Mathematics Academy

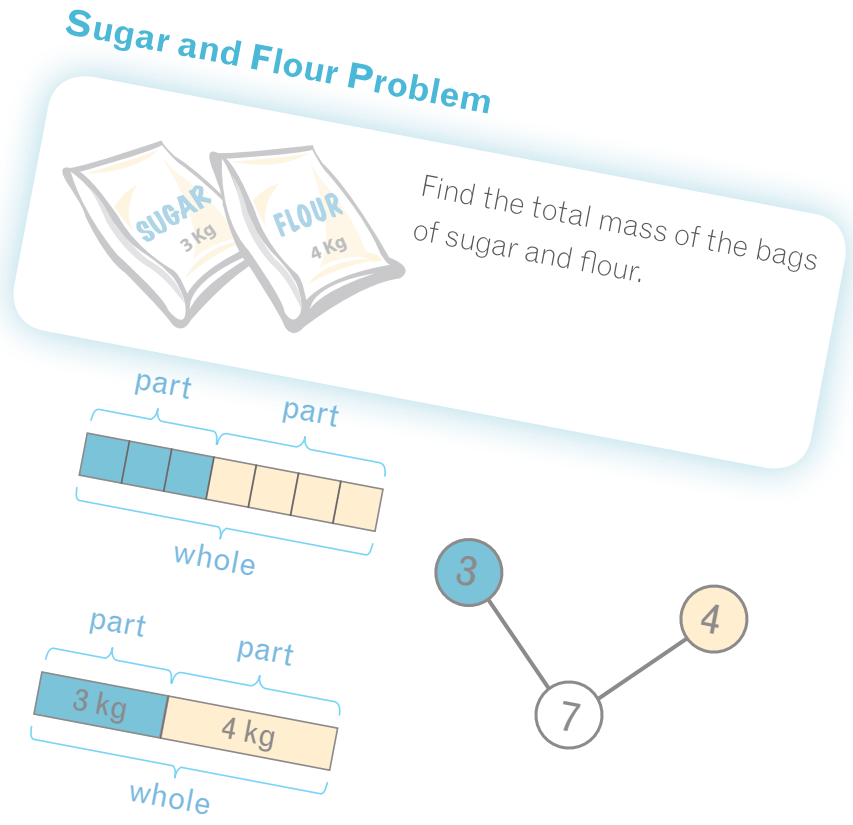
The Mathematics Academy at Marshall Cavendish Institute is led by Dr Yeap Ban Har. Our aim is to improve Mathematics education by helping Mathematics educators become more effective and providing them with avenues to deepen their knowledge of content and pedagogy.

Our Programme

At Marshall Cavendish Institute, our programme covers two major areas in teacher education – content knowledge and classroom practice. Our Mathematics teacher professional development programme is designed to give you a firm foundation in the fundamentals of Mathematics instruction and ensure successful implementation of the Mathematics curriculum.

Our programme aims to equip you with relevant content knowledge, innovative pedagogical knowledge and strong pedagogical-content knowledge. You will have greater confidence to teach the subject effectively. You will learn strategies on teaching a topic and gain insights into why a topic is taught in a certain way. You will also understand how the curriculum and teaching method develop our children for the future.

As a teacher, learning from fellow teachers is equally important in improving your teaching practice. Our courses provide avenues for both formal and informal aspects of learning. The programme involves hands-on work and observation of actual lessons, implementing what you have learnt and developing a teaching portfolio to showcase your achievements.



Certificate Programmes

• Certificate in Mathematics Teaching (Primary)

This certificate is awarded to participants who have successfully fulfilled the required number of hours of coursework and showcased excellence in the delivery of their lesson during assessment. Participants are required to complete approximately 120 hours of MAP100 and MAP200 series courses for graduation. This includes core courses as well as a number of elective courses. In addition, candidates are required to develop a teaching portfolio to showcase the skills they have learnt and implemented in their lesson.

Duration

Approximately 120 hours is required for graduation.

Assessment

Participants are required to develop a teaching portfolio to showcase how they have implemented what they learnt in the course. The teaching portfolio would include lesson plans, evidence of planning, execution and reflection which may include lesson plans, problem solving, use of technology and evidence of content mastery. Further details will be made available upon request.

There is an examination fee of about USD260 per person.

Suitable for

Our courses are open to:

- Schools and school districts / clusters interested in conducting a series of courses for teachers
- Institutions or ministries of education interested in a comprehensive Mathematics teacher professional development programme
- Academic institutions or universities interested in offering a Singapore Mathematics course as part of their degree programme

Prerequisites

Participants need to possess:

- At least an undergraduate degree or have adequate teaching experience
- Basic proficiency in English (In countries where the programme needs to be conducted in another language, a translator will be required)

Fees

Course fees include course materials and will vary depending on the scope of the programme. The fees are not inclusive of the accommodation and travel expenses incurred by the lecturers, the provision of the venue and refreshments and freighting of materials. We will work with you to understand your requirements before making a formal proposal to you.

• Certificate in Mathematics Education for Mathematics Specialist (Primary)

This certificate is awarded to participants who have successfully obtained the Certificate in Mathematics Teaching (Primary). Participants are required to complete approximately 60 hours of MAP300 series courses for graduation. Candidates will be required to renew this certification on an annual basis.

Duration

Approximately 60 hours is required for graduation.

Assessment

Participants are required to develop a teacher training portfolio to showcase how they have implemented what they learnt in the course. The teacher training portfolio would include evidence of planning, execution and reflection which may include training plans, problem solving and explanation, use of technology and evidence of content mastery. Videos of teacher training will be required.

There is an examination fee of USD380 per person.

Suitable for

Our courses are open to:

- Schools and school districts / clusters interested in conducting their own training for teachers
- Institutions or ministries of education interested in a sustainable Mathematics teacher professional development programme
- Academic institutions or universities interested in offering a Singapore Mathematics teacher training course as part of their degree programme

Prerequisites

Participants must have been awarded the Certificate in Mathematics Teaching (Primary) by Marshall Cavendish Institute before embarking on the completion of this certificate programme.

Fees

Course fees include course materials and will vary depending on the scope of the programme. The fees are not inclusive of the accommodation and travel expenses incurred by the lecturers, the provision of the venue and freighting of materials. We will work with you to understand your requirements before making a formal proposal to you.

Mathematics Courses

Based on a systematic structure, the programme is content-driven to provide teachers with a strong understanding of Mathematics teaching using the Singapore Mathematics approach. The core courses offered are either Concept-based (MAP100 series) or Content-based (MAP200 series). A range of specialist courses (MAP300 series) are also offered and these can only be taken after participants have completed 120 hours worth of core courses.

PRIMARY MATHEMATICS

Concept-Based Courses

Core Courses

MAP101 Fundamentals of Singapore Mathematics Curriculum (6 hours)

This course aims to help participants re-think the role of school Mathematics to develop thinking and problem-solving ability. Learning theories such as those by J. Bruner, R. Skemp and Z. Dienes help participants understand how students can access mathematical concepts.

MAP102 Mathematical Problem Solving (6 hours)

This course helps participants distinguish and identify mathematical tasks which are considered mathematical problems. This course helps participants understand the roles of word problems and related instructional strategies including the Newman procedure to diagnose difficulties in word problems. Participants learn to use different problem-solving heuristics and Polya's stages in problem solving.

MAP103 Lesson Planning in Primary Mathematics (12 hours)

Participants learn how to use the curriculum document to plan a Scheme of Work. Participants will also learn key stages in lesson planning which includes materials study, identification of anchor tasks, consolidation tasks and assessment tasks. Participants learn to use students' anticipated responses to develop mathematical ideas. The use of textbooks in lesson planning will also be discussed. This is a practice-based course where participants are required to maintain a portfolio of lesson plans.

MAP104 Assessment in Primary Mathematics 1 (6 hours)

Participants learn different types of items in a written test. This course focuses on the construction of selected-response items such as multiple-choice items. The concepts of reliability and validity are discussed. Participants learn the use of tables of specifications to plan a test.

Note: Informal assessment is included in the teaching of topics.

MAP105 Assessment in Primary Mathematics 2 (6 hours)

Participants learn different types of items in a written test. This course focuses on the construction of constructed-response items such as short-answer, structured and long-answer items. The concepts of reliability and validity are discussed. Participants learn the use of tables of specifications to plan a test.

Note: Informal assessment is included in the teaching of topics.

MAP106 Classroom Management in Primary Mathematics (6 hours)

This course covers the principles and practice of effective classroom management to create a positive learning environment. This includes the management of physical space, learning materials, groups, individuals as well as academic and non-academic student responses. This is a practice-based course where, through case studies and classroom practice, participants reflect upon and put into practice classroom-management strategies.

MAP107 Practice Teaching in Primary Mathematics (24 hours)

This is a practice-based course where participants plan, teach, discuss and refine lessons collaboratively using the lesson-study approach. Participants are also required to reflect on lessons planned and taught during the practice teaching period.

MAP108 Teaching of Heuristics in Primary Mathematics (6 hours)

In this course, participants learn about different problem-solving heuristics. Some heuristics are more concrete such as act-it-out while others are more pictorial such as draw-a-picture or draw-a-model. Others are more abstract such as look-for-patterns. The teaching of a particular heuristic at different grade levels is discussed using examples.

Elective Courses

MAP111 Bar Model Method for Primary Mathematics (6 hours)

Participants learn to use the bar model method to solve word problems (arithmetic and algebraic problems) that include part-whole, comparison and change situations. Advanced techniques in the method are also included.

MAP112 Calculators in Primary Mathematics (3 hours)

Participants learn the roles of calculators in problem solving, in situations with real-life data, for investigations and to develop confidence in struggling students. Participants learn to evaluate and design calculator-based tasks.

MAP113 Technology in Primary Mathematics (6 hours)

Participants learn the roles of technology in learning, consolidation and problem solving. Various tool including open tools and the internet are included. Participants learn to evaluate and design ICT resources.

MAP114 Differentiated Instruction in Primary Mathematics (6 hours)

Participants learn models for differentiated instruction. The course helps participants to plan for differentiation for advanced as well as struggling students.

MAP115 Remediation in Primary Mathematics (3 hours)

In this course, participants learn to design assessment tasks for diagnosis as well as to design remediation tasks. The principles of remediation are discussed.

MAP116 Enrichment in Primary Mathematics (3 hours)

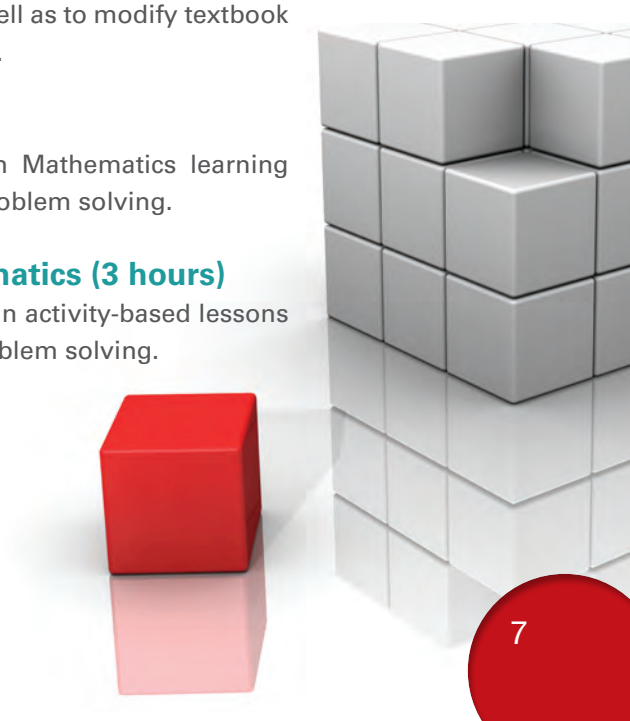
In this course, participants learn to design enrichment tasks as well as to modify textbook tasks for enrichment. The principles of enrichment are discussed.

MAP117 Games in Primary Mathematics (3 hours)

This course provides participants with examples of games in Mathematics learning including games for concept development, consolidation and problem solving.

MAP118 Activity-Based Lessons in Primary Mathematics (3 hours)

Participants revisit J. Bruner's theory of representations to design activity-based lessons including those for concept development, consolidation and problem solving.



MAP119 Using Children's Literature in Primary Mathematics (3 hours)

In this course, participants evaluate children's literature for use in teaching Mathematics. Participants get to design lessons around a selected book.

MAP120 Holistic Assessment for Lower Primary Mathematics (3 hours)

In this course, participants will learn about the use of informal assessment tools and the interpretation of assessment data. Participants will also learn how to report and provide holistic assessment.

Note: There is also a version of this course for upper primary levels.

MAP121 Teaching Primary Mathematics Through Problem Solving (3 hours)

In this course, participants will gain insight into the key elements of problem solving. Participants will encounter various models of teaching through problem solving and learn how to analyse anchor problems to identify learning goals. The use of textbooks in planning lessons around a problem will be discussed.

MAP122 Journal Writing in Primary Mathematics (3 hours)

Participants will learn the use of a journal in everyday lessons as well as for assessment. Types of journal entries will be discussed. Participants will learn the roles of journal writing in the learning of Mathematics. Suggestions on how to start using journal writing in the classroom will be given.

MAP123 Assessment in Mathematics Problem Solving (6 hours)

This course includes paper-and-pencil test items that assess problem solving as well as alternate assessment methods on problem solving. International practices will be described. Both holistic and analytical approach to scoring will be discussed. Participants are encouraged to bring drafts of assessment tasks they are working on.

MAP125 Use of Real-Life Situations in Primary Mathematics (3 hours)

Participants will be engaged in different types of mathematical tasks that are designed around real-life situations. The use of real-life situations to introduce concepts, for consolidation of learning, as well as for problem solving will be shown. There will also be some discussion on mathematical modeling at the primary level.

MAP127 Mathematics Trails (3 hours)

Participants will learn features of tasks used in Mathematics trails, and to be able to evaluate suitability of tasks for Mathematics trails. Examples of Mathematics trail tasks will be shown. Participants may also have opportunities to complete a trail, if the venue allows it.

MAP129 Development of Visualisation Skills in Primary Mathematics (3 hours)

In this course, participants learn the importance of visualisation and different types of visualisation. Participants learn to help students develop the ability to visualise through the use of manipulatives, the use of visuals and questioning techniques.

Content-Based Courses

In each of these courses, participants will examine the curriculum structure of the topic to understand J. Bruner's concept of spiral curriculum. Teaching strategies and resources including the use of technology are included. Common errors, remediation, enrichment, differentiated instruction and informal assessment are also discussed in relation to the specific topics.

Core Courses

MAP201 Teaching of Whole Numbers (12 hours)

Participants learn the different uses of whole numbers including ordinal and cardinal numbers. The concepts of number bonds, place value and regrouping are given emphasis. Participants learn to teach the four basic operations including mental strategies and combined operations. Formal ideas such as factors and multiples are also discussed.

MAP202 Teaching of Fractions (12 hours)

Participants learn fundamental ideas about fractions such as equal parts, fraction notation and equivalent fractions. The notions of fractions as part of a whole and part of a set as well as a number are included. Participants learn to teach the four basic operations including mental strategies and combined operations.

MAP203 Teaching of Decimals (3 hours)

Participants learn teaching strategies to convert between fractions and decimals. The concept of place value, regrouping and the four basic operations are revisited in the context of decimals.

MAP204 Teaching of Percent (3 hours)

Participants learn teaching strategies for percent and the relationship between percent and fraction. The concept of percentage of a quantity, and percentage change are also dealt with.

MAP205 Teaching of Ratio (3 hours)

Participants learn the relationship between ratio and fraction. The concept of equivalent ratio is included. Ratio of up to three quantities is considered.

MAP206 Teaching of Measurements (12 hours)

Participants learn about non-standard units and standard units as well as the use of common measuring instruments for length, mass, time, area and volume. Area is used as a case study.

MAP207 Teaching of Rate & Speed (6 hours)

Participants learn the concepts of rate and speed. Constant and non-constant rates are included. The idea of average speed and the use of coordinate graphs to describe rate are included.

MAP208 Teaching of Geometry (12 hours)

Participants learn about common shapes and polygons as well as selected properties of triangles and quadrilaterals. Concepts of points, lines and angles are included. Ideas such as angles on a line, angles at a point, opposite angles are discussed. Participants learn about symmetry, motion geometry and tessellation. Participants also learn about van Hiele's theory of geometric thought.

Elective Courses

MAP211 Teaching of Data & Probability (6 hours)

Participants learn ideas related to data collection and data representation. Tables and graphs including picture graphs, bar graphs, circle graphs and line graphs are included. Simple analysis such as computing average and other measures of central tendencies is included. Participants also learn about teaching probability of simple events.

MAP212 Teaching of Money (3 hours)

Participants learn teaching strategies to help students learn the use of coins and notes in local currency. Concepts such as equivalent amounts and the four basic operations involving money including change are dealt with.

MAP213 Teaching of Algebra (6 hours)

Participants learn concepts such as variable, expression and equations. Algebraic manipulations such as simplifying, evaluating and solving are included. One-step linear equations and graphical solution methods are dealt with.

Specialist Courses

These courses can be offered as part of the Certificate in Mathematics Education for Mathematics Specialist (Primary) Programme.

MAP300 Designing Learning Materials for Primary Mathematics (12 hours)

Participants will learn to design learning and formative assessment materials for use in a school. This course is for a specific content area, such as fractions. A range of mathematical topics are available. This course will include content knowledge for the specific topic. See MAP310. This course is suitable for teachers who write learning materials.

MAP301 Learning Theories for Primary Mathematics (12 hours)

Participants will learn a specific learning theory and its applications in the teaching and learning of Mathematics. Participants will learn how to achieve some degree of precision in teaching of Mathematics. The course aims to help teachers become better problem solvers in everyday teaching situations.

Note: There is a range of learning theories available for this course.

MAP310 Mathematics for Elementary School Teachers (3 hours)

Each three-hour course comprises of a selected content area. This is essentially a Mathematics course. Participants will acquire a conceptual understanding of the topic. A range of mathematical topics are available. This course is suitable for teachers who want to gain a deeper understanding of Mathematics topics they teach.

MAP321 Curriculum Development for Primary Mathematics (12 hours)

This course is designed to help participants plan and design a Mathematics curriculum for a nation / state / district / school. It includes alignment with the vision of the system, research and international practices, and the writing of the standards. This course is suitable for education officers who need to develop curriculum for an education system / school.

MAP322 Curriculum Implementation and Evaluation for Primary Mathematics (12 hours)

This course is designed to help participants align curriculum materials including textbooks with national / state standards. The course also includes designing evaluation tools to monitor curriculum implementation and assessment plans to assess the impact of curriculum implementation on student achievement and attitude. This course is suitable for curriculum leaders responsible for curriculum implementation in a school / district.

MAP323 Developing an Assessment Programme for Primary Mathematics (12 hours)

This course is designed to help participants design an assessment plan for a school / district / state / country. It includes opportunities to design and evaluate quality of test items in different formats. This course is suitable for educators who are responsible for the examination and other assessment tools used in a school / an assessment agency.

MAP331 Leading Lesson Studying Primary Mathematics (12 hours)

This course introduces the use of lesson study as a professional development tool. Participants will learn the steps in introducing and sustaining the use of such authentic forms of professional learning. This course is suitable for instructional leaders who are responsible for the professional development of other teachers.

Parent Education Programmes

The following programmes are intended to help parents understand Singapore's approach to Mathematics and better equip them to help their children.

Seminars

PEM101 Helping Children with Challenging Mathematics Problems (3 hours)

In this seminar, parents will learn about the problem-solving curriculum. Challenging problems from different grade levels will be used as examples. Participants will learn strategies to help children who have difficulties solving challenging problems. This seminar is suitable for parents with children from Primary 1 to 6. There are customised versions of this seminar for specific grade levels as well as for upper primary and lower primary.

PEM104 Model Method in Primary Mathematics (3 hours)

In this seminar, parents will learn about common tools used to solve word problems involving whole numbers, fractions, percent and ratio. The topics include how the model method is introduced in lower primary and used extensively in upper primary. Parents will learn about the different skills required in using the model method and strategies to help children who have difficulties in solving word problems. This seminar is suitable for parents with children from Primary 1 to 6. There are customised versions of this seminar for specific grade level as well as for upper primary and lower primary.

PEM110 PSLE Mathematics (3 hours)

In this seminar, parents will learn about the components of the Primary School Leaving Examination (PSLE) Mathematics. Particular attention will be given to helping children with the more demanding aspects of the examination. This seminar is suitable for parents with children in Primary 5 or 6.

PEM121 Helping Children with Primary Mathematics (3 hours)

In this seminar, parents will learn about the Mathematics curriculum and how to help their children learn Mathematics in a way that is consistent with the way individual children learn.

There are customised versions of this seminar for parents with children in Primary 1 – 2 , Primary 3 – 4 and Primary 5 – 6.

PEM129 Transition from Kindergarten Mathematics to Primary Mathematics (3 hours)

This workshop helps parents understand the core ideas and learning theories of early childhood numeracy. It covers varied, engaging hands-on activities to reinforce the core ideas. It also highlights the progression from Kindergarten to Primary Mathematics so that the young learners can make a better transition to learn Mathematics in Primary 1. Participants will better understand the expectations and demands of teaching and learning mathematics in lower primary levels, thus enabling them to prepare the young learners more adequately for the transition.

Workshops

PEM201 Coaching Children in Primary 1 and 2 Mathematics (12 hours)

This four-session workshop is designed to help parents and adults who work with children individually or in a small-group setting understand the Mathematics curriculum in Primary 1 and 2. Participants will learn strategies to assess children and provide the necessary remediation or enrichment.

PEM202 Coaching Children in Primary 3 and 4 Mathematics (12 hours)

This four-session workshop is designed to help parents and adults who work with children individually or in a small-group setting understand the mathematics curriculum in Primary 3 and 4. Participants will learn strategies to assess children and provide the necessary remediation or enrichment.

PEM203 Coaching Children in Primary 5 and 6 Mathematics (12 hours)

This four-session workshop is designed to help parents and adults who work with children individually or in a small-group setting understand the Mathematics curriculum in Primary 5 and 6. Participants will learn strategies to assess children and provide the necessary remediation or enrichment.

SECONDARY MATHEMATICS

Concept-Based Courses

MAS101 Fundamentals of Mathematics Teaching (6 hours)

This course covers the fundamentals that underpin the secondary Mathematics curriculum in Singapore. Although secondary Mathematics has more formulae and equations, the essence of Mathematics education is still focused on developing students' thinking and problem-solving skills. It is also equally important to help students embrace 21st century competencies through Mathematics learning. Such emphasis requires didactic methods to be firmly founded on time-tested learning theories to shape and enhance teaching and learning experiences for teachers and students.

MAS102 Mathematical Problem Solving (6 hours)

Problem solving is a key focus in Mathematics learning and at the same time poses tremendous challenge to students. A routine question is more of a task to handle whereas a non-routine question may truly be a problem to crack. This course shows how Newman's error analysis procedure helps to diagnose difficulties students face in word problems and how Pólya's 4-stage problem solving framework enables students to apply thinking skills and heuristics in a systematic manner.

MAS111 Bar Model Method and Algebra (6 hours)

The bar model method has been an effective pictorial way to solving word problems in primary Mathematics. In secondary Mathematics, problem solving tends to be more algebraic than pictorial. Such change in approach presents itself a gap in students' learning process. This course demonstrates ways to help students transit from the bar model method to algebra and addresses why students need to change their mindset from using bar models to applying algebraic methods.

MAS114 Differentiated Instruction in Secondary Mathematics (3 hours)

Participants learn models of differentiated instruction. The course helps participants to plan for differentiation for advanced as well as struggling students. In particular, participants will learn how to write a tiered lesson plan which is one of the strategies for differentiated instruction.

MAS213 Teaching of Algebra (6 hours)

In this course, participants will see different facets of algebra in secondary Mathematics. The course also describes how students can learn elementary algebra through hands-on activities, making abstract concrete in students' learning process. Although problem solving is essential in the learning of algebra, the course explains what it takes for students to solve problems algebraically.