Secondary 4 SN Mathematics IB 2018-2019

<u>Conceptual understanding</u>— A concept is *a big idea*. Here are *the BIG ideas* (KEY CONCEPTS) that you will focus on throughout all your subjects in the IBMYP.

Aesthetics	Change	Communication	Communities
Connections	Creativity	Culture	Development
Form	Global interactions	Identity	Logic
Perspective	Relationships	Time, place and space	Systems

The shaded ones are specific to, but not exclusive to, mathematics.

Form is the shape and underlying structure of an entity or piece of work, including its organization, essential nature and external appearance. **Form** *in MYP mathematics* refers to the understanding that the underlying structure and shape of an entity is distinguished by its properties. Form provides opportunities for students to appreciate the aesthetic nature of the constructs used in a discipline.

Logic is a method of reasoning and a system of principles used to build arguments and reach conclusions. **Logic** *in MYP mathematics* is used as a process in making decisions about numbers, shapes, and variables. This system of reasoning provides students with a method for explaining the validity of their conclusions.

Relationships allow students to identify and understand connections and associations between properties, objects, people and ideas—including the human community's connections with the world in which we live. Any change in relationships brings consequences—some of which may occur on a small scale, while others may be far-reaching, affecting large systems like human societies and the planet as a whole. **Relationships** *in MYP mathematics* refers to the connections between quantities, properties or concepts and these connections may be expressed as models, rules or statements. Relationships provide opportunities for students to explore patterns in the world around them. Connections between the student and mathematics in the real world are important in developing deeper understanding.

To support the study of the *big ideas* we will consider <u>related concepts</u>: the related concepts listed below are specific to mathematics and they will support the learning of the KEY CONCEPTS.

Related concept	Definition
Change	A variation in size, amount or behaviour
Equivalence	The state of being identically equal or interchangeable, applied to statements, quantities, or expressions
Generalization	A general statement made on the basis of specific examples
Justification	Valid reasons or evidence used to support a statement
Measurement	A method of determining quantity, capacity or dimension using a defined unit
Model	A depiction of a real-life event using expressions, equations or graphs
Pattern	A set of numbers or objects that follow a specific order or rule
Quantity	An amount or number
Representation	The manner in which something is presented
Simplification	The process of reducing to a less complicated form
Space	The frame of geometrical dimensions describing an entity
System	A group of interrelated elements

Global context

Everything will be looked at through or within a global context.
- identities and relationships
- orientation in space and time
- personal and cultural expression
- scientific and technical innovation **
- globalization and sustainability
- fairness and development

As always, along the way we develop **Approaches to Learning Skills**
- Thinking skills ex. prioritize in problem solving
- Social skills ex. help others to be successful in group work
- Communication skills ex. organize and interpret data
- Self-Management skills ex. focus and concentrate through multi-step problems
- Research skills ex. use a variety of technologies to source information

You will be evaluated on the following criteria:

Criterion A: Knowing and understanding Maximum: 8

At the end of year 4, students should be able to:

i. select appropriate mathematics when solving problems in both familiar and unfamiliar situations
ii. apply the selected mathematics successfully when solving problems
iii. solve problems correctly in a variety of contexts.

Achievement level	Level descriptor
0	The student does not reach a standard described by any of the descriptors below.
1–2	The student is able to: i. select appropriate mathematics when solving simple problems in familiar situations ii. apply the selected mathematics successfully when solving these problems iii. generally solve these problems correctly
3–4	The student is able to: i. select appropriate mathematics when solving more complex problems in familiar situations ii. apply the selected mathematics successfully when solving these problems iii. generally solve these problems correctly
5–6	The student is able to: i. select appropriate mathematics when solving challenging problems in familiar situations ii. apply the selected mathematics successfully when solving these problems iii. generally solve these problems correctly
7–8	The student is able to: i. select appropriate mathematics when solving challenging problems in both familiar and unfamiliar situations ii. apply the selected mathematics successfully when solving these problems iii. generally solve these problems correctly

Criterion B: Investigating Patterns   Maximum: 8

At the end of year 4, students should be able to:

i. select and apply mathematical problem-solving techniques to discover complex patterns
ii. describe patterns as general rules consistent with findings
iii. prove, or verify and justify, general rules.

Achievement level	Level descriptor
0	The student does not reach a standard described by any of the descriptors below.
1–2	The student is able to: i. apply, with teacher support, mathematical problem-solving techniques to discover simple patterns ii. state predictions consistent with patterns
3–4	The student is able to: i. apply mathematical problem-solving techniques to discover simple patterns ii. suggest general rules consistent with findings
5–6	The student is able to: i. select and apply mathematical problem-solving techniques to discover complex patterns ii. describe patterns as general rules consistent with findings iii. verify the validity of these general rules
7–8	The student is able to: i. select and apply mathematical problem-solving techniques to discover complex patterns ii. describe patterns as general rules consistent with correct findings iii. prove, or verify and justify, these general rules

Criterion C: Communicating   Maximum: 8

At the end of year 4, students should be able to:

i. use appropriate mathematical language (notation, symbols and terminology) in both oral and written explanations
ii. use appropriate forms of mathematical representation to present information
iii. move between different forms of mathematical representation
iv. communicate complete, coherent and concise mathematical lines of reasoning
v. organize information using a logical structure.

Achievement level	Level descriptor
0	The student does not reach a standard described by any of the descriptors below.
1–2	The student is able to: i. use limited mathematical language ii. use limited forms of mathematical representation to present information iii. communicate through lines of reasoning that are difficult to interpret.
3–4	The student is able to: i. use some appropriate mathematical language ii. use appropriate forms of mathematical representation to present information adequately iii. communicate through lines of reasoning that are complete iv. adequately organize information using a logical structure.
5–6	The student is able to: i. usually use appropriate mathematical language ii. usually use appropriate forms of mathematical representation to present information correctly iii. usually move between different forms of mathematical representation iv. communicate through lines of reasoning that are complete and coherent v. present work that is usually organized using a logical structure.
7–8	The student is able to: i. consistently use appropriate mathematical language ii. use appropriate forms of mathematical representation to consistently present information correctly iii. move effectively between different forms of mathematical representation iv. communicate through lines of reasoning that are complete, coherent and concise v. present work that is consistently organized using a logical structure.

Criterion D: Applying mathematics in real-life contexts Maximum: 8

At the end of year 4, students should be able to:

i. identify relevant elements of authentic real-life situations
ii. select appropriate mathematical strategies when solving authentic real-life situations
iii. apply the selected mathematical strategies successfully to reach a solution
iv. justify the degree of accuracy of a solution
v. justify whether a solution makes sense in the context of the authentic real-life situation.

Achievement level	Level descriptor
0	The student does not reach a standard described by any of the descriptors below.
1–2	The student is able to: i. identify some of the elements of the authentic real-life situation ii. apply mathematical strategies to find a solution to the authentic real-life situation, with limited success.
3–4	The student is able to: i. identify the relevant elements of the authentic real-life situation ii. select, with some success, adequate mathematical strategies to model the authentic real-life situation iii. apply mathematical strategies to reach a solution to the authentic real-life situation iv. discuss whether the solution makes sense in the context of the authentic real-life situation.
5–6	The student is able to: i. identify the relevant elements of the authentic real-life situation ii. select adequate mathematical strategies to model the authentic real-life situation iii. apply the selected mathematical strategies to reach a valid solution to the authentic real-life situation iv. explain the degree of accuracy of the solution v. explain whether the solution makes sense in the context of the authentic real-life situation.
7–8	The student is able to: i. identify the relevant elements of the authentic real-life situation ii. select appropriate mathematical strategies to model the authentic real-life situation iii. apply the selected mathematical strategies to reach a correct solution to the authentic real-life situation iv. justify the degree of accuracy of the solution v. justify whether the solution makes sense in the context of the authentic real-life situation.

Other IB vocabulary:

Authentic real-life	Relevant, meaningful and grounded in reality
Challenging	Demanding problems of high complexity that require students to have mathematical insight to be able to use knowledge and/or skills taught
Context	The setting of the problem
Familiar situations	Problems similar to those seen previously in which students are required to use knowledge and/or skills they have been taught
Forms of mathematical representation	Words, formulae, diagrams, tables, charts, graphs and models used to represent mathematical information
Investigation	A task where, to varying degrees, students are given opportunities to pose questions, select problem-solving opportunities to pose questions, select problem-solving techniques, discover patterns, make generalizations and communicate their findings.
Justification	Valid reasons or evidence that support the conclusion and explain why the rule works
Lines of reasoning	A connected sequence of steps
Logical structure	A general layout that prevents the need for going back and forth (between the task sheet and the student work and within the student work) in order to understand and follow the work
Mathematical language	The use of notation, symbols, terminology and verbal explanations
Pattern	The underlining order, regularity or predictability of the elements of a mathematical system. The repetitive features of patterns can be identified and described as relationships or general rules.
Problem-solving techniques	Strategies students use to solve problems (for example, make a table or chart, solve a simpler problem, work backwards, draw a picture, guess and check, and so on)

Command Terms for IB Math – these are *actions* you will take:

Term	Definition
Apply	Use knowledge and understanding in response to a given situation or real circumstances. Use an idea, equation, principle, theory or law in relation to a given problem or issue.
Communicate	Express oneself in such a way that one is readily and clearly understood. Convey information about the exchange of thoughts, messages, or information through, for example, speech, signals, writing or behaviour.
Demonstrate	Prove or make clear by reasoning or evidence, illustrating with examples or practical application.
Describe	Give a detailed account or picture of a situation, event, pattern or process.
Discuss	Offer a considered and balanced review that includes a range of arguments, factors or hypotheses. Opinions or conclusions should be presented clearly and supported by appropriate evidence.
Explain	Give a detailed account including reasons or causes.
Identify	Provide an answer from a number of possibilities. Recognize and state briefly a distinguishing fact or feature.
Justify	Give valid reasons or evidence to support an answer or conclusion.
Prove	Use a sequence of logical steps to obtain the required result in a formal
Select	Choose from a list or group
Solve	Obtain the answer(s) using algebraic and/or numerical and/or graphical methods.
State	Give a specific name, value or other brief answer without explanation or calculation
Suggest	Propose a solution, hypothesis or other possible answer.
Use	Apply knowledge or rules to put theory into practice
Verify	Provide evidence that validates the result

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