

A MESSAGE FROM THE AUTHOR

Welcome to *Growing in Mathematics*! The goal of this book is to provide Grade 9 students with a variety of mathematics problems for strengthening understanding, encouraging dialogue, building critical thinking and problem-solving skills, and nurturing an appreciation for the power and beauty of mathematics. It is not a traditional mathematics textbook and is not meant to be a stand-alone resource as it does not include instructional material beyond that which is embedded into the problems themselves. Instead, it is intended to supplement the daily practices of engaging, challenging, collaborative and inclusive classroom learning.

The units of study in this collection are organized by overarching questions, each of which offers a perspective on how the addressed topics are connected to one another and how they apply to the big questions of everyday life. This structure lends itself to a *spiralled learning* approach, in which topics are frequently revisited at growing levels of complexity and in different contexts. Compared to a pure *unit by topic* structure, spiralling not only promotes greater student retention of content knowledge, it also allows for curriculum connections to be made regularly and beginning very early in the course. To fully benefit from the interweaving of topics throughout this book, students and teachers are strongly encouraged to complete the lessons in the order in which they are presented.

Each set of problems in this book is preceded by an information page outlining the big ideas and learning goals encompassed in the subsequent material. The terms *emerging*, *evolving* and *extending* are used to indicate the learning goals and skill-building questions associated with three stages of learning. The *emerging* stage addresses the key elements of the given topic, and the corresponding problems focus on developing the skills associated with a foundational understanding. Students performing at the *evolving* stage have a strong understanding of the topic's fundamental concepts and are confident in their abilities to solve problems at the *emerging* stage. They are tackling problems of greater depth and applying their knowledge to a wider variety of contexts. Material in the *extending* category integrates problems of greater complexity and presents challenges that may reach beyond the curriculum expectations and encourage students to think at a higher level of abstraction. Students working at this level are in total command of the skills demanded to solve the problems presented in the *emerging* and *evolving* stages.

The coding sections of this book use the *Python* programming language as a natural next step from student experience with block coding. Python's user-friendly syntax, ease of access, application to mathematics and widespread use in real-world computer programming make it an ideal choice for introducing Grade 9 students to text-based coding.

I would like to acknowledge the contributions of several people who made this book possible. I am deeply indebted to my friend and colleague Rachel Vukelich for her extensive work on each topic's learning goals and for bringing this project to life through her creativity and gift for design. She is a constant source of inspiration through her unwavering dedication to the success and well-being of her students. Thank you to Daniel Yakymyshyn for his critical eye during the review stages of the book, as well as for his innovational leadership and ongoing embracement of pedagogical change. Many thanks to Susan Marks for her continual encouragement and for never hesitating to lend her top-shelf editing skills whenever I needed a fine-tooth comb. A big thanks to mathematics teachers from across the province of Ontario for reporting errors and offering suggestions for improving these problem sets during their inaugural year of implementation. My sincere gratitude to all of my students, who have kept me thinking, learning and growing since I first set foot in the classroom. I am forever grateful to my parents, Joe and Christine, for their unrelenting support of everything I do. Lastly, my most heartfelt thanks to my wife, Liz, and our two little explorers, Victoria and James, whose love and patience during the creation of this work were appreciated more than they can ever imagine.

A digital version of the most up-to-date revision of this book, as well as a variety of other teaching and learning resources, can be found at www.bhnmath.ca. I truly hope that through these problems you will find enjoyment, challenge and success.

Sincerely,
Adam Gesjorskyj
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