
Using *Nelson Mathematics 11*

Managing the Use of One Resource for Two Courses

Nelson Mathematics 11 clearly identifies lesson and chapters specifically intended for students in the Functions and Relations, Grade 11, University Preparation (MCR3U).

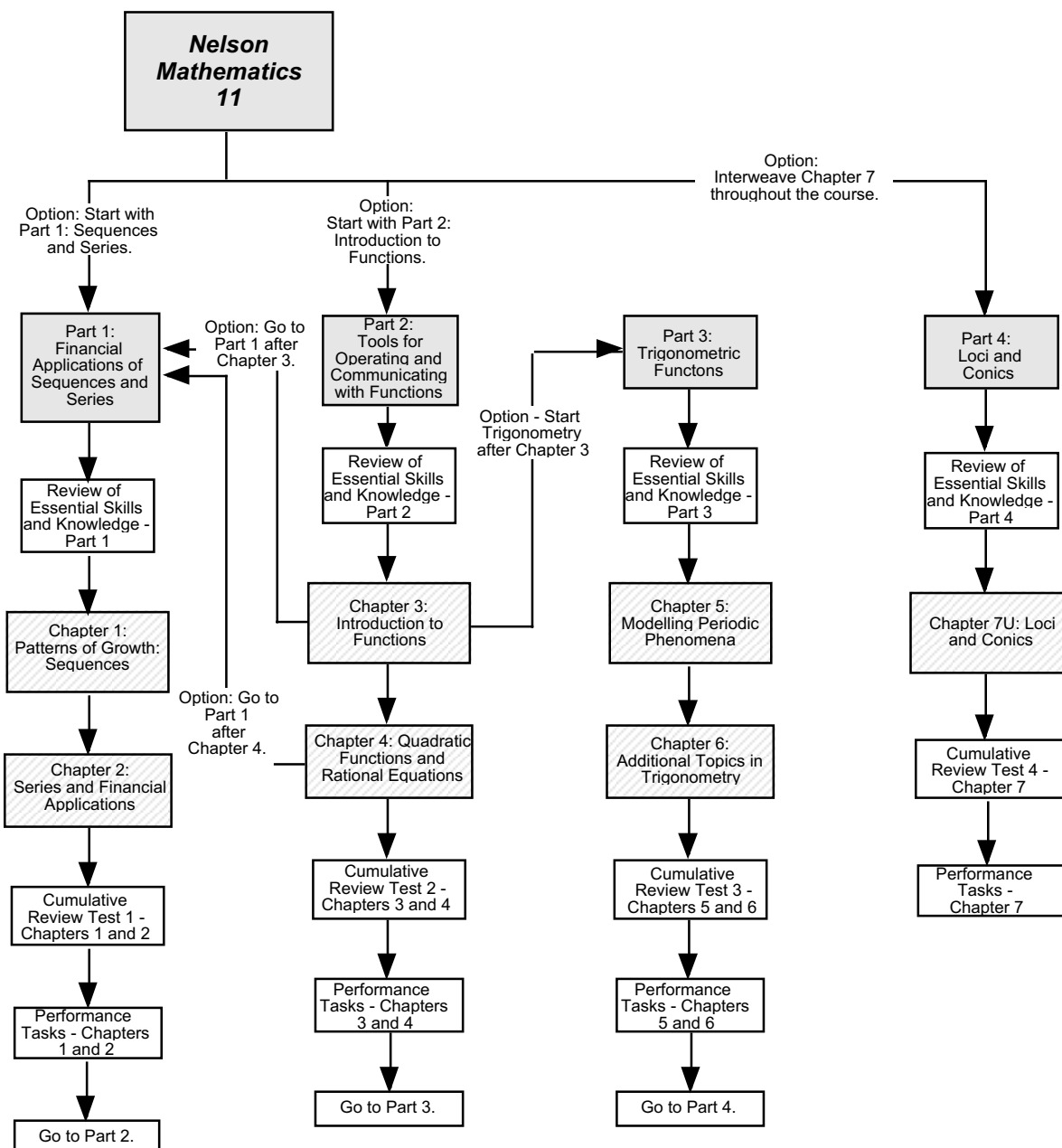
The *Teacher Resource* provides separate timing suggestions for the Functions course and the Functions and Relations course. Each chapter in the *Teacher Resource* begins with recommends for managing the chapter for each course. The *Teacher Resource* chapter also analyzes how expectations that are common to the two courses can be interpreted appropriately. Questions more appropriate for one course rather than the other are identified within the support for each text lesson.

Modular Organization of *Nelson Mathematics 11*

The modular organization of *Nelson Mathematics 11* allows teachers flexibility in sequencing the course according to personal preferences and school resources. For example, in schools where access to technology is limited, it is possible to have some classes use the computers or calculators for the sequences and series chapters while other classes work on the functions chapters.

- The chapters in Part 1 (*Chapter 1: Patterns of Growth: Sequences* and *Chapter 2: Series and Financial Applications*) are independent of the other chapters in the text and are not required as prerequisites for any of the other chapters. They should be presented in order, but may be used at any point during a term or school year.
- *Chapter 3: Introducing Functions*, as it name suggests, introduces functions and function notation. It must be completed before working on chapters 4 through 7.
- The conics work in *Chapter 7U: Investigating Loci and Conics* may be woven throughout the course or can be taught as a single unit and may be approached as a teacher-led unit, as an independent study unit or as a blend of each.
- *Chapter 4: Quadratic Functions and Rational Expressions* may be presented at any time after Chapter 3 is completed.
- As long as *Chapter 5: Modelling Periodic Functions* is completed first, the work of Chapter 5 and *Chapter 6: Extending Skills with Trigonometry* may be split within a course.

Flexible Course Sequencing



Nelson Mathematics 11 – Special Features

Review of Essential Skills and Knowledge – Part 1, Part 2, Part 3, and Part 4

A *Review of Essential Skills and Knowledge* introduces each two-chapter module, providing a brief review of the concepts and skills from grades 9 and 10 that are relevant to the chapters. Rather than teaching the material as a unit, it is intended that teachers will use it as needed for review purposes. Answers to all questions are in the text.

You could use the *Review of Essential Skills and Knowledge* as:

- a replacement or supplement to teacher-prepared review pages.
- a review assignment before starting a chapter.
- material to share with grade 9 and 10 mathematics teachers to identify essential learning.

Cumulative Review Tests follow each strand module. The test and answers allow students to assess their understanding of concepts and mastery of skills dealt with in the modules. The questions generally provide an opportunity for students to demonstrate a level of performance that matches the provincial standards for the related expectations.

Cumulative Review Tests (not shown)

In addition to having students use *Cumulative Review Tests* for their own review, you could:

- have students prepare “perfect” solutions that can be shared with the class.
- score student solutions using the generic rubrics for *Knowledge and Understanding*; *Communication*; *Application*; and *Thinking, Inquiry Problem Solving* in the *Teacher Resource*.
- have students hand in their complete solutions to be graded.
- have students prepare similar questions with full solutions and grade these.

Performance Tasks

There are four sets of *Performance Tasks* in *Nelson Mathematics 11*: one set following each strand module. The *Performance Tasks* are designed to elicit higher levels of achievement but are sufficiently open-ended to permit all students to make some progress toward a solution. Some tasks in each section should require only one class for completion. The remaining tasks are intended to encourage students to conduct research or inquiry investigations that may require more than one class and additional work outside of class time.

To use the *Performance Tasks*, you could:

- assign tasks to students or allow them to select a task.
- have students include their work on these tasks as part of a portfolio.
- have students work in teams on more difficult tasks and prepare a “Math Fair” display, seminar, poster display, or written report.
- use a shorter duration task as a challenging one-question test in class.

Review of Essential Skills and Knowledge—Part 1

Financial Applications of Sequences and Series

Pattern Recognition

When the independent variable in a relation changes by a steady increment, the dependent variable often changes according to a pattern.

Type of Pattern	Description	Example																												
Linear	The first differences between dependent variables are constant.	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td>Number of Books (< 1000)</td> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td> </tr> <tr> <td>Cost of Books (\$) (> 1000)</td> <td>60</td><td>70</td><td>80</td><td>90</td><td>100</td> </tr> <tr> <td>First Differences (< 1000)</td> <td>10</td><td>10</td><td>10</td><td>10</td><td>10</td> </tr> </table> In a linear relation, each first difference is always the same. Here, each first difference is \$10.00.	Number of Books (< 1000)	1	2	3	4	5	Cost of Books (\$) (> 1000)	60	70	80	90	100	First Differences (< 1000)	10	10	10	10	10										
Number of Books (< 1000)	1	2	3	4	5																									
Cost of Books (\$) (> 1000)	60	70	80	90	100																									
First Differences (< 1000)	10	10	10	10	10																									
Quadratic	The first differences between dependent variables change, but the second differences are constant.	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td>Time (s)</td> <td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td> </tr> <tr> <td>Height of Ball (m)</td> <td>5</td><td>30.1</td><td>45.4</td><td>50.9</td><td>46.6</td><td>32.5</td> </tr> <tr> <td>First Differences</td> <td>25.1</td><td>15.3</td><td>5.5</td><td>-4.3</td><td>-14.1</td><td></td> </tr> <tr> <td>Second Differences</td> <td></td><td>-9.8</td><td>-9.8</td><td>-9.8</td><td>-9.8</td><td></td> </tr> </table> In this case, the first differences are not the same, so the relation is nonlinear. In a quadratic relation, each second difference is always the same. Here, each second difference is -9.8.	Time (s)	0	1	2	3	4	5	Height of Ball (m)	5	30.1	45.4	50.9	46.6	32.5	First Differences	25.1	15.3	5.5	-4.3	-14.1		Second Differences		-9.8	-9.8	-9.8	-9.8	
Time (s)	0	1	2	3	4	5																								
Height of Ball (m)	5	30.1	45.4	50.9	46.6	32.5																								
First Differences	25.1	15.3	5.5	-4.3	-14.1																									
Second Differences		-9.8	-9.8	-9.8	-9.8																									
Exponential	There is a common multiplier between dependent variables.	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td>Time (h)</td> <td>0</td><td>1</td><td>2</td><td>3</td><td>4</td> </tr> <tr> <td>Number of Bacteria</td> <td>1000</td><td>2000</td><td>4000</td><td>8000</td><td>16 000</td> </tr> <tr> <td>Common Multiplier</td> <td></td><td>$\times 2$</td><td>$\times 2$</td><td>$\times 2$</td><td>$\times 2$</td> </tr> </table>	Time (h)	0	1	2	3	4	Number of Bacteria	1000	2000	4000	8000	16 000	Common Multiplier		$\times 2$	$\times 2$	$\times 2$	$\times 2$										
Time (h)	0	1	2	3	4																									
Number of Bacteria	1000	2000	4000	8000	16 000																									
Common Multiplier		$\times 2$	$\times 2$	$\times 2$	$\times 2$																									

REVIEW OF ESSENTIAL SKILLS AND KNOWLEDGE—PART 1 1

Performance Tasks for Part 1

Financial Applications of Sequences and Series

THE FOLLOWING ACTIVITIES SHOULD EACH TAKE LESS THAN A PERIOD TO COMPLETE

- Building a Pyramid**
 Build a model of a square pyramid using sugar cubes. Build the model so that it has at least six layers. Suppose you were to continue to build the model:
 - How many sugar cubes would be in the 75th layer from the top?
 - How many sugar cubes would you need to construct a model with 100 layers?
 - Analyze this problem and create an algebraic model to describe this situation. Explain how you arrived at the algebraic model and how the algebraic model can be used to make predictions. Use an example to illustrate.
- Population Growth**
 The People's Republic of China has the largest population of any country in the world. According to the 1994 World Population Prospects, approximately 1.1 billion people lived in China in 1990. In 1990, the population of China was growing at a rate of 1.5% per year.
 - Suppose the population rate continued to grow at 1.5% per year. Create an algebraic model that relates the population, P , to the number of years, n , after 1990.
 - Predict when the population will reach the two billion mark.
 - Suppose that seven million people leave China each year for other countries. Adjust your model for the growth of the population of China to take this new information into account.
- A Picture Is Worth a Thousand Words**
 Perhaps a picture could help save someone a thousand dollars. Imagine that you are a financial consultant and you want to provide your client with graphical representations of the effects of varying different options on a mortgage. Choose a current mortgage rate to work with and provide graphs showing the effects of changing payment periods and lengths of amortization. You may decide to look at several aspects to compare the mortgages—amounts of interest paid, length of time to pay off the mortgage, principal owing at various time intervals, and so on.

PERFORMANCE TASKS FOR PART 1: FINANCIAL APPLICATIONS OF SEQUENCES AND SERIES 207

Technology Lessons

Technology lessons offer direct instruction on the use of the TI-83 Plus graphing calculator. These lessons occur before the concept lesson in which the technology is applied, and include keystrokes and command sequences supported by visuals of calculator screens and computer displays.

The *Teacher Resource* provides suggestions for managing the lesson, timing estimates, and the answers to the *Practice* questions. It also alerts teachers to potential difficulties students might encounter and suggests strategies for avoiding these and intervening if they occur.

When using Technology lessons, you could:

- use them as worksheets in class to develop skills with the technology when they are first introduced in the course.
- refer students to the *Technology Index* if they need to find the Technology Lesson that provides instruction on an operation presented earlier in the textbook.
- refer students to the Technology Appendix if they need support for a skill they learned previously in grades 9 or 10.

TECHNOLOGY

1.2 TI-83 Plus Calculator: Generating the Terms of a Sequence

On the TI-83 Plus calculator, you can create a list from the general term that displays the specific terms of the sequence.

Generate or list the first five terms of the sequence defined by $t_n = n^2$.

1. Select sequence from the List OPS menu.
Press $\boxed{2\text{ND}} \boxed{\text{STAT}} \boxed{\downarrow}$. Scroll down to sequence and press $\boxed{\text{ENTER}}$.

2. Enter the information for sequence.
You will need to enter the following:

- the expression of the general term
- the variable n — let $\boxed{\text{X}\boxed{T}\boxed{0}}$ represent n
- the first position number
- the last position number
- the increment — the increment is 1, because the difference between each pair of consecutive natural numbers is always 1

Press $\boxed{\text{X}\boxed{T}\boxed{0}} \boxed{=}$ $\boxed{\text{X}\boxed{T}\boxed{0}} \boxed{=}$ $\boxed{1}$ $\boxed{=}$ $\boxed{5}$ $\boxed{=}$ $\boxed{1}$ $\boxed{=}$.

3. Generate the first five terms of the sequence.
Press $\boxed{\text{ENTER}}$.

Practice 1.2
List the first ten terms of each sequence.

(a) $t_n = 2n + 4$ (b) $t_n = n^3$ (c) $t_n = \frac{n+2}{n}$ (d) $t_n = \sqrt{n}$
 (e) $t_n = -5n - 2$ (f) $t_n = (0.5)^n$ (g) $t_n = 2(3)^n$ (h) $t_n = n^n$

26

CHAPTER 1 PATTERNS OF GROWING SEQUENCES

Exploration Lessons

Exploration lessons provide a short, optional activity designed to set the stage for the concept development lesson that follows. The *Teacher Resource* provides complete support for these lessons including timing estimates, materials lists, background notes, and discussions, management and technology suggestions, and detailed notes supporting each step in the *Think, Do, Discuss*.

When using Exploration lessons, you could:

- use the lesson as a worksheet in class to carry out an activity before starting the lesson that follows.
- use the lesson to form a part of your own lesson plan (teacher-led demonstration, whole-class instruction).
- assign students the work of the lesson as homework before the class in which the following concept lesson is presented.

EXPLORATION

Investigating Ways of Cutting "Vegetables"

When experienced cooks prepare dishes, they usually cut up a vegetable using different techniques. Often the cook cuts the vegetable in long thin strips. Then he or she stacks the pieces and then cuts in a perpendicular direction to the strips. Why does a cook do this?

Think, Do, Discuss
Use two rectangular pieces of paper and a pair of scissors. The paper will act as your "vegetable." You will cut each piece of paper in strips in two different ways.

Method 1

1. (a) Take one piece of paper and cut a thin strip (about 2 cm wide) along the width.

(b) Repeat cutting the entire sheet into strips, all of which should be about the same size.

39

1.5 INVESTIGATING WAYS OF CUTTING "VEGETABLES"

Nelson Mathematics 11 – Features of a Chapter

Introduction

The first page of the chapter presents both the mathematical and real-world context for the content of the chapter as well as a photograph to motivate the work of the chapter. The page also includes a short list of the Expectations dealt with, phrased in student-friendly language.

The Chapter Problem

The *Chapter Problem* presents a single context within which most of the concepts in the chapter can be developed. Questions in the *Practise, Apply, Solve* sections refer to the *Chapter Problem*, guiding students to apply what they have just learned toward building a complete solution to the problem.

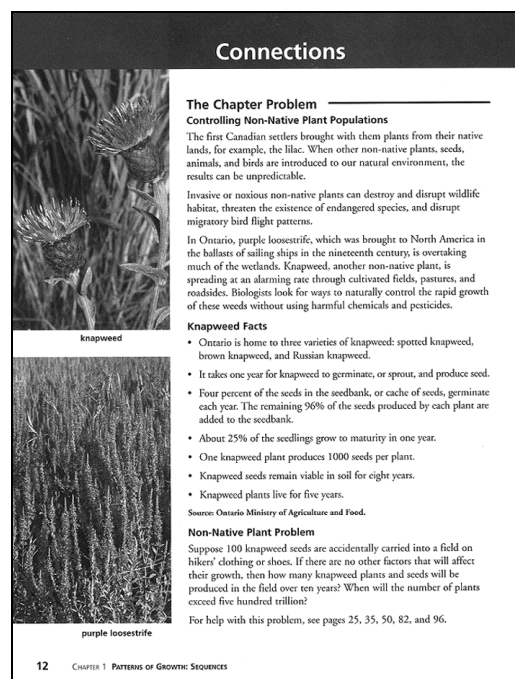
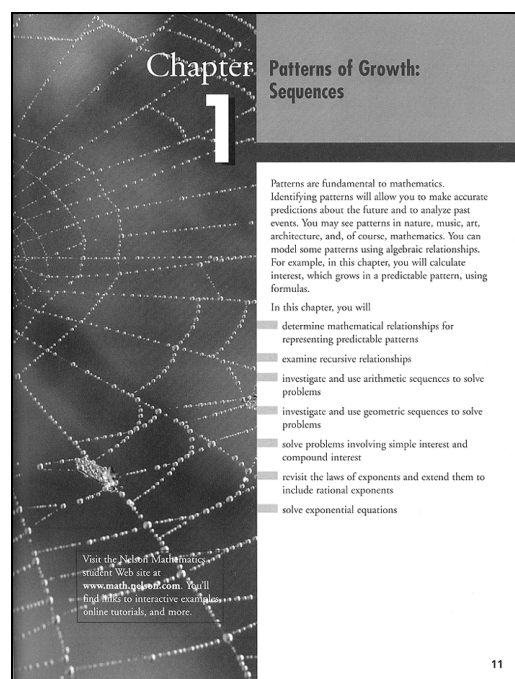
If you intend to use the *Chapter Problem* as a feature that can supplement student notes, you could:

- suggest to students that they reserve a separate section of their chapter notes for the *Chapter Problem* so that all of the work is kept in one place.
- assign the questions as homework and ensure that the solutions are taken up or presented regularly so students have a complete and correct set of notes.
- organize students into “homework buddy” pairs or groups in which students cross-check each other’s work at the beginning of class.

If you intend to use the *Chapter Problem* for assessment purposes, you could:

- distribute the *Generic Chapter Problem* rubric at the start of the chapter so students know the expectations in advance.
- take time to discuss your expectations with respect to the rubric the first time you use it.
- have students place all of their work on the *Chapter Problem* in a learning journal or include it as part of a portfolio.

- monitor student progress by collecting work from students at regular intervals and score it using the *Communication* rubric and/or the *Knowledge and Understanding* rubric.
- have individual students or groups present solutions at regular intervals and score the presentation using the *Communication* rubric and/or the *Knowledge and Understanding* rubric.
- all solutions and answers to the *Chapter Problem* questions are in the *Teacher Resource*, not the *Student Text*.



The Challenges

The *Challenges* in each chapter are cumulative assessment tasks designed to achieve complex sets of expectations. They are more open-ended than other problems and students are provided with no direct support. Answers are not in the text.

Before assigning one of the *Challenges*, you could:

- distribute and discuss the *Thinking/Inquiry/Problem Solving*, *Application*, and *Communication* rubrics to help students understand how their work will be scored.
- review the problem-solving model at the start of the text.
- discuss each problem so students can determine the relative difficulty of each.
- provide time for students to brainstorm ideas for approaching the problems.

- establish a schedule for the submission of student work.

As the class works through the chapter, you could:

- alert students when they have covered material pertinent to the work on a *Challenge* (given in the *Teacher Resource*).

- spot check student work to ensure all students are making progress.
- ask parents to sign a work log certifying time spent on the task.
- use the specific *Challenge* rubric to score the work; but do not distribute it in advance since it could provide too many clues to solving the problem.
- have students submit work, including a written analysis of the problem, an outline of an initial plan, research findings if required, and the final submission, in stages.

After students have submitted their work, you could:

- post or distribute the specific rubrics and solutions for each *Challenge*.
- discuss the most difficult components of each problem with the class.
- arrange time to discuss assessment criteria with students and how they can improve.

Getting Ready

These pages include review questions designed to verify that students have acquired the knowledge and skills needed to succeed in the chapter. Answers are in the text.

To use the *Getting Ready* as a diagnostic tool or for review, you could:

- assign the *Getting Ready* several days before the beginning of the chapter so students can seek assistance if needed.
- score student work on the *Getting Ready* as “sufficient” or “insufficient” and refer students to the appropriate pages in the review for the previous chapter or the *Review of Essential Skills and Knowledge* for additional practice (you could ask strong Grade 11 or senior students to act as peer tutors).
- refer students to earlier grades of *The Learning Equation* or *Math Trek* if available.

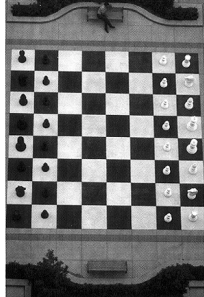
Challenge 1

Chess is a fascinating game, with a long history. There are many stories about the origin of chess. One ancient story suggests that chess was invented for a wealthy ruler in India. The ruler was so pleased with the game that he offered the inventor whatever he wanted as a reward. The inventor thought for awhile and then asked for grains of wheat, to be given to him as follows:

- one grain on the first square of the chessboard
- two grains on the second square
- four grains on the third square, and so on, until there were grains of wheat on each of the 64 squares of the chessboard

For each successive square, the number of grains of wheat is double.

1. The mass of a typical wheat grain is 0.0648 g. Calculate the total mass of wheat for the first ten squares.
2. One tonne (t) is 1 000 000 g. In 1996, the total world wheat production was 582 500 000 t. At this rate, how many years would it take to fill the chessboard completely?
3. Research to determine the selling price of 1 t of wheat in today's market. Use this information to determine the cash value of the inventor's reward.



Challenge 2

Jane draws a square and shades four corners. One side of each new square is one-quarter the length of the original square. Using the corners of the shaded squares Jane draws another square, and then shades its four corners in the same manner. If she repeats this pattern over and over again, what portion of the original square will be shaded?



Web Challenge

For a related Internet activity, go to www.math.nelson.com.

CONNECTIONS CHAPTER 1 13

Getting Ready

In this chapter, you will be working with percents, decimals, rational numbers, exponents and their laws, linear and quadratic equations, zeroes of relationships, and graphs of relationships. These exercises will help you warm up for the work ahead.

1. Extend the pattern to determine the next three numbers in each sequence.

(a) 3, 6, 9, 12, ■, ■, ■	(g) $\frac{1}{5}, -\frac{3}{5}, \frac{1}{5}, -\frac{1}{5}$
(b) 5, 6, 8, 11, ■, ■, ■	(h) $(-3)^2$
(c) 1, 4, 9, 16, ■, ■, ■	(i) -5^3
(d) -4, 5, 1, 6, 7, ■, ■, ■	(j) $(\frac{1}{2})^3$
(e) -5, -10, -20, -40, ■, ■, ■	(k) $(\frac{3}{4})^{-2}$
(f) $\frac{2}{3}, \frac{4}{9}, \frac{8}{27}, \frac{16}{81}, \frac{32}{243}, \frac{64}{729}, \frac{128}{2187}$	(l) 13^0
2. Express each percent as a decimal.

(a) 45%	(b) 39%
(c) 8%	(d) 3%
(e) 98%	(f) 4.5%
(g) 5.25%	(h) 0.5%
(i) 125%	(j) 110%
3. Evaluate.

(a) 5% of 20	(b) 18% of 240
(c) 3.6% of 50	(d) 2.1% of 36
(e) 120% of 80	(f) 135% of 150
(g) 86% of 324	(h) 75% of 60
4. Evaluate.

(a) $\frac{1}{4} + \frac{3}{4}$	(b) $\frac{1}{2} - \frac{2}{3}$
(c) $\frac{3}{4} - \frac{1}{4}$	(d) $-\frac{3}{5} + \frac{3}{4}$
(e) $(-\frac{1}{2})(-\frac{2}{3})$	(f) $-\frac{1}{2} \times \frac{10}{-4}$
(g) $(\frac{3}{12}) - 24$	(h) $(-\frac{2}{4})(\frac{2}{-9})$
(i) $\frac{1}{3} \div \frac{2}{3}$	(j) $-\frac{7}{8} \div \frac{3}{2}$
(k) $\frac{-2}{3} \div \frac{-3}{8}$	(l) $\frac{-3}{-2} \div \frac{1}{3}$
(m) $2\frac{3}{4}(-1\frac{1}{4})(-\frac{3}{4})$	(n) $(-\frac{2}{5} + \frac{1}{-2}) \div (-\frac{3}{-8} - \frac{-1}{2})$
5. Evaluate.

(a) 2^4	(b) $(-3)^2$
(c) -5^3	(d) 6^{-2}
(e) $(\frac{1}{2})^3$	(f) $(\frac{3}{4})^{-2}$
(g) 13^0	(h) $(1.5)^4$
(i) $(-7)^{-2}$	(j) 4^0
(k) $(2)^3(3)^2$	(l) $(4^{-2})(2)^2$
6. Evaluate.

(a) $4x^2 - 3x + 1$, if $x = 2$
(b) $2n + 3$, if $n = 10$
(c) $2(5)^{n-2}$, if $n = 1$
(d) Pxz , if $P = 2000$, $r = 0.08$, and $i = 2$
(e) $P(1 + i)^n$, if $P = 1000$, $i = 0.01$, and $n = 10$
(f) $P(1 + i)^{-n}$, if $P = 5000$, $i = 0.02$, and $n = 5$
7. Simplify.

(a) $(x^5)(x^3)$
(b) $(x^2)(x^{-3})$
(c) $(x^2)^3$
(d) $d^6 \div d^2$
(e) $(5x^2y^3)(-2xy^2)$
(f) $(4x^2)^2$
(g) $(3x^2y^3)^4$
(h) $20m^2n^4 \div 5m^6n^{-2}$
(i) $(-2x^2y^3)^{-2}$
(j) $(\frac{2x^2}{3y})^3$
(k) $\frac{(2x)(3x^2y)(-5y^2)}{(10x^2y^2)}$
(l) $\frac{(6x^2y^3)^2}{(4x)(5x^4)}$

Nelson Mathematics 11 – Structure of a Lesson

Concept Lesson with Think, Do, Discuss Questions

Each concept lesson begins with a realistic problem or context for students to consider. Students seek solutions to the problem by working through the *Think, Do, Discuss* questions. In doing these questions, students carry out the steps of an activity, reflect on their observations, and engage in a dialogue with their peers. Students will often hypothesize a relationship or underlying structure to explain observed results. They form generalizations from recurring results and patterns and are subsequently led to more formal representations of the underlying relationships and structures. By engaging in a meaningful learning activity—such as a problem context, an investigation, an exploration, or a directed lesson—students discover and learn concepts and strategies. This approach motivates students and encourages them to participate actively in the learning process.

You could use *Think, Do, Discuss* questions:

- in class to carry out the activity of the lesson exactly as developed in the textbook.
- as an independent study assignment for students to complete on their own.
- as a framework to construct your own lesson plan (some *Think, Do, Discuss* questions could be used as written in the text with a teacher-led demonstration or formal lesson to cover some aspects).

Concept Lessons

Some lessons do not have *Think, Do, Discuss* questions. These lessons are used to develop a mathematical concept using a direct instructional technique. Students are presented with a written exposition of the topic accompanied by several annotated solved examples. This type of lesson is generally used to develop a formal notation, an algebraic operation, or to teach a concept that would otherwise be very difficult or time consuming to present using a more exploratory approach. Students intending to go on to university or college level mathematics will need to develop those skills associated with reading and learning from a mathematics text as presented in these lessons.

You could use Concept lessons:

- in class to carry out the activity of the lesson exactly as developed in the textbook.
- as an independent study assignment for students to complete on their own.
- as a framework to construct your own lesson plan (part of the lesson could be used as written in the text with a teacher-led demonstration or formal lesson to cover the rest).

Arithmetic Sequences **1.6**

Part 1: The Days of a Month

Here is a typical calendar for October. Do the dates have any predictable patterns?

October						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		



Think, Do, Discuss

- Write the sequence of dates for the last week of October. Start with Sunday's date.
- How many terms are in this sequence? Describe the pattern in this sequence.
- Extend the pattern and write the next five terms of this sequence. (Assume that the dates may be more than 31.)
- Determine the first differences between pairs of consecutive terms of this sequence. What do you notice? What type of relationship exists between n and the value of the term?
- Graph this sequence. What is the rate of change between each pair of consecutive terms in this sequence?
- Determine the general term for this sequence.
- Write the sequence of dates for all the Tuesdays of the month.

1.6 ARITHMETIC SEQUENCES 41

2.10 Equivalent Rates and General Annuities

In previous sections, you have worked with **ordinary simple annuities**. In an ordinary simple annuity, the payment interval corresponds to the interest conversion period. In this section, you will investigate annuities where this is not the case. An annuity where the payment interval does not correspond to the interest conversion period is called a **general annuity**.

When working through this section, remember to change the decimal mode on the TI-83 Plus calculator, as necessary.

Part 1: Equivalent Rates

Two interest rates are said to be **equivalent** if they yield the same amounts at the end of one year, or at the end of any number of years. The **nominal** rate of interest is the annual rate.

Example 1

Suppose that \$1 is deposited in an account that earns 10%/a, compounded annually. Also suppose that another \$1 is deposited in another account that earns interest, but the interest is compounded quarterly. What is the interest rate of the second account so that the value in each account at the end of one year is the same?

Solution

Draw a time line to organize the given information.

Time period	Now	3 months	6 months	9 months	12 months
Principal	$P = \$1$				$A = \$1(1 + 0.10)$
					$A = \$1(1 + i)^4$

Let i be the **quarterly** interest rate. Then $4 \times i$ is the **nominal** interest rate, compounded quarterly.

One dollar invested at 10%/a, compounded annually, will accumulate at the end of one year to $\$1(1 + 0.10)^1 = \$1.10$.

One dollar invested at $4i$ %/a, compounded quarterly, will accumulate at the end of one year to $\$1(1 + i)^4 = \$1(1 + i)^4$.

172 CHAPTER 2 SERIES AND FINANCIAL APPLICATIONS

Skill Builder Lessons

Skill Builders lessons present an algebraic or technical skill directly. Students are shown solved examples in which the skill is applied and are then given questions on which to practise the skill.

When using Skill Builder lessons, you could:

- use the lesson as part of your own lesson plan (teacher-led demonstration, whole-class instruction) using the Practise, Apply, Solve questions for homework.
- have students work through the lesson on their own and follow up with a quick review in class and a practice session to verify that students have learned the required skills.

Focus

Key Ideas

The *Key Ideas* section summarizes the essential concepts and procedures developed in the lesson. Formal definitions for terms appear here and are repeated in the *Glossary*.

Solved Examples

These solved examples represent the full range of questions students should be able to complete to meet level 3 standards of performance. The examples are generally presented in order of difficulty. The solutions for some examples show how to use technologies such as graphing calculators, digital probes (CBL, CBR), spreadsheet software, and graphing software.

When using the *Focus* section, you could:

- have students use it as a resource for their notes on the lesson.
- use it as a framework for designing a teacher-led review of the lesson.
- use the Solved Examples in the text or the Teaching Example in the *Teacher Resource* as the basis for a Socratic dialogue with students.
- use the Teaching Example in the *Teacher Resource* as a quiz question to assess student understanding before moving on to the next lesson.

Simplifying Expressions Involving Exponents

1.10 SKILL BUILDER

Quite often, you may have to apply several laws of exponents to simplify numerical and algebraic expressions involving exponents.

Rule	Algebraic Example	Description
product	$2^3 \times 2^4 = 2^7$	$a^m \times a^n = a^{m+n}$
quotient	$5^4 \div 5^2 = 5^2$	$a^m \div a^n = a^{m-n}$, $a \neq 0$, $m > n$
power of a power	$(3^2)^3 = 3^6$	$(a^m)^n = a^{m \times n}$
power of a product	$(2 \times 3)^4 = 2^4 \times 3^4$	$(xy)^m = x^m y^m$
power of a quotient	$\left(\frac{4}{5}\right)^3 = \frac{4^3}{5^3}$	$\left(\frac{x}{y}\right)^m = \frac{x^m}{y^m}$, $y \neq 0$
zero as an exponent	$4^0 = 1$	$a^0 = 1$
negative exponents	$6^{-2} = \frac{1}{6^2}$	$a^{-n} = \frac{1}{a^n}$, $a \neq 0$
rational exponents	$8^{\frac{2}{3}} = (\sqrt[3]{8})^2$	$x^{\frac{p}{q}} = \sqrt[q]{x^p} = (\sqrt[q]{x})^p$

The following examples illustrate how to simplify numerical expressions using these laws of exponents.

Example 1

Use the laws of exponents to simplify each expression.

(a) $(4^2 \times 9^3)^{\frac{1}{2}}$

(b) $\frac{5^{\frac{1}{2}}}{5^{\frac{1}{3}} \times 5^{\frac{1}{4}}}$

Solution

(a) $(4^2 \times 9^3)^{\frac{1}{2}}$
 $= (4^2)^{\frac{1}{2}} \times (9^3)^{\frac{1}{2}}$
 $= 4^1 \times 9^{\frac{3}{2}}$
 $= 4 \times 81$
 $= 324$

Apply the power of a product law.
 Apply the power of a power law.
 Evaluate $9^{\frac{3}{2}}$.
 Evaluate the product.

1.10 SIMPLIFYING EXPRESSIONS INVOLVING EXPONENTS 83

Focus 1.7

Key Ideas

- In a geometric sequence, the ratio of any term, except the first one, to the previous term, is constant for all pairs of consecutive terms. This constant or common ratio is represented by r .

In the general geometric sequence $t_1, t_2, t_3, t_4, \dots, t_n, \dots$, $r = \frac{t_n}{t_{n-1}}$.

Here are some examples of geometric sequences.

4, 8, 16, 32, 64, ... and $r = 2$

-3, 6, -12, 24, -48, ... and $r = -2$

100, 10, 1, 0.1, 0.01, ... and $r = 0.1$

$\frac{1}{2}, \frac{1}{8}, \frac{1}{32}, \dots$ and $r = \frac{1}{4}$

- The general term of a geometric sequence is

$t_n = ar^{n-1}$

where t_n is the n th term,

a is the first term, or t_1 , and

r is the common ratio.

- If $r > 1$, then the terms increase. If $0 < r < 1$, then the terms decrease.

- The relationship between n and t_n of any geometric sequence is nonlinear.

Example 1

For each sequence,

- determine if it is arithmetic, geometric, or neither
- determine the next three terms
- find the general term and use it to determine t_{10}
- graph the sequence

(a) 4, 12, 36, 108, ... (b) 100, 98, 96, 94, ...

Solution

- Starting with the second term, divide each term by the term before it.

$\frac{12}{4} = 3, \frac{36}{12} = 3, \frac{108}{36} = 3$

This sequence is geometric and has a common ratio of 3.

- To find the next three terms, multiply each new term by the common ratio.

$108 \times 3 = 324, 324 \times 3 = 972, \text{ and } 972 \times 3 = 2916$

The next three terms are 324, 972, and 2916.

1.7 GEOMETRIC SEQUENCES 53

Practise, Apply, Solve

The *Practise, Apply, Solve* section contains various questions designed to provide students with the opportunity to consolidate and apply their learning.

- A-section questions require students to demonstrate basic skills, knowledge, and understanding of facts and relationships.
- B-section questions provide practice applying the concepts and procedures developed in the lesson in situations designed to elicit a level 3 response.
- C-section questions challenge students to generalize concepts, relationships, and procedures or apply them to unfamiliar situations, thus providing an opportunity for students to perform at level 3 or level 4.

Each *Practise, Apply, Solve* section has four questions linked to the categories in the Achievement Chart.

For each of these questions, the *Teacher Resource*:

- describes the link to the Achievement Chart category.
- suggests how to use the question to gather assessment data.
- describes a possible level 3 response or solution related to the question.

The last question in every B-section is a *Check Your Understanding* question. For this question students reflect on what they learned in the lesson and summarize their understanding of the key ideas in writing. The *Teacher Resource* has a sample solution and suggestions for management.

Answers are in the student text. Full solutions to *Practise, Apply, Solve* problems are in the *Solutions Manual*.

When using the *Practise, Apply, Solve* section, students could:

- submit work on the identified questions on a regular basis.
- present solutions to identified questions for class discussion.
- prepare solutions for *Application* or *Thinking, Inquiry, Problem Solving* questions in small groups.
- include their work on identified questions in a portfolio.
- maintain separate notes for *Check Your Understanding* answers.
- maintain a problem solving journal for work and commentary on *Application* or *Thinking, Inquiry, Problem Solving* questions.

Other Features of a Lesson (not shown)

Did You Know?

Did You Know? features present a fact, statistic, or mathematical relationship designed to catch the interest of students and motivate further inquiry.

People of Mathematics

These brief biographies describe women and men who have made contributions to the world and work of mathematics.

Practise, Apply, Solve 1.8

A

- For each situation, determine
 - the interest rate for each conversion period
 - the number of conversion periods
 - an investment at 5%/a, compounded annually, for 5 years
 - a loan at 8%/a, compounded semiannually, for 9 years
 - a deposit at 4.4%/a, compounded quarterly, for 7 years
 - a loan at 6%/a, compounded monthly, for 3 years
 - an investment at 5%/a, compounded annually, for 5 years
 - a deposit at 8.2%/a, compounded quarterly, for 16 months
 - an investment at 4.5%/a, compounded semiannually, for 42 months
 - a loan at 5.2%/a, compounded weekly, for 2 years
 - a deposit at 5.475%, compounded daily, for 3 years
- Evaluate to four decimal places.
 - $(1.1)^{12}$
 - $(1.05)^{-20}$
 - $(1.025)^{36}$
 - $(1.002)^{-45}$
 - $200(1.04)^{24}$
 - $5000(1.12)^{-3}$
 - $6525(1.03)^{-22}$
 - $10\,000(1.006)^{36}$
- In the formula $A = P(1 + i)^n$, what does each variable represent?
 - A
 - P
 - i
 - n
- For each situation, determine
 - the amount
 - the interest earned
 - \$4000 borrowed for 4 years at 3%/a, compounded annually
 - \$7500 invested for 6 years at 6%/a, compounded monthly
 - \$15 000 borrowed for 5 years at 2.4%/a, compounded quarterly
 - \$28 200 invested for 10 years at 5.5%/a, compounded semiannually
 - \$850 financed for 1 year at 3.65%/a, compounded daily
 - \$2225 invested for 47 weeks at 5.2%/a, compounded weekly
- For each situation, determine
 - the present value of
 - the interest earned on
 - an investment that will be worth \$5000 in 3 years. The interest rate is 4%/a, compounded annually.
 - an investment that will be worth \$13 500 in 4 years. The interest rate is 6%/a, compounded monthly.
 - a loan of \$11 200 due in 5 years, with interest of 4.4%/a, compounded quarterly.

Nelson Mathematics 11 – Chapter Review

Check Your Understanding

This page of leading questions encourages students to review and reflect on the essential ideas of the chapter. Students could use these pages to assess their cumulative understanding of the work of the chapter, structure a set of review notes, or verify the completeness of their notes.

In addition to students working through *Check Your Understanding* as part of their own review, they could:

- work through the questions without their notes and then correct their responses using their notes and textbook as references.
- use the questions as a checklist for determining the level of completeness of their notes.
- reorganize their notes using the questions as a guide.
- in small groups, each responsible for a subset of the questions, cooperatively develop complete responses to be shared with the class as a whole.
- submit the questions separately or include them as part of a portfolio.

Review Organized by Lessons

The *Check Your Understanding* section is followed by a chapter Review and Practice organized by lesson. The review questions of each section revisit the key ideas and concepts. These questions are followed by several additional practice question. Answers to all questions are in the text.

Chapter Summary (not shown)

The *Chapter Summary* is a synthesis of the work of the chapter.

Chapter 1 Review

Patterns of Growth: Sequences
Check Your Understanding

1. Must a sequence have a recognizable pattern? Explain.
2. Can any sequence be represented by a formula or by a general term?
3. Explain why the set of natural numbers is used in the general term of a sequence.
4. How do you decide whether a list of numbers represents an arithmetic sequence or a geometric sequence? Use examples in your explanation.
5. In any arithmetic sequence,
 - (a) what is true about the rate of change between consecutive terms of the sequence?
 - (b) what type of relationship exists between n and t_n ?
6. In any geometric sequence,
 - (a) what is true about the rate of change between consecutive terms of the sequence?
 - (b) what type of relationship exists between n and t_n ?
7. Write the recursive formula for
 - (a) any arithmetic sequence
 - (b) any geometric sequence
8. Explain why an investment of \$1000 will be worth more in ten years if the interest is compounded annually, but is not simple.
9. What is the difference between the amount of an investment and the present value of an investment? Use an example in your explanation.
10. In your own words, define the n th root of a number x . Express the n th root of x using exponents.
11. Without using a calculator, evaluate $25^{-\frac{1}{2}}$ using two different methods. Verify both answers by using a calculator.
12. List and describe the steps for simplifying the expression $\left(\frac{1}{x}\right)^{p+q} (x^p)^m$.
13. How can you decide whether an exponential equation should be solved algebraically or by graphing?
14. Solve $6(3^{2x-1}) = 486$ algebraically. Verify your answer by solving this equation using graphing technology.

CHAPTER 1 REVIEW 97

Review and Practice

1.1 Exploring Patterns and Sequences

1. What is a sequence? What is a term in a sequence? Use examples to illustrate your answers.
2. What is the general term of a sequence? How can you use the general term to generate the terms of a sequence?
3. Describe a situation that could be represented by
 - (a) a finite sequence
 - (b) an infinite sequence
4. Determine the first five terms of each sequence. Start with $n = 1$.
 - (a) $t_n = 4n + 1$
 - (b) $t_n = 2n^2 - 2n$
 - (c) $t_n = 3^{n-1}$
 - (d) $t_n = -3n + 2$
 - (e) $t_n = (2n + 1)(2n - 1)$
 - (f) $t_n = \frac{10}{n}$
5. Graph the first six terms of each sequence in question 4.
6. Determine the general term of each sequence.
 - (a) 2, 7, 12, 17, ...
 - (b) 30, 24, 18, 12, ...
 - (c) 9, 27, 81, 243, ...
 - (d) $\frac{5}{2}, \frac{5}{4}, \frac{5}{8}, \frac{5}{16}, \dots$
 - (e) 2, 5, 10, 17, ...
 - (f) $\frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \frac{5}{6}, \dots$
7. A car's purchase price is \$24 000. At the end of each year, the value of the car is three-quarters of the value at the beginning of the year.
 - (a) Write the first four terms of the sequence of the car's value at the end of each year.
 - (b) Determine the general term of this sequence.
 - (c) Find the value of the car at the end of the seventh year.

1.2–1.3U Sequences and Recursive Formulas

8. Compare how to generate the terms of a sequence from a recursive formula and from the general term of a sequence.
9. A recursive formula consists of two parts. Describe them.
10. Write the first five terms of each sequence.
 - (a) $t_1 = 7, t_n = (t_{n-1}) - 10$
 - (b) $t_1 = -3, t_n = 5(t_{n-1}) + 6$
 - (c) $t_1 = -4, t_n = (t_{n-1}) \times 2$
 - (d) $t_1 = 3, t_n = 4(t_{n-1})^2 - 2$

98 CHAPTER 1 PATTERNS OF GROWTH: SEQUENCES

Chapter Review Test

The *Chapter Review Test* is a comprehensive summary assessment opportunity for students. Students are encouraged to use this test for self-assessment. Four questions in each text have been linked to the Achievement Chart categories:

Knowledge and Understanding; Communication; Application; and Thinking, Inquiry Problem Solving. Cues are not provided to help students identify questions from particular sections within the chapter because questions often require students to apply learning from several sections simultaneously. Answers are in the text. Full solutions are in the *Solutions Manual*.

In addition to having students use the *Chapter Review Test* for their own review and study, you could:

- assign students or small groups to prepare “perfect” solutions with annotations that can be shared and discussed in class.
- score student solutions using the generic rubrics included in the *Teacher Resource*.
- have students hand in their complete solutions to be graded.

- assign students to prepare similar questions with full solutions to become part of an assessment/review bank and grade these.

Other Features of the Text

Answers

To facilitate student-directed review, practice, study, and self-assessment, the answers are provided for all *Practise, Apply, Solve* questions, *Chapter Review* and *Practice* questions, *Chapter Review Tests*, and the *Cumulative Review Tests*. Full solutions are in the *Solutions Manual*.

Glossary

All terms defined in the *Focus* sections appear in the glossary, along with their commonly accepted definitions.

Index

The *Index* provides page references for all key terms and concepts.

Technology Index

The *Technology Index* helps students locate Technology lessons specific to the functions of the TI-83 Plus graphing calculator and *The Geometer's Sketchpad* software. This allows them to review procedures if needed.

Chapter 1 Review Test

Patterns of Growth: Sequences

- i. Determine the first four terms of each sequence.
ii. Is each sequence arithmetic, geometric, or neither?
(a) $t_n = 6n + 5$
(b) $t_n = \frac{2}{n(n+1)}$
(c) $t_n = 3(4)^{n-1}$
(d) $t_1 = 5, t_2 = 1, t_{n+2} = 3t_{n+1} - 2t_n$, and $n \geq 1$
- Knowledge and Understanding
Determine the number of terms in each sequence.
(a) $-6, -11, -16, \dots, -156$
(b) $4, 12, 36, \dots, 972$
- For an arithmetic sequence, $t_{13} = -177$ and $t_{23} = -207$. Find a , d , and t_n .
- Evaluate.
(a) $\left(\frac{-8}{27}\right)^{-\frac{2}{3}}$
(b) $(36^{-\frac{1}{2}} + 8^{-\frac{2}{3}}) + (12^{-2})$
- Simplify:
(a) $\frac{(16x^4y^3)^{\frac{1}{2}}(4y^6)^{\frac{1}{3}}}{(x^3y^9)^{\frac{1}{3}}}$
(b) $(a^{2n} + 3a^3(a^{2n} - 2a^3) \div [(a^{2n})(a^{2n})])$
- Communication: Explain how you can determine whether a given sequence is arithmetic or geometric. Use an example of each type of sequence in your explanation.
- Solve.
(a) $2^{5x-2} = 64$
(b) $3x^2 + 4x = \frac{1}{81}$
- Application: Monica drops a rubber ball from a height of 60 m. After each bounce, the height of the ball's bounce is $\frac{2}{3}$ the height of the ball's previous bounce. How high does the ball bounce after the tenth bounce?
- Jacques wants to invest now so that he will have \$20 000 in five years for a down payment on a new car. How much must Jacques invest now, if the interest rate is 8%/a, compounded semiannually?
- The town of Lancaster is growing at a rate of 3% each year. The current population is 12 400. Determine when the population will reach 13 250.
- In a small community college lecture hall, there are 15 rows of seats. For the first four rows, the number of seats are 14, 18, 22, 26. How many seats does the last row have?
- Thinking, Inquiry, Problem Solving
Bernie invests \$5000 in a savings account that pays 6.75%/a, compounded semiannually. Three years later, he deposits another \$2000 in the account. What will be the balance in the account at the end of five years?

Glossary

accumulated value: see *annuity*.
amplitude: the magnitude of the distance from the axis of the curve to either the maximum or minimum value of a periodic function.
amortization period: the term of a loan.
amortization table: a record of payments, interest and principal paid, and outstanding balances.
amortize: to reduce, or pay, a debt or loan through a series of regular blended payments.
amount (annuity): the sum of all the future values of all payments at the end of the term. Also called *accumulated value* or *future value*.
angle: a geometric figure formed by one ray rotating about another at a common end point or vertex. In standard position, the initial arm of the angle lies along the positive axis, and the terminal arm rotates counter-clockwise; the angle is positive. When it rotates clockwise, the angle is negative. See also *concurrent angles*, *related acute angle*.
annuity: a series of payments, or deposits, at regular intervals. In a simple annuity, the payment interval coincides with the interest conversion period. In a general annuity, the payment interval does not coincide with the payment interval. In an *annuity due*, periodic payments are made at the beginning of each payment interval. In an *ordinary annuity*, periodic payments are made at the end of each payment interval.
The amount of a simple, ordinary annuity is $S_n = \frac{a(r^n - 1)}{r - 1}$, where a is the payment, r is $1 + i$, and n is the number of payments, or $PV = A \times \frac{1 - (1 + i)^{-n}}{i}$.
arithmetic sequence: a linear sequence where the common difference, d , is constant. $t_n = a + (n - 1)d$ where a is the first term and n is the number of terms.
arithmetic series: the sum of the terms in an arithmetic sequence. $S_n = \frac{n}{2} [2a + (n - 1)d]$.
asymptote: a line that a function approaches but does not touch or intersect.
axis of the curve: the horizontal line that is halfway between the maximum and minimum value of a periodic curve. Also called *axis of the shape*.
blended payment: a payment that includes interest.
break-even point: the point at which profit equals zero, that is, where revenue equals costs.
CAST rule: C means quadrant IV, A means quadrant I, S means quadrant II, and T means quadrant III. $\cos \theta$ is positive in quadrant IV (C), all angles are positive in quadrant I (A), $\sin \theta$ is positive in quadrant II (S) and $\tan \theta$ is positive in quadrant III (T).
circle: a set of points equidistant from one other point, the centre.
common difference: the constant difference between two consecutive terms in an arithmetic sequence or series.
common ratio: the constant ratio between two consecutive terms in a geometric sequence or series. See *geometric sequence*.
completing the square: the method of changing a quadratic equation in standard form to vertex form.
complex number: any number, real or imaginary, in the form $a + bi$, where a and b are real numbers and $i^2 = -1$.
conjugate: the complex roots of a quadratic equation, $a + bi$ and $a - bi$, where a and b are real numbers and i is a non-real number such that $i^2 = -1$.
conversion period: the period for calculating interest.
cosine law: for acute triangle ABC , $a^2 = b^2 + c^2 - 2bc \cos A$, $b^2 = a^2 + c^2 - 2ac \cos B$, and $c^2 = a^2 + b^2 - 2ab \cos C$.
cost function, $C(t)$: the relation between the costs of making an item and the number of items, n .
concurrent angles: related angles having the same initial arm and the same terminal arm. The principal angle, between 0° and 360° is the smallest positive angle for all the angles in a group of concurrent angles. See *angle*.
curve of best fit: a model that best represents the relation between the variables for a set of points.
cycle: the portion of a graph is the smallest complete repeating pattern of the graph.
degree of a polynomial: the value of the highest exponent of any one variable in the polynomial. A polynomial of degree 0 is called a constant. A polynomial of degree 1 is linear. A polynomial of degree 2 is quadratic. A polynomial of degree 3 is cubic.
demand function, $p(d)$: the relation between the price of an item, p , and the number of items sold, d .
depreciation: the rate at which an asset's value decreases.
domain: the set of all possible values of the independent variable.
ellipses: the set of points such that the sum of the distances from two fixed points to any other point is constant. The longest horizontal and vertical line segments in the ellipse are the axes. The longer axis is the major axis; the other axis is the minor axis. The end points of the longer axis are the vertices. The foci lie on the major axis.
equivalent interest rates: different rates that produce the same amount at the end of the same period.

Technology Appendix

The *Technology Appendix* helps students refresh their skills at using the TI-83 Plus graphing calculator and commonly used spreadsheets introduced in previous grades.

Teacher Resource – Chapter Introduction

Chapter Overview

The first few pages of the *Teacher Resource* support for each chapter give an overview of the chapter.

Chapter Overview Chart

This chart suggests timing of lessons, lists materials and technology required, and identifies the Curriculum Expectations addressed in each lesson.

Specific Expectations Chart

This chart identifies the Specific Expectations in the Ontario Curriculum that are addressed by the chapter.

What “big ideas” should students develop in this chapter?

This list synthesizes the essential skills, important knowledge, and significant concepts addressed in the chapter. The items are presented in terms of what students should be able to do once they have achieved the Expectations from the Ontario curriculum addressed by the chapter.

What do students already know about the work of this chapter?

This section lists the skills that students should already have and the concepts they should know from previous grades. It also includes a list of skills, knowledge, and concepts from this course that are covered in earlier chapters. This information forms a base from which the development of strategies, techniques, and procedures can proceed.

Using this Chapter with the Functions and Relations Course and the Functions Course

This item suggests ways to use each lesson appropriately for students in each course.

Connections

Chapter Problem

The *Teacher Resource* has a blackline master that lists all of the *Chapter Problem* questions. This can be used by teachers who assign the *Chapter Problem* at once rather than have students work on it throughout the chapter. Since the *Chapter Problem* has the same role in all chapters, there is a single generic rubric for assessing student work on problems in the Assessment Section of the *Teacher Resource*. Answers to the *Chapter Problem* questions are in the *Teacher Resource* but not in the text.

The Challenges

The *Teacher Resource* prompts the teacher to point out when something relevant to a *Challenge* has been covered in class. A sample scoring rubric and a sample solution for each *Challenge* are provided as blackline masters at the end of the teaching notes for each chapter.

Also included with the Challenges is a Web Challenge, an online problem that integrates the use of the Internet and the mathematics of the chapter.

Getting Ready

This chart correlates the *Getting Ready* questions to previously learned concepts and procedures. References to review sections of previous chapters and *Review of Essential Skills and Knowledge* pages are provided to support extra practice and remedial intervention.

Assessment Organizer

This page provides an overview of the assessment opportunities available in the chapter:

- *Practise, Apply, Solve* questions keyed to *Achievement Chart* categories
- chapter test
- opportunities for student self-assessment
- *Performance Tasks*

Page references help teachers locate appropriate items in the student text and the associated support material in the *Teacher Resource* as they plan assessment for the chapter.

Teacher Resource – Support for Each Lesson

Introduction

- A brief synthesis of the main activities of the lesson appears as a list below the number and title of the section.
- Suggested timing is given for each lesson and each section of the student text. Where appropriate, different timing estimates reflect the different courses and use or non-use of recommended technology.
- A materials and equipment list identifies technology, print, or other resources or equipment needed for each section in the lesson.
- Management options offer alternative approaches to the lesson. Teachers can select a strategy that is suitable for them, recognizing the needs of particular classes or students.
- Teacher intervention suggestions are provided for use with students who do not have the prerequisite skills and knowledge for the lesson.
- A rationale for using the recommended technology is often provided.

Specific Expectations/Evidence of Learning Chart

The *Teacher Resource* correlates each lesson with the specific Expectations it addresses. Under “Evidence of Learning,” the chart gives several examples of student performance that would confirm whether the Curriculum Expectations have been met.

Think, Do, Discuss

An overview of the activity is provided: a summary of the lesson activities and the problem context of the lesson. Where appropriate, misconceptions or errors that are likely to occur are highlighted.

- *Think, Do, Discuss* questions from the student book are reproduced in bold type.
- Anticipated answers to questions are provided.
- The purpose of steps is explained and suggestions for guiding students are clearly stated.
- Suggested responses to some predictable student answers and queries are given.
- Detailed notes support the use of technology, providing “how to” and background information.
- Organizational and management suggestions are given in the margin.
- Where appropriate, blackline masters to support the lessons are provided.

Focus, Key Ideas

The *Key Ideas* in the student text are reproduced in bold type. Additional background information and discussion notes are provided.

Examples

Suggestions for discussing the solutions of the solved examples are provided where appropriate.

Teaching Example

An additional fully solved example is provided. Where appropriate, two examples are given, one more suitable to the Functions course and the other for the Functions and Relations course.

Notes

Throughout each lesson, notes offer the following suggestions and alternative strategies.

- extension ideas
- management suggestions
- technology suggestions
- assessment suggestions

Key words link assessment suggestions to specific categories in the mathematics *Achievement Chart* or to *Learning Skills*.

Practise, Apply, Solve

- Questions correlated to the *Achievement Chart* are supported by management suggestions for using them for assessment purposes. Guidelines for identifying performance at the anticipated provincial standard are also provided.
- Management suggestions and solutions guidelines are provided for the *Check Your Understanding* question.
- Full solutions to all questions are provided in the *Solutions Manual*.

The Chapter Problem and the Challenges

Anticipated answers are given for the *Chapter Problem* questions following the *Practise, Apply, Solve*. Suggestions for monitoring and assessing student progress are given. If appropriate, similar suggestions are offered for the *Challenge*.

Blackline Masters

Sometimes teaching notes and suggestions for a lesson include blackline masters that you may wish to provide for students or use as transparencies. The blackline masters for each chapter are at the end of the chapter, along with the answers to the *Check Your Understanding* question, the *Chapter Problem* questions and answers, and solutions and rubrics for the *Challenges*.

Teacher Resource – Review and Assessment

Chapter Review

Answers to the *Chapter Review* and *Practice* questions and the *Chapter Review Test* questions are in the student text. Answers for the *Check Your Understanding* questions are on a blackline master in the *Teacher Resource*.

Sample Chapter Tests

The *Teacher Resource* provides a blackline master version of a sample test for each chapter. Also included are answers for all questions, full solutions for selected problems and suggestions for scoring student solutions.

You could use the *Sample Chapter Tests* as:

- a chapter test.
- an example of a cumulative chapter test.
- as a model for interpretation of performance standards related to Curriculum Expectations.

Performance Tasks

The *Performance Tasks* appear in the text in four sets. Some tasks will require one class to complete while others will take longer. The *Teacher Resource* provides management suggestions, a full solution or solution guidelines, a reproducible assessment rubric, and assessment suggestions for each task. In some cases, there is also an extension suggestion.

Nelson Mathematics 11 — Additional Components

Computerized Test Bank

The *Nelson Mathematics 11 Test Bank* has over 1750 questions that can be used as a source of extra practice questions and to build tests for lessons or chapters. Tests can be built by the teacher or randomly generated. The format allows questions to be added or modified easily. The 45 questions for each lesson include multiple choice, short answer, and extended answer. In addition, there are 30 end-of-chapter questions for each lesson that are linked to the Achievement Chart categories Knowledge/Understanding, Application, Communication, and Thinking/Inquiry/Problem-Solving. Generic rubrics for each category support assessment of these questions. The *Test Bank* can be used with Macintosh and Windows 95/98/NT.

Solutions Manual

The *Nelson Mathematics 11 Solutions Manual* provides full solutions, including art, to all the questions from the *Student Text*. Pages from the *Solutions Manual* may be reproduced for students. An electronic version of the *Solutions Manual* on CD-ROM is included in the *Teacher Resource*.

Nelson Mathematics Teacher Resource CD-ROMs

The *Nelson Mathematics 11 Teacher Resource* has CD-ROMs with electronic versions of the student text, *Teacher Resource*, and *Solutions Manual*.

Nelson Mathematics Student CD-ROM

The *Nelson Mathematics 11 Student CD-ROM* includes an electronic version of the student text plus interactive examples and activities directly associated with examples and exercises in the text book.

Nelson Mathematics Web Sites

The *Nelson Mathematics 11* Web site is located on the Nelson Web site at www.math.nelson.com. The site is comprised of a Teacher Centre, a Student Centre, a Parent Centre, and an “About the Resources” section.

The Student Centre includes Web links for most sections of the Student Text that provide additional information, online tutorials, and interactive examples and activities. There is also a series of Web activities developed specifically for each chapter.

The Teacher Centre includes the same features as the Student Centre, plus Assessment Support, Foundation Statements, and frequently asked questions (FAQs).

In addition to these publicly accessed sites, *Nelson Mathematics 11 Teacher Resource* users will also have access to the online Teacher Resource. Like the CD-ROM that accompanies the print *Teacher Resource*, the password-protected online version includes all of the material in the print *Teacher Resource*, the Solution Manual, the Student Text, and interactive examples. It also includes links to useful reference material and to the Nelson Web activities. All of the material is organized according to the sections of the Student Text, enabling convenient access to the support you will need to prepare for any given lesson.