**IB MYP Mathematics**
**Year 1**
**Lesson Plan: Chapter 7**

**SUMMARY**

| Teacher(s) | | Subject group | Mathematics | Level | Standard level |
|---|---|---|---|---|---|
| Unit title | Algebra and equations | MYP year | 1 | Unit duration (hours) | 9 |
| **Description** | | | | | |
| In this chapter students will build on their learning from chapter 6 and explore algebraic expressions in more detail before leading into equations at the end of the chapter. The chapter begins by looking at algebraic notation and the concept of simplifying expressions by using the properties of number learned in chapter 3. Within this, students will learn the importance of using the correct terminology and common abbreviations and conventions for working with multiplication and division and the role of grouping symbols within the order of operations.<br>After they have covered the basic notation and terminology, students will explore the meaning of algebraic expressions and how to simplify expressions by first considering concrete objects and then collecting like terms. Later on in the chapter they will encounter simplifying expressions with grouping symbols and after this those with powers of the same variable. From here they will review and extend their work on evaluating expressions started in chapter 6. The chapter finishes by bringing the journey through the introduction to algebra full circle by considering algebraic equations and using algebraic equations to solve real-life problems. | | | | | |

**INQUIRY: ESTABLISHING THE PURPOSE OF THE UNIT**

| Key concept | | Related concepts | |
|---|---|---|---|
| Form | | Equivalence, Representation, Simplification | |
| **Conceptual understanding** | | **Global context** | |
| Algebra uses letters and symbols to represent numbers, quantities and operations. | | Scientific and technical innovation | |
| **Statement of inquiry** | | | |
| Generalising patterns and representing them in a simplified form helps us to find innovative solutions to real-life problems. | | | |
| **Inquiry questions** | | | |
| **Factual** | **Conceptual** | | **Debatable** |
| Can mathematics be regarded as a language? | How do mathematical skills support technical advancement? | | Can all problems be tackled efficiently with mathematical tools? |

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| Aims | | |
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| • Enjoy mathematics, develop curiosity and begin to appreciate its elegance and power. | | |

| Summative assessment tasks | | |
|---|---|---|
| Objectives | Outline of summative assessment tasks | Relate to the statement of inquiry |
| **A: Knowing and understanding**<br>i) select appropriate mathematics when solving problems in both familiar and unfamiliar situations<br>ii) apply the selected mathematics successfully when solving problems<br>iii) solve problems correctly in a variety of contexts. | Unit test<br>Teachers can use the Check your knowledge questions at the end of the chapter as a model to prepare a unit test. Students will solve problems in both familiar and unfamiliar situations in a variety of contexts. Problems will range in difficulty from simple to complex. | The unit test will give students the opportunity to demonstrate their learning from the unit and to show how they can generalise situations and describe patterns using algebraic expressions and equations. Furthermore they can use expressions and equations to predict outcomes and solve real-life problems precisely. |
| **B: Investigating patterns**<br>i) select and apply mathematical problem-solving techniques to discover complex patterns<br>ii) describe patterns as general rules consistent with findings<br>iii) prove, or verify and justify, general rules. | Investigation 7.1 (page 220)<br>In this task students will explore conventions in languages, for example, the use of the apostrophe. They will also explore conventions in mathematics. | Through completing **Investigation 7.1** students will understand that mathematics is a language that is distinct from natural languages. Its aim is to communicate in a concise and unambiguous way. |
| **C: Communicating**<br>i) use appropriate mathematical language (notation, symbols and terminology) in both oral and written explanations<br>ii) use appropriate forms of mathematical representation to present information<br>iii) move between different forms of mathematical representation<br>iv) communicate complete, coherent and concise mathematical lines of reasoning<br>v) organise information using a logical structure. | Investigation 7.2 (page 221)<br>This task, which builds on Investigation 7.1, requires students to consider expressions that can be interpreted in more than one way. They will then be required to consider how the expressions could be written to avoid ambiguity.<br><br>Investigation 7.3 (page 245)<br>In this investigation students will utilise their research skills to find an online graphing package and hence use graphs to solve given equations. | In **Investigation 7.2** students will use prior learning to rewrite mathematical expressions so that the meaning is clear. They will understand that variables follow the same rules that apply to numbers.<br><br>Through completing **Investigation 7.3** students will understand how useful graphs can be to visualise patterns and to solve equations. |

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| D: Applying mathematics in real-life contexts | | |
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| i) identify relevant elements of authentic real-life situations<br>ii) select appropriate mathematical strategies when solving authentic real-life situations<br>iii) apply the selected mathematical strategies successfully to reach a solution<br>iv) justify the degree of accuracy of a solution<br>v) justify whether a solution makes sense in the context of the authentic real-life situation. | | |

**Approaches to learning**

Communication (communication skills): Use and interpret a range of discipline-specific terms and symbols.
A key concept of this chapter is communicating using the correct algebraic notation and terminology. Throughout the chapter, students will encounter situations where they will have opportunities to explicitly demonstrate their understandings and interpretations.

Thinking (critical thinking): Analyse complex concepts and projects into their constituent parts and synthesise them to create new understanding.
Students will identify similarities and make comparisons between their native languages and the language of mathematics in order to develop their conceptual understanding of algebraic notation and terminology.

Research (information literacy skills): Access information to be informed and inform others.
Students will have the opportunity to link their work on equations to graphing expressions to explore how they can use graphs to solve equations.

**Possible interdisciplinary links**

Possible interdisciplinary link with Sciences by investigating the link between using expressions to describe problems and equations to solve problems. For example: in Biology using both word and chemical equations to describe photosynthesis and aerobic and anaerobic respiration; in Chemistry, for chemical formulae and balancing equations; in Physics, when working with formulae for forces, energy and motion.

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## ACTION: TEACHING AND LEARNING THROUGH INQUIRY

| Content | Learning experiences |
|---|---|
| **Understand** and **use** correct algebraic notation. | In **Explore 7.1** students will explore two expressions and consider how both expressions give the same result but one looks more complicated than the other. This will introduce the idea of simplifying algebraic expressions. |
| **Understand** and **use** correct algebraic terminology. | |
| **Distinguish** between terms and factors. | |
| **Understand** and **use** correct algebraic abbreviations. | |
| **Recognise** and **use** grouping symbols. | In **Explore 7.2** students will explore an ambiguous statement and explore how the location of the brackets in an expression can give it different meanings. They will understand that the use of correct algebraic notation and order of operations will help to eliminate ambiguities. |
| **Understand** the meaning of algebraic expressions in context. | In **Explore 7.3** students will explore a real-life situation and explain how to find the solution. Algebraic expressions could be used to show the solution in an efficient way. |
| **Simplify** algebraic expressions by collecting like terms. | In **Explore 7.4** students will be introduced to simplifying expressions with pictures. They will simplify expressions with variables in **Explore 7.6** and **Explore 7.7**. |
| **Create** an expression to represent a real-life situation. | In **Explore 7.5** students investigate how to create an expression to represent a real-life situation and then evaluate their expression to make a decision. |
| **Evaluate** algebraic expressions. | |
| **Simplify** algebraic expressions by grouping symbols. | In **Explore 7.6** students will look at how to create expressions for the length of string required to create two different shapes individually and then together. They will understand how to simplify simple expressions with brackets. They will build on this in **Explore 7.7** by looking at two sets of identical shapes (two semicircles, then three triangles) and explore how the distributive property works in each case. |

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| **Expand** expressions with parentheses with both positive and negative numbers. | |
| **Use** index notation. <br> **Simplify** products of powers. | In **Explore 7.8** students will explore the multiplication rule for indices. Previously, in Chapter 3, students studied this rule using numbers; now they will consider how it applies when using variables. Subsequently, they will look at the division and power rules. |
| **Understand** that an equation is made up of expression connected by an equal sign. | **Explore 7.9** and **Explore 7.10** introduce students to the concept of creating an algebraic expression to represent a situation described in words, and exploring what is the same about them. |
| **Understand** what it means to solve an equation. | |
| **Solve** one- and two-step equations. | In **Worked example 7.6** students will be introduced to solving two-step equations. More practice with two-step equations will be gained in **Worked examples 7.7** and **7.8**. |
| **Convert** word problems into equations. | **Explore 7.11** gives students an introduction to writing equations to represent real-life problems. |
| **Solve** linear equations graphically. | In **Explore 7.12** students will complete tables of values to draw graphs. They will understand that they can use the method of graphing to find solutions to equations. |
| **Formative assessment** | |
| Practice questions, Explores, Investigations and Check your knowledge questions can be used as formative assessments. | |
| **Differentiation** | |
| Practice questions are levelled by difficulty and Challenge questions marked to extend students. | |

**REFLECTION: CONSIDERING THE PLANNING, PROCESS AND IMPACT OF THE INQUIRY**

**Reflections**

| Prior to studying the unit | During the unit | After the unit |
|---|---|---|
| Suggested questions:<br>• What do students already know and what can they do?<br>• From previous experience, what can I expect in this unit?<br>• What opportunities are there to integrate:<br>    ○ learner profile attributes<br>    ○ interdisciplinary connections<br>    ○ service learning? | Suggested questions:<br>• What difficulties arose during the unit?<br>• What difficulties were there when completing the summative assessment task(s)?<br>• Which resources are useful and what additional resources are needed?<br>• Which skills need more practice?<br>• What is the level of student engagement?<br>• How can we support students who are having difficulty with the concepts?<br>• What adjustments or changes can we make? | Suggested questions:<br>• How well did the summative assessment task address the learning objective for the unit?<br>• Was the summative assessment task sufficiently complex to allow students to reach the highest levels?<br>• Which teaching strategies worked well?<br>• What evidence of learning can we identify?<br>• What will we do differently the next time?<br>• Did we differentiate effectively?<br>• What did we learn from assessment standardisation? |