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| Planning a school mathematics program |

A whole-school approach to planning a mathematics program will help provide the continuity and sequential learning that an effective education in mathematics requires. A school program maps the core learning of the curriculum to ensure sequential learning and to provide opportunities for students to engage with the learning outcomes and core content of the key learning area. Some schools may prefer to plan in bands of schooling, such as early, middle or upper primary or lower secondary, rather than across the whole school.

This document is a tool to:

* help focus on relevant planning issues
* identify actions that need to be taken to improve learning opportunities for students
* suggest the personnel who will be involved in undertaking those actions
* identify resourcing issues.

Personnel involved in the development of a school program may include:

* school administrators
* curriculum leaders
* teachers
* support staff
* other members of the school community.

Steps that contribute to the development of a school mathematics program are described on the following pages under the headings:

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| Step 1 | Identify and evaluate organisational issues to ensure effective implementation of the Mathematics Syllabus |
| Step 2  | Consider the relationship between year levels and the levels of learning demonstrated by students  |
| Step 3  | Identify the strands and topics that will be the major foci of each year level or band of schooling |
| Step 4  | Choose a range and balance of real-life and life-like purposeful contexts for learning  |
| Step 5  | Adopt an investigative approach. Frame the contexts for learning as investigations |
| Step 6 | Identify the learning sequence |
| Step 7 | Plan a range of assessment opportunities |
| Step 8 | Reflect on the draft program |

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| **Step 1: Identify organisational issues** |
| **Identify and evaluate organisational issues to ensure effective implementation of the Mathematics Syllabus** |
| * What are the considerations identified in the school’s operational plan?
* How can human resources be allocated to implement the mathematics program?
* How will the budget affect the program (e.g. resources, professional development, staffing)?
* What materials and resources are available?
* Have staff members had sufficient professional development about the *Years 1 to 10 Mathematics Syllabus* to allow them to implement the syllabus? If not, what opportunities can be provided for staff to receive professional development?
* What areas of professional development are needed (e.g. content knowledge, pedagogy)?
* How will timetabling impact on the program?
* How much time will be allocated per week?
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| Step 2: Consider the relationship between year levels and the levels of learning demonstrated by students |
| It is essential that school programs reflect the needs and abilities of all students and are not restricted by year levels. Teachers are encouraged to plan cooperatively and collaboratively across year levels to promote curriculum continuity and coherence, and to avoid unnecessary repetition.The table below shows the levels from the syllabus on which a school operating in year levels has chosen as a focus. |
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| **Year** | **Level** |  | **Year** | **Level** |
| 1 | 1 |  | 8 | 5 |
| 2 | 1 (Semester 1)2 (Semester 2) |  | 9 | 5 (Semester 1)6 (Semester 2) |
| 3 | 2 |  | 10 | 6 or Beyond Level 6 |
| 4 | 3 |
| 5 | 3 |  |  |
| 6 | 4 |
| 7 | 4 |

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| **Step 3: Identify the strands and topics that will be a major focus of each year level or band of schooling** |
| The table below is an **example** of an overview of a Year 7 program in mathematics, which shows topics that will be the focus for each term. The focus topics provide opportunities for students to develop deep understanding through investigations. |

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| **Year 7 overview** |
| **Topics** | **Term 1** | **Term 2** | **Term 3** | **Term 4** |  |
| Number concepts |  |  |  |  |  |  | focus |
| Addition and subtraction |  |  |  |  |  |
| Multiplication and division |  |  |  |  |  | minor focus |
| Patterns and functions |  |  |  |  |  |
| Equivalence and equations |  |  |  |  |  | incidental |
| Length, mass, area and volume |  |  |  |  |  |  |
| Time |  |  |  |  |
| Chance |  |  |  |  |
| Data |  |  |  |  |
| Shape and line |  |  |  |  |
| Location, direction and movement |  |  |  |  |

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| **Step 4: Choose contexts for learning** |
| **Choose a range and balance of real-life and life-like purposeful contexts for learning** |
| Contexts, topics or investigations reflect the needs and interests of students and support the learning required by the core learning outcomes and the core content. The table below shows an exampleof contexts for Year 7. Some contexts provide opportunities for students to develop understandings in more than one topic. |
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| Year 7 |  | **Issues to be considered when choosing purposeful contexts for learning** |
|  | **Term 1** | Term 2 | **Term 3** | **Term 4** |
| Number concepts | *The world around me* | *Australia’s wealth* | *Health and safety* |  | * What learning contexts would be appropriate for the age, experience and local community environments of students?
* How can existing school and community events be incorporated into the mathematics program?
* How can students be given opportunities to negotiate the contexts for learning?
* What implications might the school mathematics program have for different cultural and social groups in the community and how might these be managed?
* Which learning contexts connect to outcomes from other key learning areas?
* How can students’ mathematical experiences in contexts inside and outside the school be taken into account?
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| Addition and subtraction | *The world around me* |  |  | *Media and me* |
| Multiplication and division |  | *Australia’s people* |  | *Media and me* |
| Patterns and functions |  | *Communicating* | *Being responsible* |  |
| Equivalence and equations |  | *Communicating* | *Being responsible* |  |
| Length, mass, area and volume | *Science at work* |  | *Helping the environment* | *Cultural celebrations* |
| Time |  | *Democracy in Australia* |  | *Media and me* |
| Chance |  | *Communicating* | *Health and safety* |  |
| Data  | *Science at work* | *Australia’s people*  | *Health and safety*  |  |
| Shape and line  | *Designing the future*  |  |  | *Cultural celebrations* |  |
| Location, direction and movement | *The world around me* |  | *Helping the environment* |  |  |  |

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| Step 5: Adopt an investigative approach. Frame the contexts for learning as investigations. |
| In mathematics, investigations are developed from purposeful contexts for learning and should be framed in terms of a problem to be solved, a question to be answered, a significant task to be completed or an issue to be explored. The table below shows an example of how the contexts identified for Term 1 in Step 4 have been framed as investigations. Further information about sample investigations and ideas for investigations can be found in the support materials or on the QSA website www.qsa.qld.edu.au. |
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| **Year 7 — Term 1 (Level 4) Investigations** |  | **Issues to be considered when planning investigations** |
| Number concepts | ***The world around me — What is the most exciting four-week overseas holiday you could plan for $10 000?***Students prepare an itinerary for a four-week, around-the-world holiday given a $10 000 budget. They investigate flight schedules, the cost of the travel for flights and other modes of travel, accommodation, food and sightseeing tours necessary to see all the places they wish to visit. Students also create maps to scale to show the routes they recommend. |  | * Which levels of learning in mathematics are students currently demonstrating?
* How do the investigations cater for students with different needs — for example, students with talents, disabilities, learning difficulties, English as a second language, particular socioeconomic, cultural or geographic circumstances?
* How has students’ prior knowledge and experience been considered?
* How can investigations be made more open-ended?
* Do the investigations have the characteristics of a worthwhile investigation? (Refer to *Have I developed a quality investigation*? in the planning section of the *Years 1 to 10 Mathematics support materials*.)
* What opportunities exist to develop the cross- curricular priorities of literacy, numeracy, lifeskills and a futures perspective?
* How do investigations provide opportunities for students to develop the attributes of a lifelong learner?
* Which QSA investigations are relevant to this context?
* What, if any, modifications need to be made to them?
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| Addition and subtraction | ***The world around me (as above)*** |
| Multiplication and division |  |
| Patterns and functions |  |
| Equivalence and equations |  |
| Length, mass, area and volume | ***Science at work — How could you measure items that are unusual shapes or very small?***Students design and construct their own measuring instruments to use in situations of their own choice (e.g. volume of a rock, the size of an ant). (Refer to the Science sourcebook module, *Measuring in Science*.) |
| Time |  |
| Chance | ***Designing the future — Design and construct a model of the perfect school.***Students take on the role of an architect to design school buildings and school grounds for a school of the future. They investigate the use of 2D and 3D shapes in their school environment and consider the reasons for the choice of shapes. Students use this knowledge to inform their design and construction of a scale model of a particular building or area of the future school. |
| Data | ***Science at work (as above)*** |
| Shape and line | ***The world around me (as above)*** |
| Location, direction and movement | ***The world around me (as above)*** |

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| **Step 6: Identify the learning sequence** |
| Investigations are typically developed in three phases: Identifying and describing; Understanding and applying; and Communicating and justifying. Sample investigations that demonstrate how thinking, reasoning and working mathematically have been embedded in the phases are available in the support materials and on the QSA website. |
| Issues to be considered when planning a learning sequence |
| * How can I use the elaborations of the learning outcomes to help guide the learning?
* Has focused learning been included to develop knowledge, procedures and strategies?
* Have I provided opportunities for students to select appropriate knowledge, procedures and strategies?
* To what extent has the core content been included?
* How will students be encouraged to talk about their mathematical ideas?
* What resources are available? Are there sufficient for all students?
* Have students been provided with multiple opportunities to demonstrate their learning?
* How can I use the thinking, reasoning and working mathematically documents in the support materials to help me plan?
* Have I provided opportunities for students to develop some or all of the valued attributes of a lifelong learner?
* Does the sequence of learning incorporate the cross-curricular priorities of literacy, numeracy, lifeskills and a futures perspective?
* How have I been inclusive of all students?
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| **Step 7: Plan a range of assessment opportunities** |
| Issues to be considered when planning assessment opportunities |
| * How can assessment be made an integral part of the learning sequence?
* What opportunities are there for students to demonstrate their learning?
* Have opportunities been provided for teachers to gather evidence from a variety of sources?
* How will a range of assessment techniques be used?
* How can students’ peer- and self-assessment practices be developed?
* How will students’ demonstrations of learning be recorded in a way that supports planning and is manageable?
* How will assessment information be used to:
* provide feedback on the progress of individual students to students, teachers, parents/carers and other stakeholders
* make decisions about students needs, the learning and teaching process and resource requirements
* plan learning and teaching programs
* discuss future learning pathways with students and parents/carers
* make decisions about providing learning support to particular groups of students
* develop learning resources and curriculum materials?
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| **Step 8: Reflect on the draft program** |
| Issues to be considered when evaluating the mathematics program |
| * Does the program provide for the development of a deep understanding of mathematical concepts?
* Have students been provided with opportunities to engage in open-ended investigations?
* Do the learning sequences provide opportunities for students to think, reason and work mathematically?
* Does the program provide opportunities for students to engage in investigations in a range and balance of situations from life-related to purely mathematical?
* Are there opportunities to monitor demonstrations of learning to provide evidence of student progress?
* How has the program contributed to the development of the valued attributes of a lifelong learner?
* Does the program incorporate the cross-curricular priorities?
* Have the students been provided with learning opportunities in all strands of Mathematics?
* Does the program promote self-reflection and allow students to be involved in the development and/or negotiation of learning and assessment opportunities?
* Are the students demonstrating positive dispositions towards mathematics? If not, which elements of the program need to be modified?
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