absolute value of an integer number and representing it on the number line. |
| | 4. Distinguishing between different forms of rational numbers, reading, writing, and representing them on a number line. |
| | 5. Comparing rational numbers and ordering them in ascending and descending order. |
| 9-4-1-1-2 Understanding real numbers, classifying, comparing, and Ordering them. | 1. Finding the square root of a number and approximating it to the nearest whole number or to the nearest decimal place, by using a calculator and without using one. |
| | 2. Distinguishing irrational numbers, ordering them in ascending and descending order, approximating them to rational numbers, and representing them on the number line. |
| | 3. Distinguishing real numbers and classifying them into whole numbers, integers, rational numbers, and irrational numbers. |
| | 4. Comparing integers, rational, and real numbers, and ordering them in ascending and descending order. |
| 1-2 Number sense and operations | |
| 9-4-1-2-1 Finding the powers of rational numbers, and distinguishing laws of exponent, and using them to simplify numerical expressions, Writing and finding their values, writing numbers in scientific notation. | 1. Finding the power of a rational number (with an integer exponent), distinguishing the laws of exponents, and using them to simplify numerical expressions. |
| | 2. Writing numerical expressions with rational numbers, including powers with integer exponents and parentheses, and finding their values by using the order of operations. |
| | 3. Writing very large or very small numbers by using scientific notation and converting between scientific notation and standard form. |
| 9-4-1-2-2 Performing the four operations on integers, rational numbers, and square roots, and using them to simplify the numerical expressions and solving mathematical problems including real-life applications. | 1. Adding, subtracting, multiplying, and dividing integers numbers. |
| | 2. Adding, subtracting, multiplying, and dividing rational numbers. |
| | 3. Adding, subtracting, multiplying, and dividing square roots. |
| | 4. Simplifying numerical expressions involving square roots using operations on square roots and rationalizing the denominator. |
| | 5. Solving mathematical problems including real-life applications that require the four operations on integers and rational numbers, numerical expressions, and providing and explanation their solutions. |

# Mathematics area

| | |
|---|---|
| 9-4-1-2-3 Finding the ratio, unit rate, percentage, estimating them, and distinguishing proportional relationships, solving proportions, and solving mathematical problems including real-life applications. | 1. Finding ratios and unit rates, and using them to compare quantities that include fractions. |
| | 2. Distinguishing proportional and non-proportional relationships, formulating proportions, and solving them. |
| | 3. Finding percentages of a number (including percentages greater than 100%) and estimating them using Proper fractions, compatible numbers, or rounding. |
| | 4. Distinguishing percentage, proportion, and using it to find one value when two of the following are known: percentage, whole, and part. |
| | 5. Solving mathematical problems including real-life applications of ratio, rate, percentage, proportionality, and percentage proportion, such as zakat, discounts and increases, profit and loss, added value, and scale, and explanations their solutions. |
| 2- Algebra and analysis | |
| 2-1 Patterns, Relationships and Functions | |
| 9-4-2-1-1 Understanding arithmetic sequences and relationships, representing them graphically, distinguishing linear relationships, and solving mathematical problems including real-life applications. | 1. Distinguishing an arithmetic sequences, finding the nth term, and calculating any term in the sequence. |
| | 2. Expressing an arithmetic sequence as a linear function and representing it graphically. |
| | 3. Distinguishing the relationship between two variables, defining its domain and range, and representing it through various means such as tables, ordered pairs, scatter plots, graphs, and equations, as well as converting between these representations. |
| | 4. Finding rates of change in linear relationships and using constant change to identify linear relationships. |
| | 5. Solving mathematical problems including real-life applications on arithmetic sequences, the relationship between two variables, and rates of change, and explaining their solution. |
| 9-4-2-1-2 Understanding functions, distinguishing linear and quadratic functions, identifying their properties, and representing them graphically. | 1. Describing a function, determining its domain and range, writing its rule using two variables, and finding its values for given inputs from its domain. |
| | 2. Distinguishing linear functions and representing them graphically. |
| | 3. Distinguishing quadratic functions (parabolas), representing its, finding their maximum and minimum values, domain and range, and their zeros algebraically and graphically. |
| | 4. Solving mathematical problems including real-life applications of linear and quadratic functions, and explaining their solutions. |
| 2-2 Algebraic structures and mathematical expressions | |
| 9-4-2-2-1 Writing algebraic expressions with rational coefficients, finding their values, performing arithmetic operations on them, and Distinguishing basic identities. | 1. Writing algebraic expressions with rational coefficients and absolute values, positive and negative powers, and finding their values. |
| | 2. Performing the four operations on algebraic expressions and simplifying them. |
| | 3. Distinguishing the basic identities: the square of a sum of two terms, the square of a difference of two terms, and the product of the sum and difference of two terms, and using them. |
| 9-4-2-2-2 Factoring algebraic terms, algebraic expression, the quadratic algebraic expression into their factors, and writing them in simplest form. | 1. Finding the greatest common factor of algebraic terms and factoring an algebraic term completely. |
| | 2. Factoring algebraic expressions by using the distributive property, grouping terms, and expressing them in their simplest form. |
| | 3. Distinguishing quadratic algebraic including perfect square trinomials, expressions of the form $x^2$+ bx + c, $ax^2$ + bx + c, and the difference of two squares, and Factoring them into two factors. |

# Mathematics area

| | |
|---|---|
| 9-4-2-2-3 Writing linear and quadratic equations, solving them algebraically and graphically, and estimating their solutions from graph representations. | 1. Estimating the solution of a linear equation from its graph, writing linear equations that include parentheses or variables on both sides, and solving them algebraically and graphically. |
| | 2. Solving equations that include an absolute value on one side and representing their solutions graphically. |
| | 3. Distinguishing linear equations with two variables, and finding ordered pairs that satisfy them using substitution. |
| | 4. Estimating the solution of a quadratic equation from its graphical representations, and solving quadratic equations graphically and algebraically using factoring, the quadratic formula, or completing the square. |
| 9-4-2-2-4 Writing a system of two linear equations with two variables, and solving them algebraically and graphically. | 1. Writing and solving a system of two linear equations with two variables, both algebraically (by substitution or elimination) and graphically. |
| | 2. Solving a system of two linear equations with two variables graphically, and using graphical representations to distinguish between consistent and inconsistent systems, and between independent and dependent systems. |
| | 3. Solving mathematical problems including real-life applications of two linear equations, and explaining their solutions. |
| 9-4-2-2-5 Understanding inequalities, distinguishing linear inequalities and compound inequalities, writing and solving them, and representing their solutions on the number line. | 1. Distinguishing inequalities, identifying linear and compound inequalities, and writing them. |
| | 2. Solving simple linear inequalities and inequalities that include parentheses, and representing their solutions on the number line. |
| | 3. Solving compound inequalities and inequalities that include absolute value, and representing their solutions on the number line. |
| | 4. Solving mathematical problems including real-life applications of linear inequalities and compound inequalities, and explaining their solutions. |
| 3- Geometry and measurement | |
| 3-1 Geometric shapes | |
| 9-4-3-1-1 Distinguishing the interior angles of polygons, and the relationships between angles formed by a transversal intersecting parallel lines, and using them to find unknown angle measures, and determining polygons that can form tessellations. | 1. Distinguishing the sum of the interior angle measures of a polygon and using its to find the measure of an angle in a regular polygon or unknown angle measures, and determining polygons that can form tessellations. |
| | 2. Distinguishing pairs of angles formed when a transversal intersects two parallel lines (alternate interior and exterior angles, corresponding angles), identifying the relationships between them, and using them to find unknown angle measures. |
| 9-4-3-1-2 Distinguishing three-dimensional shapes from their nets and drawing them, identifying symmetry in geometric shapes and the properties of quadrilaterals, and using them to draw the shapes and find unknown measures. | 1. Distinguishing shapes that are symmetric about an axis, identifying axes of symmetry and shapes that have rotational symmetry about a point, and determining angles of rotation. |
| | 2. Distinguishing the properties of quadrilaterals and the relationships among them, and using these properties to classify, draw, and find unknown measures. |
| | 3. Distinguishing three-dimensional geometric shapes (right triangular and right rectangular prisms, right triangular and right rectangular pyramids, cylinders, and cones) from their nets, and drawing a three-dimensional shape given its top, front, and side views. |
| 9-4-3-1-3 Distinguishing the properties of triangles and the relationship between the sides of a right triangle (the Pythagorean Theorem), using them to find unknown measures, and solving mathematical problems including real-life applications. | 1. Identifying the common properties of all triangles and the specific properties of certain types of triangles, and using them to draw triangles and find unknown angle measures. |
| | 2. Distinguishing the relationship between the sides of a right triangle (the Pythagorean Theorem), using its to find the length of an unknown side, and using its converse to determine whether a triangle is a right triangle. |
| | 3. Solving mathematical problems including real-life applications of the Pythagorean Theorem and its converse, and explaining their solutions. |

# Mathematics area

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|---|---|
| 9-4-3-1-4 Distinguishing the congruence and similarity of two polygons, using them to find unknown measures, and solving mathematical problems including real-life applications. | 1. Distinguishing the congruence of two polygons and using its to identify congruent polygons and find unknown measures. |
| | 2. Distinguishing cases of triangle congruence and using them to prove the congruence of two triangles. |
| | 3. Distinguishing the similarity of two polygons and using its to identify similar polygons and find unknown measures. |
| | 4. Solving mathematical problems including real-life applications of polygon congruence and similarity, and explaining their solutions. |
| 9-4-3-1-5 Distinguishing the basic trigonometric ratios of an acute angle and their inverses, finding each of them, and using them to solve right triangles. | 1. Distinguishing the basic trigonometric ratios (sine, cosine, and tangent) and finding them for an acute angle in a right triangle (manually and using a calculator), rounded to the nearest given place. |
| | 2. Distinguishing the inverse trigonometric ratios and using them to find the measure of an acute angle in a right triangle using a calculator. |
| | 3. Solving right triangles using the basic trigonometric ratios and their inverses. |
| 3-2 Coordinates and Geometric Transformations | |
| 9-4-3-2-1 Determining the locations of points in the coordinate plane and plotting them, finding the distance between two points and the coordinates of the midpoint, and determining the slope of a line, writing its equation, and graphing it. | 1. Determining the locations of points in the coordinate plane (rational-number coordinates) by utilizing ordered pairs of rational numbers. |
| | 2. Finding the slope of a line from its graph and from two points on the line, and interpreting it algebraically and graphically. |
| | 3. Distinguishing the equation of a line and writing its using the slope-intercept form, the point-slope form, and the standard form. |
| | 4. Distinguishing the relationship between the slopes of two parallel or perpendicular lines, and using its to write the equation of a line parallel or perpendicular to a given line. |
| | 5. Finding the distance between two points in the coordinate plane, and finding the coordinates of the midpoint. |
| 9-4-3-2-2 Determining the type of geometric transformation in the coordinate plane, and drawing the image resulting from these transformations. | 1. Distinguishing the type of transformation (reflection, translation, and rotation), and determining its elements. |
| | 2. Distinguishing dilation and determining its type, center, and scale factor. |
| | 3. Determining the type of geometric transformation of a figure and its image in the coordinate plane, and drawing the image resulting from a given transformation (reflection, translation, rotation, or dilation). |
| 3-3 Measurement and its units | |
| 9-4-3-3-1 Distinguishing the relationships between the units of length, mass, and capacity, and using them to convert within these units and between English and metric measurement units. | 1. Distinguishing the relationships between English units of length (inch, foot, yard, mile) and using them to convert between units. |
| | 2. Distinguishing the relationships between English units of mass (ounce, pound, and ton) and using them to convert between units. |
| | 3. Distinguishing the relationship between the two English units of capacity (cups and gallons) and using them to convert between units. |
| | 4. Distinguishing the relationships between English and metric units of length, mass, and capacitance, and using them to convert between units. |
| 9-4-3-3-2 Distinguishing the formulas for perimeter and area of two-dimensional shapes, using them to find perimeters and areas, and solving mathematical problems including real-life applications. | 1. Distinguishing the formulas for the perimeter and area of a circle and a regular polygon, and using them to find each. |
| | 2. Distinguishing the relationship between the perimeters of similar shapes, and using its to find unknown measures. |
| | 3. Solving mathematical problems including real-life applications of the perimeter and area of a circle, the area of a regular polygon, and the areas of composite figures, and explaining their solutions. |

# Mathematics area

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|---|---|
| 9-4-3-3-3 Distinguishing the formulas for volume and surface area of three-dimensional shapes, using them to find volume and surface area, and solving mathematical problems including real-life applications. | 1. Distinguishing the volume formulas for right square pyramids, right triangular pyramids, cylinders, and cones, and using them to find their volumes and the volumes of composite solids. |
| | 2. Distinguishing the surface area formulas for right square pyramids, right triangular pyramids, cylinders, and cones, and using them to find their surface areas. |
| | 3. Solving mathematical problems including real-life applications of volumes and surface areas, and explaining their solutions. |
| 4- Statistics and probabilities | |
| 4-1 Statistics and graphic representations | |
| 9-4-4-1-1 Understanding survey studies and using them to collect, organize, and represent data, reading and interpreting graphical representations, and using them for prediction and decision-making. | 1. Describing survey studies and using them to collect and organize data, distinguishing random samples and their types, and classifying them. |
| | 2. Representing data using stem-and-leaf plots, box-and-whisker plots, single and double bar graphs, and single and double histograms, comparing them, and selecting the most appropriate representation for given data. |
| | 3. Reading data from graphical representations, interpreting them, and using them for prediction and decision-making. |
| | 4. Reading scatter plots and using them to determine the strength of the relationship between two variables and to predict the value of one variable given the value of the other. |
| 4-2 Data analysis and interpretation | |
| 9-4-4-2-1 Analyzing data by using measures of central tendency and measures of dispersion, interpreting, and comparing between them. | 1. Finding measures of central tendency for a set of individual values, data organized in simple or grouped frequency tables, or data represented graphically, and using them to describe and interpret data. |
| | 2. Comparing measures of central tendency for a set of values and determining the most appropriate measure to represent the data. |
| | 3. Finding measures of dispersion (range and interquartile range) and outliers, and using them to describe data. |
| | 4. Distinguishing measures of dispersion (mean deviation, standard deviation, and variance) and finding them for a set of individual values. |
| | 5. Solving mathematical problems including real-life applications of measures of central tendency and measures of dispersion, and explaining their solutions. |
| 4-3 Calculating probabilities | |
| 9-4-4-3-1 Writing the sample space of a random experiment, finding the number of possible outcomes, distinguishing types of events, and calculating their probabilities. | 1. Distinguishing the sample space of a random experiment and writing its by using organized lists, tables, or tree diagrams. |
| | 2. Finding the number of possible outcomes of an experiment using the Fundamental Counting Principle, permutations, and combinations, and calculating their probabilities, expressing them in words, Proper fractions, decimal fractions, or percentages. |
| | 3. Distinguishing types of events (simple and compound, mutually exclusive and non-mutually exclusive, complementary, independent and dependent) and calculating their probabilities. |
| | 4. Calculating theoretical and experimental probabilities of an event, comparing them, and using them for prediction. |
| | 5. Solving mathematical problems including real-life applications of probability, using probability for prediction, and explaining the solutions. |

## Cognitive Levels:

**National mathematics assessments aim to evaluate the extent to which learners demonstrate proficiency in two integrated domains:**
**the mathematical content domain with its various branches, and the cognitive domain with its progressive levels and the associated mental processes targeted for assessment.**
**The cognitive domain reflects the level of learners' mental skills in terms of the depth of their knowledge, their ability to apply concepts, and their proficiency in reasoning skills.**

Cognitive levels in mathematics are defined as a set of organized and interconnected mental processes to be assessed, reflecting learners' mathematical proficiency when solving a question, completing a task, or generating solutions to a problem.
Below is a brief description of these cognitive levels, along with the key mental processes included in each level:

01 Knowledge: This level covers basic mental processes that reflect the learner's ability to recall and retrieve mathematical concepts and perform direct mathematical procedures. These processes include the skills of recall or retrieval, recognition, classification/ordering, computation, extraction, and measurement.

02 Application: This level covers mental processes that reflect the learner's ability to apply mathematics in familiar contexts, presented either through real-life situations or purely mathematical questions. These processes include the skills of identification, representation/modeling, and execution.

03 Reasoning: This level covers mental processes that reflect the learner's ability to think beyond routine problem solving to address unfamiliar situations, complex contexts, and multi-step problems. These processes include the skills of analysis, synthesis/integration, evaluation, drawing conclusions, generalization, and justification

# SCIENCE SECTION

# Science Section

## Design of National Assessment Content

This section of the document presents a description of the design of the national assessment content for the Science Domain and clarifies the targeted cognitive levels, as follows:

### 1 ◆ Sience Domain Content at the End of Grade Six

National assessments at the end of Grade Six focus on measuring the learner's level of proficiency in the Science Domain through the following areas:

**01** Identifying the structure of the cell and its vital functions, describing the structure of some body systems and linking them to their biological functions, describing the changes associated with the growth of some living organisms, and classifying living organisms according to their observable characteristics.

**02** Describing ecosystems, their components, and the interactions among them, tracing the flow of matter and energy within ecosystems, explaining the impact of environmental changes and organisms' adaptations to them, and describing the effect of human activities on ecosystems.

**03** Studying the inheritance of traits, explaining variation among them, tracing their transmission from one generation to another, distinguishing between types of traits (dominant and recessive), and explaining the influence of the environment on them.

**04** Exploring the physical and chemical properties of matter, describing its molecular structure, explaining changes resulting from heat, understanding concepts related to chemical changes and reactions, their indicators and types, the factors affecting reaction rates, and applying the law of conservation of mass.

**05** Explaining the concept of force, distinguishing between its types, identifying the factors affecting it, understanding Newton's laws, and interpreting the motion of objects in light of these laws.

**06** Distinguishing between the concepts of energy and work, understanding the principle of conservation of energy and the concept of kinetic energy, its transfer, and its applications in everyday life.

**07** Understanding the concept of waves and their properties, explaining the reflection of light and the transmission of sound, and interpreting their role in interaction and communication within the surrounding

**08** Understanding the concept of electric charge, explaining attraction and repulsion between charged objects, comparing static and current electricity, and describing the properties of magnets and their uses.

**09** Identifying the solar system and the role of gravity in the motion of its components, explaining related phenomena, and clarifying the relationship between the solar system, galaxies, and the universe.

**10** Describing Earth's layers, their components and characteristics, and explaining the processes that occur within them, along with their causes and effects

# Science Section

## Table (7): Sixth Grade Science Learning Outcomes and Indicators

| Science (5) – Grade Six (6) | |
|---|---|
| Learning Outcomes | Indicators |
| 1-Life Sciences | |
| The central idea: 1-1. Structure and function in living organisms | |
| By the end of grade six, the student will demonstrate proficiency in: | |
| 6-5-1-1-1 Describing the cell structures and linking them to their vital functions. | 1.Explaining the concept of a cell and distinguishing between unicellular and multi-cellular organisms. |
| | 2.Identifying and naming structures in the cell (nucleus, cytoplasm, cell membrane, cell wall). |
| | 3.Linking between cellular structures and their specific functions. |
| 6-5-1-1-2 Identifying the major structural and func-tional differences between animal and plant cells. | 1.Comparing between the cell membrane in animal cells and the cell wall in plant cells, and their functions. |
| | 2.Identifying chloroplasts in plant cells and determining its function. |
| | 3.Describing how animal and plant cells performs biological processes (passive transport, diffusion, photosynthesis, cellular respiration) |
| 6-5-1-1-3 Identifying the main body systems and their specialized organs and linking them to their func-tions that supports growth and survival of living organ-isms (plants and animals). | 1.Identifying the main systems in animal's body and its specialized organs, and link-ing them to their functions that helps them grow and survive (digestive, circulato-ry, excretory, respiratory, skeletal, muscular, and nervous). |
| | 2.Identifying basic plant structures and relating them to specific functions that sup-port plant growth and survival. (root, stem, leaves and flowers). |
| 6-5-1-1-4 Describing the different patterns in the life cycles of animals and plants and the changes accom-panying them, and comparing them. | 1.Describing the different patterns in life cycles of different animals (insects, am-phibians, and mammals) and different plants, and comparing them. |
| | 2.Describing the changes that occur to animals and plants during life cycles and predict them based on the pattern of reproduction and the life cycle. |
| 1-2 Organization and diversity of living organisms | |
| 6-5-1-2-1 Classifying living organisms into groups based on common phenotypic traits. | 1.Classifying different plants from the local environment into two groups (gymno-sperms and angiosperms); and comparing them according to their similarities and differences in phenotypic traits and characteristics. |
| | 2.Determining the common characteristics and traits of various animals in order to justify their classification within specific groups. |
| | 3.Classifying animals and microorganisms from local environment into groups based on common phenotypic characteristics. |
| 1-3. Ecosystems and their interactions | |
| 6-5-1-3-1 Representing biological communities and identifying types of population that lives in it, describ-ing the interrelationships among them, and their inter-action with the abiotic components, and the impact of biological communities changes on their survival and sustainability. | 1.Describing the biological community and the types of population and living or-ganisms that live in it, and their ability to survive in their habitats through the avail-ability of the necessities of life. |
| | 2.Identifying the interrelationships among living organisms, and their interaction with the abiotic components of their habitats to obtain their needs. |
| | 3.Describing the effect of different changes in biological communities on the surviv-al and sustainability of different species. |

# Science Section

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| 6-5-1-3-2 Describing the components of the ecosystem and explaining the impact of the availability of different resources in ecosystems on the survival and sustainability of living organisms, and proposing solutions to problems that affect the stability of the ecosystem. | 1. Describing the biotic and abiotic components of ecosystems and their interaction to provide the needs of living organisms, and its impact on the survival and stability of the ecosystem. |
| | 2. Determining the causes of changes in habitats and their impact on plants and animals that lives there. |
| | 3. Identifying problems that results from changes in habitats, and provide evidence on the efficiency of solutions to restore ecological balance. |
| 6-5-1-3-3 Representing the relationships between living organisms in which matter is circulated in the ecosystem, and identifying the relationship between plants and energy obtained from the sun to produce food. | 1. Clarifying the cycle of matter between living organisms, and the transfer of energy in the ecosystem through food chain, and classify their different roles (producer, consumer, predator, decomposer) |
| | 2. Classifying living organisms into (autotrophic - heterotrophic). |
| | 3. Explaining the process of photosynthesis and its role in determining the relationship between plants and the energy obtained from the sun to produce food. |
| 6-5-1-3-4 Describing the effect of environmental changes on plants and animals that live in specific environments. Inferring how behavioral and structural adaptations can help plants and animals survive in their habitats | 1. Identifying the physical factors that affect the survival of plants and animals in specific habitats |
| | 2. Predicting the changes that will happen to living organisms as a result of of changes in their environments. |
| | 3. Describing how structural and behavioral adaptations can help plants and animals live and survive in specific habitats. |
| | 4. Describing the climatic conditions in different environments and their impact on living organisms. |
| 6-5-1-3-5 Inferring the impact of human activity on environmental habitats and populations, and predicting its effect, proposing solutions for their protection | 1. Explaining human interaction with environments, and inferring the positive and negative impact of human activities on the environmental habitats and populations. |
| | 2. Identifying natural environmental events of the Kingdom of Saudi Arabia and predicting their positive and negative impacts. |
| | 3. Proposing solutions to protect the earth's resources and preserve the environment. |
| 1-4. Genetics | |
| 6-5-1-4-1 Identifying the inheritance of traits, explaining the variation in them, tracing their transmission from one generation to the next, distinguishing their types (dominant and recessive), and clarifying the impact of the environment on them. | 1. Clarifying that variation in inherited traits results from a pattern of variation between inherited traits in living organisms of the same species. |
| | 2. Applying a pedigree chart to track the transmission of inherited traits from parents to offspring |
| | 3. Comparing dominant and recessive traits, identifying the letter symbols for each of them, and providing examples. |
| | 4. Distinguishing genetic traits from acquired traits and comparing them. |
| | 5. Identifying some of the environmental factors that affect the acquired traits of animals and plants (the amount of food, the amount of water, the amount of animal movement), and identifying the traits that are affected by environmental factors (height, weight, and color). |

# Science Section

| 2-physical Sciences | |
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| 2-1. Matter and its interactions | |
| By the end of grade six, the student will demonstrate proficiency in: | |
| 6-5-2-1-1 Exploring the physical properties of matter, distinguishing the molecular structure of its different states, and explaining the change of matter states due to heat. | 1. Identifying the physical properties of matter that can be measured or calculated, and indicates the scientific units of measurement used. |
| | 2. Distinguishing the different materials in terms of the physical properties of the substance that can be calculated or measured, such as mass, volume, density, buoyancy, color and boiling point |
| | 3. Comparing between conductors and insulators in terms of their physical properties, supported by examples |
| | 4. Comparing, through models, the states of matter (solid, liquid, and gas), and in terms of movement and forces of attraction between molecules, and the effect of that on the shape and size of matter. |
| | 5. Explaining the changes of matter due to the effect of heat. |
| 6-5-2-1-2 Distinguishing between compounds and mixtures and their types, explaining chemical changes of matter and the related concepts and methods, and comparing the masses of substances when their properties change based on the law of conservation of mass. | 1. Explaining the changes in the composition and properties of matter as a result of a chemical reaction. Concluding that the mass of the substance remains preserved during the chemical reaction and when forming mixtures. |
| | 2. Distinguishing between a mixture and a compound, enumerating the types of mixtures, distinguishing them, and giving examples of each type. |
| | 3. Defining the solution, identifying its parts, and describing the concentration of the solution in terms of quality (concentrated, dilute) or in terms of quantity (saturated, unsaturated). |
| | 4. Explaining the concept of solubility and gives the factors affecting it. |
| | 5. Distinguishing between the physical methods used to separate the components of a mixture or solution, and providing examples. Describing the process of distillation and identifying some of its industrial applications. |
| 6-5-2-1-3 Explaining chemical bonding, describing chemical reactions, their indicators and types, and the factors affecting the rate of reaction. | 1. Defining the chemical bond, explaining its role in changing the properties of a chemical substance, and identifying indicators of a chemical reaction occurrence. |
| | 2. Describing the chemical change (reaction) using the chemical equation, fulfilling the law of conservation of mass. Identifying the atoms of the elements of the reactants and products in the chemical equation, and their ratios. |
| | 3. Classifying chemical reactions and gives examples of each type, and explains the factors affecting the rate of a chemical reaction from a variety of chemical reactions. |
| | 4. Distinguishing between endothermic and exothermic reactions and gives examples of each |
| 6-5-2-1-4 Exploring the chemical properties of materials, and distinguishing between the interactions of acids and bases, their chemical properties, and their uses. | 1. Defining the chemical property and classifying the chemical elements; according to its chemical properties. |
| | 2. Distinguishing between acids and bases and give examples of each type. |
| | 3. Listing the uses of acids and bases according to their properties, identify the reagents, give examples of them, and explain how to detect acids and bases through them. |
| | 4. Defining the pH, determining the values of solutions of some acidic, basic, or neutral substances, and classifies them. |
| | 5. Explaining what is meant by the neutralization reaction between an acid and a base to form a salt, and name some types of salts, and their properties and uses |

# Science Section

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| 2-2 Motion and Forces | |
| At the end of Grade Six (6) students will be able to: | |
| 6-5-2-2-1 Describing the concept of force and distinguishing between different types of forces. | 1. Describing how force affects the shape and motion of objects. |
| | 2. Distinguishing between balanced and unbalanced forces and describing their effects on motion. |
| | 3. Distinguishing between types of forces based on their causes (gravity, friction, and magnetism). |
| 6-5-2-2-2 Understanding Newton›s three laws of motion and using them to explain body motion | 1. Determining the relationship of distance to motion and explaining how the position of an object can be determined using a reference point. |
| | 2. Define velocity and its unit, calculating velocity by knowing distance and time, and distinguishing between speed and velocity. |
| | 3. Defining acceleration and its unit, calculating acceleration by knowing the change in velocity and time, and showing the effect of changing the direction of movement on acceleration. |
| | 4. Explaining Newton's three laws of motion and their real life applications. |
| 6-5-2-2-3 Explaining the factors affecting types of forces, such as gravitational force, friction, and magnetism. | 1. Explaining the relationship between gravitational force and the weights of objects, and identifying the factors that affect it. |
| | 2. Explaining how frictional force is generated and the factors affecting its magnitude, and explaining the effect of air resistance on the motion of objects. |
| | 3. Explaining attraction and repulsion in magnetic force without direct contact between objects. |
| 2-3 Energy | |
| 6-5-2-3-1 Understanding the concept of energy and work, distinguishing between them, and giving real life examples . | 1. Explaining the concept of energy and work based on their role and impact on bodies. |
| | 2. Explaining the concept of potential energy and kinetic energy and their relationship to body movement. |
| | 3. Selectsing the simple machine that facilitates completing a task from among different machines, and provides examples of the benefits of simple machines in everyday life |
| 6-5-2-3-2 Understanding the principle of energy conservation during its transformations and apply it in daily life. | 1. Describing how energy is transferred from one place to another in its surroundings and between objects and systems. |
| | 2. Explaining the law of conservation of energy and applies it to real-life examples of energy transformations. |
| Physical Sciences | |
| 2-4 waves and vibrations | |
| 6-5-2-4-1 Describing waves, distinguishing between their properties theoretically and graphically, and predicting their movement. | 1. Explaining the concept of wave and representing it graphically. |
| | 2. Distinguishing between the properties of sound and light waves theoretically and graphically. |
| | 3. Predicting the movement of the wave when exposed to some natural influences. |
| | 4. Describing the transmission of sound and light as waves through material media and space and distinguishing between them. |

# Science Section

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| 6-5-2-4-2 Understanding the concepts of reflection and refraction of light, transmission of sound, and explaining their role in interaction and communication in the surrounding environment. | 1. Explaining the concept of reflection and refraction of light, and supports that with examples of the applications of reflection, refraction and absorption of light in mirrors and lenses. |
| | 2. Explaining the eye's vision of the objects and colors around it. |
| | 3. Describing the transmission of sound by absorbing or reflecting it through different media and objects. |
| | 4. Describing the pitch and intensity of the sound, and determines their relationship to frequency. |
| 2-5 Electromagnetism | |
| 6-5-2-5-1Understanding the concept of electric charge, explaining the attraction and repulsion of charged bodies, and comparing electrical circuits connected in series and in parallel. | 1. Explaining the concept of electric charge and explaining the attraction and repulsion of charged bodies theoretically and graphically. |
| | 2. Explaining how electric current flows in electrical circuits. |
| | 3. Comparing electrical circuits connected in series and parallel theoretically and by drawing. |
| 6-5-2-5-2Understanding the properties of magnets and their uses in daily life. | 1. Defining magnets, identifying and naming their poles, and explain how magnets are formed. |
| | 2. Describing the properties of magnets and providing examples of the uses in everyday life. |
| | 3.Comparing permanent magnets and electromagnets and explaining how they can be used to generate electricity. |
| 3-Earth and Space Sciences | |
| 3-1 The universe and the solar system | |
| By the end of third grade (6), the student will demonstrate proficiency in: | |
| 6-5-3-1-1 Describing the changes in the appearance of the moon during its revolution around the Earth explains the reasons for these changes | 1. Describing the apparent shape of the moon during its rotation around the earth, and naming the different phases of the moon. |
| | 2. Explaining the change in the apparent shape of the moon during its orbit around earth |
| 6-5-3-1-2 Explaining the phenomena related to the movement of the earth, the moon and the sun and the resulting changes. | 1. Explaining the importance and impact of the sun's movement on aspects of life around them. |
| | 2. Explaining the occurrence of the phenomena of night and day, and the four seasons. |
| | 3. Explaining the occurrence of the lunar eclipse and the solar eclipse. |
| 6-5-3-1-3 Concluding the effect of gravity on the movement of the solar system, galaxies and associated phenomena. | 1. Explaining the phenomenon of tides, and explaining the influence of the moon in its occurrence and its geological effects. |
| | 2. Describing the movement of celestial bodies in the solar system, their relationships with each other, and their effects. |
| | 3. Distinguishing the phenomena associated with the movement of celestial bodies, and providing supporting evidence. |
| | 4. Relating the speed of rotation and gravity between celestial bodies, and providing evidence for that |

# Science Section

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| 6-5-3-1-4 Determining the characteristics of the solar system, and comparing the solar system to the galaxy and the universe. | 1. Comparing the solar system, the galaxy and the universe in terms of size and locating the solar system in the Milky Way galaxy. |
| | 2. Comparing the sun and other stars in terms of size, color and explans the relationship between a star's color and its temperature |
| | 3. Distinguishing the extent of the universe and the sizes of its bodies, providing supporting evidence. |
| 3-2 The Earth System | |
| 6-5-3-2-1Classifying the layers of the atmosphere and identifying their components, characteristics, changes, its effects on the environment and their benefits to humans. | 1. Classifying the layers of the atmosphere and comparing them in terms of similarities and differences, and identifying some environmental problems resulting from changes in atmospheric layers. |
| | 2. Explaining the movement of air masses and air currents and describing their effects on Earth's weather. |
| | 3. Identifying the causes of weather variability and their relationship to the Earth's water cycle, and predicting their environmental impacts on weather. |
| | 4. Explaining the causes of climate change in some regions of the world and proposing multiple solutions to address the impacts and risks of weather fluctuations. |
| 6-5-3-2-2 Deducing the relationship of the Earth›s spheres to each other and predicting the interactions, and changes that occur between them and the geological effects resulting from them. | 1. Describing the Earth's spheres and Plate tectonics, identifying the layers of the Earth that make up the lithosphere and the biosphere, and distinguishing between them. |
| | 2. Describing how magma moves Earth's plates, using that for explaining the formation of oceans and mountains. |
| | 3. Identifies Earth's natural features, including landforms and water bodies, and explains the causes of their formation. |
| 6-5-3-2-3 Describing the factors and processes that affected the Earth›s surface which changed some of its features. | 1. Explaining the geological changes and processes that affect the earth's surface, classifying and locating them. |
| | 2. Describing the impact of earthquakes and volcanoes in shaping the Earth's surface and changing its features. |
| | 3. Explaining the factors of erosion, weathering, and sedimentation and their causes, and predicting the patterns of their action and their effects on earth. |
| 6-5-3-2-4 Describing the types of rocks and their relationship to minerals and distinguishing their characteristics and uses. | 1. Distinguishing mineral and its properties and describing its relationship to rocks, and how they are formed. |
| | 2. Describing the types of rocks in his area, explaining their characteristics, and their use. |
| | 3. Explaining the geological events that the rocks were exposed to in his area. |
| 6-5-3-2-5 Determining the causes and effects of earthquakes and volcanoes and identifying the sites most vulnerable to earthquakes and volcanoes. | 1. Relating the change of the Earth's shape with the external and internal geological processes. |
| | 2. Explaining the causes of earthquakes and volcanoes, anticipating the damages that result from them, and proposing solutions for prevention to limit their effects. |
| | 3. Determining the locations and types of earthquake monitoring stations and devices in the Kingdom of Saudi Arabia and comparing between them. |

# Science Section

## 2 ◆ Science Domain Content at the End of Grade Nine

National assessments at the end of Grade Nine focus on measuring the learner's level of proficiency in the Science Domain through the following areas:

01 Understanding that the cell is the basic unit of structure and function in living organisms, tracing the stages of cell growth and division, and identifying the technologies that contributed to its discovery.

02 Understanding the importance of the integration between the structure and functions of the human body systems and their role in maintaining homeostasis and overall health.

03 Identifying the development of genetics as a scientific field, applying Mendel's laws to trace and explain the inheritance of traits, describing the structure of chromosomes and their relationship to genes, and explaining their role in transmitting hereditary traits from one generation to another.

04 Tracing the historical development of the atomic model and the periodic table, understanding the structure of the atom, the organization of elements in the periodic table, their properties and uses, distinguishing between compounds and mixtures, and comparing acids and bases.

05 Understanding thermal energy and its relationship to molecular motion and chemical reactions, explaining how atoms bond together and the types of chemical bonds, understanding how chemical reactions occur and representing them in light of the law of conservation of mass, and describing the rate of chemical reactions and the factors affecting them.

06 Understanding thermal energy, the mechanisms of heat transfer, its relationship to temperature, and the concept of specific heat, distinguishing between kinetic and potential energy and the factors affecting them, understanding energy transformations, the law of conservation of energy, and methods of energy generation.

07 Understanding the concepts of motion and momentum, explaining the concept of friction and its types, understanding inertia, and applying Newton's three laws of motion.

08 Understanding the behavior of sound and light waves, their properties, and their applications.

09 Explaining the concept of electric current and methods of its generation, its relationship with magnetism, describing the relationship between the electric field and electric force and comparing it with the magnetic field, explaining the role of electric circuits in energy transfer, the electrical conductivity of materials, and the conversion between electrical and mechanical energy.

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10 Evaluating data related to the expansion and vastness of the universe, describing the technologies and methods that contributed to its discovery, and inferring the prevailing conditions in some celestial bodies.

11 Explaining the structure of the Earth and the components of its spheres, the movement of materials within them, interpreting the changes that occur and their impacts on the Earth system, identifying natural resource sources, and proposing solutions for their utilization, conservation, and sustainability.

Table (8): ninth Grade Science Learning Outcomes and Indicators

| Life Sciences | |
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| 1-1 Structure and function in living organisms | |
| By the end of third grade (9), the student will demonstrate proficiency in: | |
| 9-5-1-1-1 Understanding that the cell is the basic building unit of living organisms, knowing some of the technologies that helped study them, and comparing single-celled and multi-cellular organisms. | 1. Identifying the basic unit of structure of living organisms, stating the principles of the cell theory, recognizing the importance of technological tools (magnifying devices and microscopes), and explaining their role in identifying cells and their components. |
| | 2. Describing cell structures, relating them to their specialized functions within the cell, and explaining how each structure contributes to overall cellular functions. |
| | 3. Comparing unicellular and multicellular organisms and providing examples of each. |
| | 4. Describing the vital activities and processes of the cell that are necessary for the continuation of life in living organisms |
| 9-5-1-1-2 Describing the main events in the stages of the cell cycle and comparing between mitosis and meiosis. | 1. Illustrating the two main stages of the cell cycle (interphase and cell division), describing the changes and events associated with each stage, identifying their duration, and providing examples. |
| | 2. Explaining the importance of interphase and cell division, describing the condition of cells during these stages, and distinguishing them from active cells. |
| | 3. Defining mitosis and identifying its successive phases and the changes that occur in the cell during each phase. |
| | 4. Defining meiosis, describing its stages, comparing (using diagrams) what occurs during anaphase I and anaphase II in the division processes, and distinguishing their different forms. |
| | 5. Comparing mitosis and meiosis in terms of importance, stages, outcomes, and the types of cells in which each division occurs. |
| 9-5-1-1-3 Understanding the importance of integration of human body systems and how the structure of different organ relate to one another to maintain homeostasis and body health. | 1. Identifying the components of the human's body systems (circulatory, immune, digestive, respiratory, excretory, muscular, skeletal, nervous, hormonal, and reproductive) and their specific functions that support the functioning of the body. |
| | 2. Explaining how the systems interact and integrate in maintaining homeostasis health and safety of the body's balance. |
| | 3. Predicting diseases resulting from a malfunction in the functioning of organs and systems in the human body and suggesting ways of prevention. |

# Science Section

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| Life Sciences | |
| 1-2 Organizing of living organisms and their diversity | |
| 9-5-1-2-1 Classifying living organisms according to modern classification system based on their features and characteristics. | 1. Comparing the ancient and modern methods of classification and identifying the kingdoms and levels of modern ' taxonomic scale. |
| | 2. Comparing the main characteristics of living organisms. |
| | 3. Classifying living organisms from the local environment using graded taxonomic levels based on internal and external structural features and characteristics. |
| Life Sciences | |
| 1-3 Ecosystems and their interactions | |
| 9-5-1-3-1 Explaining the impact of changes in biodiversity on the environment and humans at both local and global levels, and describing how the ability of species to adapt to diverse environmental conditions affects biodiversity. | 1. inferring the impact of biodiversity on species survival and the sustainability of ecosystems. |
| | 2. Explaining the impact of species' ability to adapt to diverse environmental conditions on biodiversity in different ecosystems. |
| | 3. inferring the consequences of the extinction of certain species of living organisms and its impact on biodiversity in the Kingdom of Saudi Arabia, proposes possible solutions to address a problem that threatens biodiversity in the local environment, and explains the national efforts made to reduce the extinction of endangered species . |
| 9-5-1-3-2 Explaining the impact of extinction on biodiversity and describing the changes that have occurred in biodiversity throughout the history of life on Earth. | 1. Organizing data on the appearance of specific fossilized organisms (fossils) in the fossil record as a function of time, determined by their position in sedimentary layers or by rock ages. |
| | 2. Analyzing data using graphs and maps to provide evidence illustrating the changes that have occurred in living organisms throughout the history of life on Earth. |
| 9-5-1-3-3 Explaining how matter and energy are transferred within an ecosystem, predicting the changes resulting from the extinction of one of its components, describing material cycles in the ecosystem, and inferring their role in supporting its sustainability. | 1. Explaining how matter is recycled and energy flows between biotic and abiotic components in food webs within an ecosystem, and predicting the impact of the extinction of a biotic component on ecosystem balance and stability. |
| | 2. Describing material cycles (water, carbon dioxide, and nitrogen) in an ecosystem and their transfer through biotic and abiotic components, and inferring their role in supporting sustainability. |
| 9-5-1-3-4 Describing types of aquatic and terrestrial ecosystems and the interactive relationships among their components. | 1. Describing aquatic and terrestrial ecosystems, identifying the characteristics of the biological populations that live within them, and explaining how they interact together to form a biological community. |
| | 2. Describing the interactive relationships among living organisms in ecosystems (competition, predation, mutualism, and parasitism). |
| 9-5-1-3-5 Identifying the characteristics of a balanced ecosystem, analyzing the factors and variables that affect its balance, explaining the impact of human activities on it, predicting the consequences of its imbalance, and evaluating designed solutions to address local environmental problems and restore its balance. | 1. Identifying the characteristics of a balanced ecosystem based on the availability of factors that maintain its balance (availability of clean water, recycling of nutrients, prevention of soil erosion, and diversity of living organisms). |
| | 2. Distinguishing between human and natural factors that affect ecosystem balance, and predicting the effects resulting from changes in one component of the ecosystem on the living organisms that inhabit it. |
| | 3. Analyzing data to identify the factors and variables that affect the efficiency of ecosystems. |
| | 4. Explaining the impact of human activities on relationships within ecosystems, and evaluating designed solutions to address problems related to restoring the balance of a local ecosystem, in light of the benefits and limitations of each design. |
| 9-5-1-3-6 Describing the concept of biomass and its sources, and identifying its importance in biofuel production and reducing carbon emissions. | 1. Explaining the concept of biomass and identifying its sources. |
| | 2. Describing the concept of biofuel and inferring its advantages and limitations. |
| | 3. Explaining the efforts of the Kingdom of Saudi Arabia to reduce carbon emissions and their impacts, and providing examples of these efforts. |

# Science Section

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| 1-4 Genetics | |
| 9-5-1-4-1 Describing the development of genetics, and the use of Mendelian laws to explain the inheritance of genetic traits, and the probabilities of their appearance in different generations. | 1. Explaining the development of genetics, and illustrating Mendel's role in it. |
| | 2. Applying Mendel's first and second law for the transmission of genetic traits, and predicting the emergence of genetic traits in generations and their occurrence ratio. |
| | 3. Clarifying the concept of genetics and its principles and explaining how traits are inherited, and explaining the role of alleles. |
| | 4. Distinguishing between homozygous and heterozygous genes, distinguish between homozygous genes organisms and non- homozygous organisms, and providing an example of each. |
| | 5. Calculating the probability of the appearance of genetic characteristics of living organisms using the Punnett square. |
| 9-5-1-4-2 Describing the structure of the chromosome and the relationship between its components, and predicting the results of the defects that occur in the genetic chain when genetic mutations occur and their effects. | 1. Distinguishing the structure of the chromosome, and the relationship between its components. Explaining the concept of a gene, identifying its components and its location on the chromosome, and explains the occurrence of genetic mutation and its effects on making protein in the cell. |
| | 2. Describing the result of deviation and defect in meiosis, and providing examples. |
| | 3. Comparing nucleic acids, DNA and RNA, and describing their shapes and structures, importance and functions of each type. |
| | 4. Explaining the number and types of chromosomes in the human body's cell, and providing examples. Differentiating between diploid cells and haploid cells, and providing examples for each. |
| 2-Physical Sciences | |
| 2-1 Matter and its interactions | |
| By the end of third grade (9), the student will demonstrate proficiency in: | |
| 9-5-2-1-1 Explaining the development of the atomic model throughout history, and understanding the structure and components of the atom. | 1. Explaining atomic models and their development throughout history, evaluating them and describing their results, and relating that to aspects of the nature of science and the development of scientific knowledge. |
| | 2. Illustrating the components of the atom's nucleus (protons and neutrons) and their properties, describing the movement of electrons (electronic cloud) around the nucleus, and determining the number of protons, neutrons and electrons in the atom of the elements based on their atomic numbers. |
| | 3. Defining isotopes, providing an example of them, comparing isotopes of an element according to mass and atomic numbers, explaining the meaning of radioactive decay, and how it occurs, and differentiating between it and radioactive transformation. |
| | 4. Comparing alpha and beta particles, explaining the changes that occur in the nucleus upon emission of each of them, and their uses in life, explaining the concept of decay rate (half-life), and calculating the half-life of some isotopes. |
| 9-5-2-1-2 Comparing between compounds and mixtures, classifying mixtures, suggesting appropriate methods to separate their components, and distinguishing between types of solutions and their components. | 1. Comparing compounds and mixtures according to their chemical and physical properties. |
| | 2. Classifying homogeneous and heterogeneous mixtures according to the nature of their components. |
| | 3. Identifying the component of the solution, and factorsaffecting it, distinguishing different types of solutions from everyday life, defines aqueous solutions, and explains why water is considered a universal solvent |

# Science Section

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| 9-5-2-1-3 Determining the concept of solubility, the rate of solubility in a solution, and deducing the factors affecting the solubility rate of a solute in a solvent. | 1. Defining the concept of solubility and the rate of dissolution in a solution graphically and describing the relationship between the solvent and the solute according to the concept of solubility. |
| | 2. Inferring the effect of temperature and compound composition on the solubility of a solution and explaining it. |
| | 3. Inferring the factors affecting the rate of solubility of the solute in the solvent for different types of solutions. |
| 9-5-2-1-4 Explaining the properties of liquids, comparing crystalline and amorphous solids, and describing the pattern of crystals in solids. | 1. Explaining the properties of liquids (viscosity, surface tension) according to the composition of the substance, the arrangement of its molecules, and the forces between them. |
| | 2. Comparing crystalline and non-crystalline solids according to the organization and arrangement of their atoms. |
| | 3. Describing the organization of molecules in crystalline solids by building models that describe their structure. |
| 9-5-2-1-5 Describing the history of the periodic table, explaining how the elements are organized in the periodic table, and the properties of the elements and their common uses. | 1. Explaining the contributions of scientists to the arrangement of the elements discovered in the periodic table and the history of its development leading to the modern periodic table. |
| | 2. Explaining the properties of the elements in the periodic table sectors within the period and group, and lists the uses of the common elements around it. |
| | 3. Explaining the element key, naming some chemical elements and knowing how to write their chemical symbols. Distinguishing between metals, non-metals and metalloids, and providing examples thereof. |
| | 4. Recognizing the location of the representative elements, the transitional elements, and the inner transition (lanthanides and actinides) in the periodic table, based on their electronic composition, predicting their physical and chemical properties, and identifying some of their uses. |
| | 5. Explaining the meaning of processed elements and catalyst, and providing examples for each. |
| 9-5-2-1-6 Comparing acids and bases according to their properties and uses, and their effect on reagents. | 1. Comparing acids and bases according to their properties and determining their applied uses in real life cases. |
| | 2. Comparing the strength of acids and bases using the pH and explaining the effect of acids and bases on some reagents. Explaining what is meant by a neutralization reaction and providing examples. |
| | 3. Inferring that salts result from the reaction of acids and bases, determining its properties, and naming some types of salts and their uses. |
| 9-5-2-1-7 Explaining how atoms bond with each other, identifying what is a chemical bond and how it is formed, and distinguishing between different types of bonds. | 1. Describing how electrons are arranged within the atom, and its relationship to their position in the periodic table. Comparing the numbers of electrons in each energy levels, and determining the lowest and highest energy levels of an element. |
| | 2. Describes the states of the outer electron level (valence electrons) through the periodic chemical properties of elements within the same group. |
| | 3. Illustrating the electronic distribution of a number of groups of the periodic table, and explaining the method of dot representation of electrons, and represent it for a number of elements. |
| | 4. Explaining the concept of a chemical bond, comparing its different types (ionic, covalent, metallic, and polar), and describing how atoms are linked together by different chemical bonds to form compounds, using examples and illustrative models. |
| | 5. Distinguishing between an ion, a molecule, a compound, and give examples for each one, explaining what is meant by a chemical formula, and its indication through various examples. |
| 9-5-2-1-8 Understanding how a chemical reaction occurs, expressing it in a balanced chemical equation based on the law of conservation of mass, and distinguishing chemical reactions according to the energy associated with them. | 1. Explaining information on the properties of materials before and after a reaction, determining whether a reaction will occur or not, and describing indications of its occurrence. |
| | 2. Describing a chemical reaction using a balanced verbal and symbolic chemical equation and apply the law of conservation of mass to different chemical reactions. |
| | 3. Listing the different forms of energy associated with chemical reactions (absorbed, released), and providing examples thereof. |
| | 4. Distinguishing between an endothermic reaction and an exothermic reaction, providing examples of each, explaining how to express them in a chemical equation. |

# Science Section

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| 9-5-2-1-9 Describing the speed of chemical reactions and identifying the factors affecting them | 1. Defining the rate of a chemical reaction and determining how it is measured and the factors or conditions affecting it, distinguishing between automatic and non-spontaneous ones, providing examples thereof. |
| | 2. Determining the factors affecting the rate of a chemical reaction (concentration of reactants, concentration of reactants, pressure, temperature, catalyst). |
| | 3. Explaining the concept of activation energy and its role in the rate of reaction and providing an example of it. |
| | 4. Defining inhibitors, catalysts, and enzymes and explaining the importance of their use to slow down or speed up chemical reactions, and providing examples. |
| Physical Sciences | |
| 2-2 Motion and Forces | |
| 9-5-2-2-1 Describing the movement of a body based on the concepts of the main elements of movement and distinguishing between them. | 1. Distinguishing between types of velocity theoretically and graphically by calculating the velocity value of a moving object. |
| | 2. Explaining the concept of acceleration for a moving body, and indicating the time of its occurrence. Calculating the value of positive and negative acceleration |
| | 3. Explaining the relationship between acceleration, velocity, displacement, time and direction of motion theoretically and mathematically. |
| | 4. Identifying the circular motion, show the effect of the centripetal force on it, and provide an example of it. |
| 9-5-2-2-2 Understanding the concept of momentum and the law of momentum conservation. | 1. Explaining the concept of momentum, listing daily life examples of it, identifying the factors affecting it, and describing it graphically and mathematically. |
| | 2. Calculating the magnitude of momentum mathematically for a moving body. Explaining the law of conservation of momentum theoretically and mathematically. |
| | 3. Predicting the motion of bodies based on the principle of conservation of momentum and providing examples thereof. |
| 9-5-2-2-3 Understanding the concept of friction force, its types, and how it affects the movement of objects. | 1. Stating Newton's first law of motion and providing examples thereof. |
| | 2. Defining the force of friction, give examples of it, and explaining how friction affects motion. |
| | 3. Listing types of friction (static, sliding, and rolling), distinguishing each type, and providing examples thereof. |
| 9-5-2-2-4 Understanding the concept of moment of inertia and reformulating Newton›s first law based on it. | 1. Clarifying the concept of moment of inertia. Giving examples of factors affecting inertia in daily life |
| | 2. Formulating Newton's first law according to the moment of inertia. |
| 9-5-2-2-5 Understanding Newton›s second law theoretically and graphically and determining the relationship between body acceleration and the factors affecting it. | 1. Explaining Newton's second law theoretically and graphically. Listing daily life examples. |
| | 2. Determining the relationship between the acceleration of the body and the factors affecting it, based on Newton's second law, theoretically and mathematically. |
| | 3. Calculating the value of the acceleration of the body affected by the resultant force mathematically. |
| | 4. Defining the force of gravity and its effects on bodies and providing examples. |
| | 5. Defining the concept of weight, differentiating between the weight and the mass. Calculating the weight of an object mathematically. |

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| 9-5-2-2-6 Understanding Newton›s third law and calculating the value of mutual forces mathematically based on it. | 1. Determining the magnitude and direction of the mutual forces between two bodies, theoretically and graphically, and calculating them mathematically. |
| | 2. Formulating Newton's third law and giving practical daily life examples. Explaining some phenomena in light of it, such as weightlessness and free fall, theoretically and graphically |
| | 3. Explaining gravitational attraction between two bodies and the factors affecting it based on the universal law of attraction. |
| 2-3 Electromagnetism | |
| 9-5-2-3-1 Explaining the concept of electric current and methods of generating it in electrical circuits and its relationship to voltage and electrical resistance, and distinguishing between direct and alternating currents. | 1. Explaining the concept of electric current theoretically and by drawing. |
| | 2. Describing the methods of generating electric current in electrical circuits |
| | 3. Determines the relationship between electric current, electric voltage, and electrical resistance, and calculates the value of each using Ohm's law mathematically |
| | 4. Distinguishing between direct current and alternating current and their sources |
| 9-5-2-3-2 Understanding the relationship between the electric field and the electric and compares electric and magnetic fields using theoretical explanations and diagrams. | 1. Explaining the formation of the electric force between charges theoretically and graphically, and describing its relationship to the electric field. |
| | 2. Comparing the magnetic field and the electric field theoretically and by drawing. |
| | 3. Explaining the components and role of electrical circuits in energy transmission. |
| | 4. Comparing between series and parallel connection in electrical circuits, theoretically and by drawing. |
| 9-5-2-3-3Comparing between different types of materials in terms of their electrical conductivity. | 1. Comparing the types of materials in terms of their electrical conductivity. Providing examples of conductive and insulating materials and their uses in daily life. |
| | 2. Explaining the meaning of superconductors, explaining their characteristics, providing an example of these materials, and listing their uses. |
| 9-5-2-3-4 Interpreting the relationship between magnets and electric current and their role in designing devices that convert electrical energy into mechanical energy and vice versa. | 1. Explaining the relationship between the electric current and the magnetic field, and deducing the factors that control it. |
| | 2. listing its applied uses, and showing how an electric current generates a magnetic field. |
| | 3. Defining the magnetic region, explaining how magnets are generated, and providing an example. |
| | 4. Suggesting devices that convert electrical energy into mechanical energy and vice versa, using magnetic fields produced by currents. |
| Physical Sciences | |
| 2-4 Energy | |
| 9-5-2-4-1 Clarifying the concept of thermal energy, its impact and its relationship to temperature. | 1. Explaining the concept of thermal energy. Giving examples of thermal energy and its effects on his daily life |
| | 2. Describing the relationship between thermal energy and temperature. |

# Science Section

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| 9-5-2-4-2 Understanding the mechanism of heat transmission and conduction between objects, and measuring temperature. | 1. Explaining the transfer and conduction of heat between objects. |
| | 2. Comparing the methods of transmission and conduction of thermal energy between objects. |
| | 3. Distinguishing between materials based on their degree of heat conduction. |
| | 4. Explaining the method of designing a thermometer. Comparing the properties of temperature scales (Celsius, Fahrenheit, and Kelvin) and mathematically convert between them. |
| 9-5-2-4-3Understanding specific heat and the factors affecting it. | 1. Explaining the concept of specific heat. |
| | 2. Determining the factors affecting the body's absorption or loss of thermal energy. |
| 9-5-2-4-4 Distinguishing between the kinetic and potential energy of a body and the factors affecting them. | 1. Comparing between the characteristics of the body's kinetic energy, potential energy, and the factors affecting each type. And provides real-world examples of conversion between the two |
| | 2. Deducing the linear and non-linear relationship between kinetic energy and the mass and speed of the moving body and express it mathematically. |
| | 3. Calculating the kinetic and potential energy of objects, and deducing the relationship between them. |
| | 4. Predicting the relationship between the potential energy and the height of the object above the Earth's surface. |
| 9-5-2-4-5 Understanding the law of energy conservation during its transformations and suggesting ways to generate energy. | 1. Giving examples from the surrounding environment that illustrate the concept of energy transformation from one form to another. |
| | 2. Tracking a series of applications of technical or natural energy transformations and applying the law of conservation of energy in it. |
| | 3. Proposing ways to generate energy from renewable and non-renewable natural resources depending on the mechanism of energy generation. |
| Physical Sciences | |
| 2-5 Waves and vibrations | |
| 9-5-2-5-1 Understanding the behavior and characteristics of sound waves. | 1. Explaining the concept of sound wave theoretically and by drawing, Determining the type of sound wave (longitudinal or transversem, Describing the properties of sound waves (wavelength, frequency, amplitude) mathematically and graphically. |
| | 2. Distinguishing between the intensity of the sound, its sharpness, and its pitch. |
| | 3. Explaining the occurrence of echo and its applications in daily life. |
| 9-5-2-5-2 Understanding the behavior of light waves, their distinctive properties, and their associated applications. | 1. Explaining the concept of light wave theoretically and by drawing, and defining the type of light wave (longitudinal or transverse.), describing the properties of light waves (wavelength, frequency, amplitude) mathematically and graphically. |
| | 2. Explaining color vision based on the properties of light waves as they travel through physical media. |
| | 3. Explaining with examples the applications of light electromagnetic spectrum in everyday life. |
| | 4. Explaining the reflection, refraction, and absorption of light through its transmission through different media. |

# Science Section

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| 3- Earth and space sciences | |
| 3-1 The universe and the solar system | |
| By the end of third grade (9), the student will demonstrate proficiency in: | |
| 9-5-3-1-1<br>Describing some of the methods, techniques and tools used in exploring the universe. | 1. Explaining the means, techniques and tools used in space exploration and listing the most important space flights. |
| | 2. Explaining one of the means of exploring the universe, illustrating its basic characteristics and its most prominent advantages. |
| | 3. Organizing and analyzing the data and information available on the vastness and magnitude of the universe, on the number of galaxies, their cosmic distances and paths, to provide evidence for them. |
| 9-5-3-1-2<br>Analyzing information related to the movement of celestial bodies and their apparent and relative locations, and deducing the conditions prevailing in them. | 1. Describing the prevailing climatic conditions in some planets of the solar system. |
| | 2. Analyzing information related to the movement of celestial bodies across the sky to know their apparent and relative locations. |
| | 3. Evaluating the supporting or denying information about the existence of life outside of planet Earth |
| At the end of Grade Nine (9) students will be able to: | |
| Earth and space sciences | |
| 3-2 Earth System | |
| 9-5-3-2-1 Explaining the causes of climate change, its effects and associated phenomena. | 1. Describing the changes resulting from the phenomenon of heat transfer, retention and their effects. |
| | 2. Analyzing data to identify similarities and differences in temperatures in the surrounding area. |
| | 3. Providing evidence of the causes of climate change in some parts of the world and its future consequences. |
| 9-5-3-2-2 Understanding the importance of the carbon cycle, its geological utility and describing the phenomena associated with it. | 1. Determining the rates and locations of carbon in the Earth's layers and explaining the process by which it is cyclically transported. |
| | 2. Describing the phenomena associated with the process of carbon transport through the earth's layers and various materials. |
| | 3. Illustrating the role of organic carbon in the life of organisms after their death its importance, and usefulness. |
| 9-5-3-2-3 Describing the natural cycles and identifying their causes and benefits. | 1. Explaining how natural cycles occur in the local environment and determining their usefulness. |
| | 2. Analyzing information and data related to natural cycles and their effects on the environment |
| 9-5-3-2-4 Describing the types of rocks and minerals, their characteristics and uses. | 1. Determining the general and specific characteristics of rocks and minerals, and indicating their uses in his area. |
| | 2. Classifying minerals and providing examples for comparison to identify similarities and differences between them. |

# Science Section

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| 9-5-3-2-5 Explaining the characteristics of different rocks, their classification methods, and the cycle of their change from one type to another. | 1. Classifying Igneous rocks according to their characteristics and locations of origin. |
| | 2. Comparing the types of metamorphic rocks to determine the similarities and differences in their characteristics. |
| | 3. Explaining the characteristics of sedimentary rocks, the method of their formation, and the best way to classify them. |
| | 4. Describes the rock cycle, the transformation of rocks from one type to another, and the processes and changes associated with it. |
| 9-5-3-2-6 Explaining the causes of stresses affecting the rocks that make up the Earth's interior, and describing the resulting effects. | 1. Defining the concept of crack, listing the types of cracks (normal, reverse, lateral, or slip), and distinguishing each type by drawing. |
| | 2. Defining earthquakes, seismic waves and their types, and defining the epicenter of the earthquake and distinguishing each of them through drawing. |
| | 3. Explaining the phenomena resulting from earthquakes, explaining the reasons of their occurrence, showing their destructive effects, and explaining ways to be safe from them. |
| | 4. Listing the different forms of volcanoes (shield, conical, compound, and fissure eruptions), identifying and distinguishing each of them, and providing an example. |
| 9-5-3-2-7 Analyzing information and data related to the theory of plate motion and continental drift and predicting its results and benefits. | 1. Defining the theory of the earth's plates, their structure and components, listing their types (oceanic and continental), identifying the lithosphere, the plate and the fluid layers, and distinguishing the shape of each of them. |
| | 2. Explaining what is meant by moving plate boundaries, listing their types (convergence boundaries, divergence boundaries, and lateral or transformational boundaries), and distinguishing each type. |
| | 3. Explaining the relationship of volcano sites and earthquake centers to plate boundaries, showing the effect of divergent plate boundaries, defining rupture pits, and providing an example of them. |
| | 4. Explaining the results related to the reasons for platelet movement, its benefits, and the positive aspect of it. |
| Earth and space sciences | |
| 3-3 earth and human activity | |
| 9-5-3-3-1 Tracking some of the changes that occurred to the Earth as a result of human activity and exploring the natural hazards that may occur on Earth and how to predict them. | 1. Describing the impact of human activity on the future of the Earth and predicting various and adverse changes in human life. |
| | 2. Analyzing data and information about natural events on Earth to comparing them in terms of their effects, and to knowing the role of science in predicting them and limiting their damage. |
| | 3. Proposing solutions and means to prevent natural and human hazards and proving their effectiveness. |
| 9-5-3-3-2 Determining the sources of natural resources, ways of managing them, and the importance of preserving and developing them. | 1. Describing environmental changes and their negative effects on natural resources and tracks their occurrence over time. |
| | 2. Predicting the effects and variables when relying entirely on non-renewable energy sources. |
| | 3. Proposing solutions and means to preserve natural resources and protect them from pollution and depletion |

## Cognitive Levels:

**Cognitive levels in the Science Domain are defined as a set of organized and interconnected mental processes to be assessed, reflecting the learner's ability to think, analyze data and information, and draw conclusions, as well as the ability to extend scientific inquiry through asking scientific questions. These levels are structured within three comprehensive and clearly defined core cognitive levels, each accompanied by a precise and explicit description of its sub-cognitive levels. The framework also clarifies the relationship between these cognitive levels and the knowledge structure of the natural sciences.**

**The following is a brief description of these cognitive levels, highlighting the key mental processes included in each level:**

01 Knowledge: reflects the learner's ability to recall and retrieve scientific knowledge, understand it, describe it, and provide examples of it, and the skills included within this level are essential for assessing foundational scientific understanding.

02 Application: reflects the learner's ability to use scientific knowledge to generate scientific explanations, solve practical problems, compare, identify relationships, use models, and apply conceptual knowledge in contexts related to natural science learning.

03 Reasoning: reflects the learner's ability to think critically, analyze data and information, draw conclusions, extend scientific inquiry by formulating scientific questions, broaden applications through creative thinking, formulate hypotheses, conduct investigations, and use evidence in analysis, synthesis, and generalization.

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