

MATHEMATICS

SUBJECT CONTINUUM



The TRINT mathematician goes through a developmental journey that involves a global language involving symbols, investigation and play. The students look at the application of mathematics to real-life skills and are active participants in their learning. Teachers need to use and develop their own mathematical knowledge to prepare, excite and develop their learners.

Mathematics at TRINT is taught through inquiry-based learning, and the student should be aware of transdisciplinary connections. The students will explore and develop skills related to knowledge and understanding, pattern and investigation, communication and real-life application.

These intentions will allow the students at TRINT to: develop an appreciation for the mathematics with an intrinsic value, utilise the global language of mathematics to solve problems on the global stage, and prepare the students for society and real-life.

HOW TO READ THIS DOCUMENT:

The document is sectioned into two parts; the Primary Years Programme (PYP) and the Middle Years Programme (MYP).

PRIMARY YEARS PROGRAMME,

IN THE SECTION FOR THE PYP YOU WILL FIND:

Written Curriculum for the various year levels.

Contains conceptual understandings from the International Baccalaureate PYP subject documents as well as competency targets from the Norwegian curriculum. We are obliged to teach the Norwegian curriculum, and we teach through the framework and lens of the IB. Therefore, they are written parallel to each other to show correlation.

Examples of taught curriculum

Examples of how we work with the targets above in our lessons and our units. This is not an extensive list, neither is it a representation of what is done every year. It gives insight into methods and approaches that may be used by our teachers.

Milestones

The milestones refer to skills and understandings that we believe a child will reach by the end of this age-mix. These are milestones that we are working towards, connected to the written curriculum.

How can you support your child

These are tips from our teachers on how you can support your child in the subject at home, outside of the regular homework.

PRIMARY YEARS PROGRAMME

How are mathematics practices changing?	
Increased emphasis on:	Decreased emphasis on:
connecting mathematical concepts and applications to learning	treating mathematics as isolated concepts and facts
manipulatives, to make mathematics understandable to students	rote learning, memorization and symbol manipulation
real-life problem solving using mathematics	word problems as problem solving
instruction built on what students know, what they want to know, and how they best might find out	instruction focused on what students do not know
a variety of strategies for possible multiple solutions—emphasis on process	one answer, one method, emphasis on answer
students being encouraged to speculate and pursue hunches	the teacher as the sole authority for right answers
a broad range of topics regardless of computational skills	computational mastery before moving on to other topics
mathematics as a means to an end	teaching mathematics disconnected from other learning
the use of calculators and computers for appropriate purposes	a primary emphasis on pencil and paper computations
programme of inquiry as the context for learning	the textbook as the context for learning
students investigating, questioning, discussing, justifying and journaling their mathematics	the use of worksheets
students and teachers engaged in mathematical discourse.	teacher telling about mathematics.

PYP 1 – 2 WRITTEN CURRICULUM

PYP conceptual understandings	Norwegian Curriculum
Numbers can be used in many ways for different purposes in the real world.	explore numbers, amounts, totals, and counting through play, in nature, in visual arts, music, and children's literature, represent numbers in different ways and be able to switch between different representations
Making connections between our experiences with number can help us to develop number sense.	
Numbers are a naming system	explore and describe general properties of even and odd numbers
Numbers are connected to each other through a variety of relationships.	experiment with counting both backwards and forwards, choosing different starting points and intervals between numbers and patterns in counting
The base 10 place value system is used to represent numbers and number relationships.	describe the place value system using different representations
Number operations can be modelled in a variety of ways.	place numbers on the number line and use the number in arithmetic and problem solving
Number operations can be modelled in a variety of ways.	explore addition and subtraction and use them to formulate and solve problem through play and in your own day-to-day life
explore the commutative and associative properties of addition and use it in mental math	There are many mental methods that can be applied for exact and approximate computations.
Patterns and sequences occur in everyday situations.	recognise and describe repetitive units in patterns and create own patterns
Patterns repeat and grow.	
Shapes can be described and organized according to their properties.	explore, draw and describe geometric figures from local environment and argue for ways to sort them according their properties
Shapes are classified and named	
Measurement involves comparing objects and event	measure and compare lengths and areas with the help of non-standardised and standardised units of measurements, describe how and discuss the results
objects have attributes that can be measured using non-standard units.	
Standard units allow us to have a common language to identify, compare, order and sequence objects and events.	explain how one can describe time using clock and a calendar
We use tools to measure the attributes of objects and events	use tools, volume and target weight and simple techniques in conjunction with cooking (Mat og Helse)
Events can be ordered and sequenced.	create and follow rules and sequenced instructions in play and games

EXAMPLES OF TAUGHT CURRICULUM

- Working with **number place and value** through counting forwards and backwards, from different numbers, early addition and subtraction strategies (using number line, base 10 cubes, multilinks, counting on, counting backwards), recognizing and counting quantities in pictures and real life, ordinality / cardinality - numbers as quantities (amounts), lists (1st, 2nd) and labels (33 bus), partitioning for problem solving, adding and subtracting, early multiplication and division, money transfer, prealgebra, exploring infinity in the number line, double and halving, odd and even numbers in real life,
- Working with **data handling** through representing data, reading and creating bar graphs and pictograms, reading and tally, sorting and classifying. Eg. venn and carroll diagram
- Working with **shapes and space** through 2D shapes, properties of polygons, symmetry, position and direction, computing, measuring, patterns and function
- Sequences, predicting what comes next, creating their own pattern/sequence, day, week, month, year, seasons, temperature (also negative numbers), time analog/digital, Norwegian / non-norwegian.

MILESTONES:

- Add and subtract with numbers between 0 – 20
- Recognize, write numbers up to 100
- Understanding relational signs: = > <
- Understand that the number line is infinite in all directions.
- Develop informal strategies for measurements
- Knowing days and months and tell what year we are in.
- Knowing full and half hour on analog and digital
- Explore properties of shapes

HOW YOU CAN SUPPORT YOUR CHILD:

- Keep maths real life based not abstract (baking, counting at home, seeing maths in the environment)
- Build resilience by celebrating errors as a path to learning.
- Asking mathematical questions, ask for their reasoning.
- Show your thinking.
- Explore money
- Estimate when talking maths
- Play board games such as yatzy battleship, tic tac toe, chess, monopoly etc.

PYP 3 – 4 - WRITTEN CURRICULUM

PYP conceptual understandings	Norwegian Curriculum
The operations of addition, subtraction, multiplication and division are related to each other and are used to process information to solve problems.	develop and use appropriate strategies for subtraction in practical situations
	explore and explain connections between addition and subtraction and use it in mental math and problem solving
	explore and explain the connections between the four operations and use the connections appropriately
	make arithmetic expressions for practical situations and find practical situations that fit the inverse operation
Number operations can be modelled in a variety of ways	experiment with multiplication and division in everyday situations
	represent multiplication in different ways and go back and forth between the different representations.
	represent division in different ways and go back and forth between the different representations.
	explore and use division as both sharing and partitioning in practical situations
	explore, use and describe different division strategies
There are many mental methods that can be applied for exact and approximate computations.	use communitive, associative and distributive properties to explore and describe strategies in multiplication.
Whole numbers exhibit patterns and relationships that can be observed and described.	Describe similarities and differences in comparing sizes, amounts, expressions and number use the symbol for equal and not equal.
Some events in daily life are more likely to happen than others. Objects and events can be organized in different ways.	model situations from their own everyday and explain their thinking
	make arithmetic expressions for practical situations and find practical situations that fit the inverse operation
Functions are relationships or rules that uniquely associate members of one set with members of another set	create algorithms and express them by using variables, conditions and loops.
By analysing patterns and identifying rules for patterns it is possible to make predictions.	explore and describe the structures and patterns in play and games
Patterns can be represented using numbers and other symbols.	explore equilibrium and balance in practical situations, representing this in different ways and going back and forth between different representations.
Standard units allow us to have a common language to identify, compare, order and sequence objects and events.	use different units of measure for length and mass in practical situations and justify your choice of unit of measure.
Estimation allows us to measure with different levels of accuracy.	use tools, basic techniques and cooking methods to create safe and sustainable food that provides a basis for good health (mat og helse). use recipes in cooking and calculate and evaluate the amount in the portions both with and without the use of digital resources (mat og helse).
Objects in our immediate environment have a position in space that can be described according to a point of reference.	make and follow rules and sequences instructions in play and games connected to the coordinate system.
Shapes are classified and named according to their properties.	explore, describe and compare properties with 2D and 3D shapes by using angles, edges and corners.

EXAMPLES OF TAUGHT CURRICULUM

- Working with **number place and value** through
 - reading and recognizing numbers to a 1000 and beyond, place value system, partitioning, subitizing.
 - Investigating different strategies for addition and subtraction using written methods, mental methods and equipment.
 - Exploring the commutative, associative and distributive laws for addition and subtraction, recognizing and counting different representations of quantities eg. mass, distance, building recalls eg number bonds 1-100,
 - Adding/subtracting 3-digit numbers, - multiplication and division, estimate answers to check if it makes sense, multiplications of 3,4, 8
- Working with **data handling** through exploring the coordinate system, crating different representations of data, as well as reading and interpreting representations of data.
- Working with **shapes and space** through area and perimeter, properties of 3D shapes, regular/irregular, recognizing angles, measuring, patterns and function.
- Sequences, predicting what comes next, creating their own pattern/sequence, day, week, month, year, seasons, temperature (also negative numbers), time analog/digital, Norwegian / non-norwegian.

MILESTONES:

- Division and multiplication with numbers between 0 – 20
- Understanding base ten up to 1000000
- Exploring decimals up to hundredths
- Understanding and represent whole, half, quarters and thirds in fractions
- Being able to use coordinates within simple coordinate systems.
- Being able to describe geometric properties using terms such as sides, angles, vertices, dimentions etc
- Understand negative numbers

HOW YOU CAN SUPPORT YOUR CHILD:

- Keep maths real life based not abstract (baking, carpentry, crafting, counting at home, seeing maths in the environment)
- Ask what their strategies are and show yours.
- Build resilience by celebrating errors as a path to learning.
- Asking mathematical questions, ask for their reasoning.
- Explore money by shopping and setting up budgets
- Estimate when talking maths
- Play board games such as yatzy battleship, tic tac toe, chess, monopoly etc.
- Talk about negatives in loans, temperature or just on the number line.

PYP 5 – 6 Written Curriculum

PYP conceptual understandings	Norwegian Curriculum
Fractions, decimal fractions and percentages are ways of representing whole-part relationships.	explore and explain connections between fractions, decimals and percentages and use it in mental math
	represent fractions in different ways and go back and forth between the different representations
	formulate and solve a problem from real-life situations, which has to do with decimal numbers, fractions and percentages and explain their own ways of thinking
Fractions are ways of representing whole-part relationships.	describe fraction as part of whole, an amount and as part of number on the number line. Assess and name the sizes.
	explore decimal counting strategies and compare integer calculation strategies
For fractional and decimal computation, the ideas developed for whole-number computation can apply	develop and use different strategies for calculating positive numbers and fractions and explaining their reasoning
	formulate and solve a problem from their everyday life that has to do with fractions
There are many mental methods that can be applied for exact and approximate computations	
Probability can be based on experimental events in daily life.	discuss randomness and probability in games and practical situations and relate it to fractions
Probability can be expressed in numerical notations.	
Even complex operations can be modelled in a variety of ways, for example, an algorithm is a way to represent an operation	solve equations and inequalities through logical reasoning and explain what it will say that a number is a solution to an equation
	make and solve tasks in spreadsheets that involve personal economy
Accuracy of measurements depends on the situation and the precision of the tool.	formulate and solve a problem from their everyday life involving the concept of time
Conversion of units and measurements allows us to make sense of the world we live in.	
A range of procedures exists to measure different attributes of objects and events.	

Functions are relationships or rules that uniquely associate members of one set with members of another set.	make and programme algorithms with and using variables conditions and loops
By analysing patterns and identifying rules for patterns it is possible to make predictions.	
Shapes are classified and named according to their properties	describe properties and simple definitions of two- and three-dimensional figures and explain what properties the figures have in common, and what properties separate them from each other
	measure radius, diameter and circumference in circles and explore and justify the relationship
	explore area and volume targets in practical situations and represent them in different ways
	use different strategies to calculate area and perimeter and explore the relationships between these
By analysing patterns and identifying rules for patterns it is possible to make predictions.	explore and describe symmetry in pattern and translation of congruent figures with and without coordinate system
Patterns can often be generalized using algebraic expressions, equations or functions.	use variables and formulas to express contexts in practical situations
Exponential notation is a powerful way to express repeated products of the same number.	use variables, loops, terms and functions in programming to explore geometric shapes and patterns
Functions are relationships or rules that uniquely associate members of one set with members of another set	use variables, luck, terms and functions in programming to explore geometric shapes and patterns

EXAMPLES OF TAUGHT CURRICULUM

- Working with **number place and value** through Fractions, decimals and percentages in real life situations, ratio and proportions, probability, numbers 1-1 000 000 and beyond (eg. Finn.no house prices, personal economy), fraction-wall, adding fractions and equivalent fractions, decimals, methods for calculations.
- Working with **data handling** through spreadsheet, Conversion –km, m, advanced coordinates, reading, interpreting and using data in different forms.
- Working with **shapes and space** through area and perimeter, coordinates NE longitude and latitude, fractions and shapes, patterns and function, programming, writing instructions, games and challenges, floor plans, 2D-3D shapes, coordinate geometry, Circle properties, area and volumes in practical situations, construction work for angles.

MILESTONES:

- Understanding the connection between fractions decimals and percentages and start to convert between.
- Develop strategies for calculating three digits numbers (multiplication, division, addition and subtraction)
- Understand terminology and discuss properties of 2D and 3D shapes.
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HOW YOU CAN SUPPORT YOUR CHILD:

- Bake, cook, plan meals and budgets
- Discuss choices and prices of the meals, e.g. set a limit to how much they can spend.
- Personal bank accounts.
- Plan holidays.
- Use measurements, estimation, fractions etc when building and crafting.
- Involve children in timetabling and home economy (loans, savings, apps, phone bills, priorities, electricity etc)
- Use estimation, fractions and percentages when discussing the above.
- Ask what their strategies are and show yours, ask them to compare strategies and discuss efficiency.
- Build resilience by celebrating errors as a path to learning.
- Asking mathematical questions, ask for their reasoning.
- Play board games such as yatzy battleship, tic tac toe, chess, monopoly etc.

MIDDLE YEARS PROGRAMME,

IN THE SECTION FOR THE MYP YOU WILL FIND:

Written Curriculum for the various year levels.

This section contains the competency targets from the Norwegian curriculum, and a brief outline of the four criteria used for assessment. We are obliged to teach the Norwegian curriculum, and we teach through the framework and lens of the IB.

Examples of taught curriculum

Here you will see examples of how we work with the targets above in our lessons and our units. This is not an extensive list, neither is it a representation of what is done every year. It gives insight into methods and approaches that may be used by our teachers.

Milestones

The milestones refer to skills and understandings that we believe a child will reach by the end of this age-mix. These are milestones that we are working towards, connected to the written curriculum.

How can you support your child

These are tips from our teachers on how you can support your child in the subject at home, outside of the regular homework.

MIDDLE YEARS PROGRAMME

MYP Mathematics is a framework fostering conceptual knowledge rather than a pre-set progression from one single book. Each unit may have components of several areas of Mathematics which are relevant for the unit. The IB framework has therefore not set any pre-made targets but have listed areas that could be covered during the students' years at MYP, but with no regard to order.

In the MYP the students will have assessments leading to a final grade in the subject. In comparison to many other programmes and countries, the MYP assess students in four pre-set criteria that links to the main objectives of the subject.

Criterion A: Knowledge and understanding

Knowledge and understanding are fundamental to studying mathematics and form the base from which to explore concepts and develop skills. This objective assesses the extent to which students can select and apply mathematics to solve problems in both familiar and unfamiliar situations in a variety of contexts.

Criterion B: Investigating patterns

Investigating patterns allows students to experience the excitement and satisfaction of mathematical discovery. Working through investigations encourages students to become risk-takers, inquirers and critical thinkers. The ability to inquire is invaluable in the MYP and contributes to lifelong learning

Criterion C: Communicating

Mathematics provides a powerful and universal language. Students are expected to use appropriate mathematical language and different forms of representation when communicating mathematical ideas, reasoning and findings, both orally and in writing.

Criterion D: Applying mathematics in real-life contexts

MYP mathematics encourages students to see mathematics as a tool for solving problems in an authentic real-life context. Students are expected to transfer theoretical mathematical knowledge into real-world situations and apply appropriate problem-solving strategies, draw valid conclusions and reflect upon their results.

MYP 2-3 Written Curriculum

Norwegian competency targets

Develop and use appropriate strategies when working with fractions, decimals and percentages and explain their thinking methods

Represent and use fractions, decimals and percentages in different ways and explore the mathematical relationships between these representational forms

Exploring negative numbers in real-life situations

Use a number line when working with positive and negative numbers

Use composite calculation expressions to describe and perform calculations

Use different strategies to solve linear equations and inequalities and evaluate whether solutions are valid

Explore and use appropriate measures of central tendencies in their own and others' statistical surveys

Record, sort, present and read data in tables and charts and justify the choice of presentation

Create and assess personal budgets and accounts using spreadsheets with cell references and formulas

Use programming to explore data in tables and datasets

Use exponents and square roots in exploration and problem solving and justify procedures and results

Develop and communicate strategies for mental calculation

Explore and describe prime factorization and utilize it in fractions

Explore algebraic calculus

Describe and generalize patterns both algebraically, and using own words

Create and solve problems relating to composite measurement units

Create and explain calculation expressions with numbers, variables and constants linked to real-life situations

Create, solve and explain equations related to real-life situations

Explore, explain and compare functions related to real-life situations

Represent functions in different ways and show connections between the representations

Explore how algorithms can be created, tested and improved using programming

EXAMPLES OF TAUGHT CURRICULUM

- Working with **number place and value** through Fractions, decimals and percentages in real life situations, ratio and proportions, probability, numbers 1-1 000 000 and beyond (eg. Finn.no house prices, personal economy), fraction-wall, adding fractions and equivalent fractions, decimals, methods for calculations.
- Working with **data handling** through spreadsheet, Conversion –km, m while enjoying probability games
- Working with **shapes and space** through area and perimeter, coordinates NE longitude and latitude, fractions and shapes, patterns and function, programming, writing instructions, games and challenges, floor plans, 2D-3D shapes, coordinate geometry, Circle properties, area and volumes in practical situations, construction work for angles.
- Work on the information we can get from roots, exponents, and sequences eg. Fibonacci in real life, Stonehenge, flowers. Algebraic representation of sequences (Fibonacci, geometric), multiplication of brackets, opening brackets, inverse operations in relation to associative, distributive, and commutative laws. Measures of central tendencies to describe real life situations and justify which is best for each data set.
- Working with **algebra** through real life situations and examples which can be shown and analyzed through **graphs** and **tables**.

MILESTONES:

- Students should be able to convert fractions, decimals, and percentages with ease and be able to solve problems in real life situations.
- To be able to collect different type of data and be able

HOW YOU CAN SUPPORT YOUR CHILD:

- Be curious about what they are doing in the current unit. Ask your child what they are working on, and even if you do not complete have control over the topic, you should be able to hear if the student has no idea or have at least some control of the topic.
- Help us educators by talking about numbers at home. We strive to show the students that Mathematics is everywhere and we go through topics about how knowing Mathematics can be helpful.
- Discuss feedback on formative tasks and (especially) summative tasks. We post information about the topics for a test a minimum of two weeks prior to a summative.

MYP 4 – 5 Written Curriculum

Norwegian competency targets

Describe, explain and present structures and developments in geometric and numerical patterns

Exploring the properties of different polygons and explaining the concepts of similarity and congruence

Explore, describe and justify relationships between the side lengths of triangles

Exploring and justify how changing conditions in geometric problems affects solutions

Explore and justify formulas for area and volume of three-dimensional figures

Interpret and critically evaluate statistical representations from the media and the local community

Find and discuss measures of central tendencies and distribution in real data sets

Explore and justify how representations of numbers and data can be used to influence and persuade different points of view

Calculate and evaluate probability in statistics and games

Simulate outcomes in randomized trials and calculate the probability that something will happen using programming

Explore and generalize multiplication of polynomials algebraically and geometricly

Explore and compare properties of various functions using digital tools

Create, solve and explain equations related to practical situations

Calculate the slope of a linear function and use it to explain the concepts of change (per unit) and the average speed

Explore the relationship between constant percentage change, growth factor and exponential functions

Extract and interpret relevant information from texts about purchasing and selling, various types of loans and utilize them to formulate and solve problems

Plan, execute and present exploratory work related to personal finance

Interpret and critically evaluate statistical representations from the media and the local community

Use modeling functions and justify procedures and results

Modeling situations related to real data sets, presenting results and justify that the models are valid

Explore mathematical properties and contexts using programming

EXAMPLES OF TAUGHT CURRICULUM

- Exploring **real-life models** with Geogebra, participate in the UngeAbel contest and explore a mathematical puzzles that usually have the students explore new **representations of data** and equations to persuade a new point of view, and exploring the proofs in geometry.
- Utilizing Excel spreadsheets to **organize information**, and the students conduct the Game of life unit, which covers personal finance, and learn about and projectile motion.
- Working with **shapes and space** through Geometry unit where we explore the rules and proofs set for 2D shapes, proving the Pythagoras Theorem, the Congruence theorems and some of the Circle Theorems.

HOW YOU CAN SUPPORT YOUR CHILD:

- Be curious about what they are doing in the current unit. Ask your child what they are working on, and even if you do not complete have control over the topic, you should be able to hear if the student has no idea or have at least some control of the topic.
- Help us educators by talking about numbers at home. We strive to show the students that Mathematics is everywhere and we go through topics about how knowing Mathematics can be helpful.
- Discuss feedback on formative tasks and (especially) summative tasks. We post information about the topics for a test a minimum of two weeks prior to a summative.