7.3 Factor a Difference of Squares

Specific Expectations

Manipulating Quadratic Expressions
In this section, students will
QR1.04 factor the difference of squares of the form $x^2 - a^2$ (e.g., $x^2 - 16$)

Link to Get Ready

You may wish to have students complete all the Get Ready questions before proceeding with Section 7.3.

Warm-Up

1. Square each number.
   a) 5   **b)** 7   **c)** -3

2. Square each term.
   a) $7x$ **b)** $8x$ **c)** $-9x$

3. Evaluate each expression.
   a) $3^2 - 2^2$ **b)** $5^2 - 4^2$ **c)** $(-6)^2 - (-5)^2$

Warm-Up Answers

1. a) 25   **b)** 49   **c)** 9

2. a) $49x^2$ **b)** $64x^2$ **c)** $81x^2$

3. a) 5   **b)** 9   **c)** 11

Teaching Suggestions

Warm-Up
• Write the Warm-Up questions on the board or on an overhead. Have students complete the questions independently. Then, discuss the solutions as a class. (5–10 min)

Section Opener
• Read the opening paragraph aloud.
• Hand out a checkerboard grid, geoboard, or **BLM G1 Grid Paper** for students to use to make sense of the opening paragraph. An actual checkerboard may help students visualize what is happening. Alternatively, use an overhead transparency so all students can see as you figure out the process as a class.
• As an extension, invite students to cut out three-by-three sections in other areas (e.g., the corners or middle) and examine if the result is the same.
• Review what a square number and square term are.
• Use **BLM 7.3.1 Practice: Factor a Difference of Squares** for extra practice or remediation.
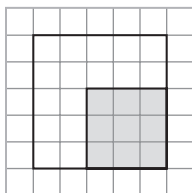
Investigate

- Hand out **BLM G1 Grid Paper** for students to cut out the squares described in Investigate A.
- Use algebra tiles to help students recall the zero concept as they complete Investigate B.
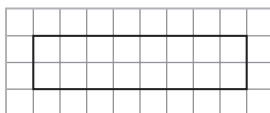
Investigate Answers (pages 298–299)

Investigate A

1, 2, 3.

4.

5. The dimensions of the rectangle are 2 cm by 8 cm.

6. When I rearranged the remaining area to form a rectangle, the dimensions of the new rectangle were 2 cm by 8 cm. The length of the rectangle is the side length of the large square plus the side length of the small square. The width of the rectangle is the side length of the large square less the side length of the small square.

7. The large square had side length 5 cm. If I add the side length of the small square to one side and subtract this side length from the other side, the dimensions become $5 + 3$, or 8 cm by $5 - 3$, or 2 cm.

8, 9, 10.

Large Square Area	Small Square Area	Remaining Area Difference Between Squares	Dimension of the Rectangle and Its Area
5^2	3^2	$5^2 - 3^2 = 16$	$(5 + 3) \times (5 - 3)$ $= 8 \times 2$ $= 16$
9^2	4^2	$9^2 - 4^2 = 65$	$(9 + 4) \times (9 - 4)$ $= 13 \times 5$ $= 65$
10^2	5^2	$10^2 - 5^2 = 75$	$(10 + 5) \times (10 - 5)$ $= 15 \times 5$ $= 75$
12^2	6^2	$12^2 - 6^2 = 108$	$(12 + 6) \times (12 - 6)$ $= 18 \times 6$ $= 108$
a^2	b^2	$a^2 - b^2$	$(a + b)(a - b)$

Investigate B

1. a) $x^2 + x - x - 1$
$= x^2 - 1$

b) $x^2 + 2x - 2x - 4$
$= x^2 - 4$

c) $x^2 + 3x - 3x - 9$
$= x^2 - 9$

d) $x^2 + 4x - 4x - 16$
$= x^2 - 16$

e) $x^2 + 5x - 5x - 25$
$= x^2 - 25$

2. Each product has two terms. Each product is a binomial.

3. Area

4. a) The first term in the product is the product of the first terms of the binomials.

    d) The second term in the product is the product of the second terms of the binomials. When two binomials have the same terms with opposite signs, the product of the binomials is the square of the first term minus the square of the second term.

Examples
- To complete Example 1, use the chart developed for the Chapter Opener.
- If students need reinforcement, refer them to Investigate A.
- Emphasize the key features of the difference of squares.
- Using grid paper or **BLM G1 Grid Paper**, have students complete Example 2 using the same method as Investigate A.
- Direct students' attention to the MathConnect. Have interested students follow the link and try some square root calculators.

Key Concepts
- Include the factors of difference of squares using different symbols. For example, $D^2 - O^2 = (D + O)(D - O)$.

Discuss the Concepts
- Have students create a journal entry for each concept. Collect the journals the following day to check that students understand the concepts.

Discuss the Concepts Suggested Answers (page 302)

D1. Examples will vary. Three examples of square constant terms are 49, 4, and 100. Three examples of square variable terms are x^2, y^2, and 16 m^2. A variable term is a square term if the numerical coefficient is a perfect square and the exponent on the variable is even. A constant term is a square term if it is a perfect square.

D2. Subtraction. The terms must have opposite signs. If the first term is negative, the operation between the terms will be addition. For example, $-x^2 + 25$.

Practise the Concepts (A)
- Encourage students to refer back to the Examples before asking for assistance.
- Invite a volunteer to answer question 5 on the board while the others work individually. Or you may wish to have students work with a partner.
- Take up the solutions as a class.

Apply the Concepts (B)
- Have students work with a partner for question 7. You might assign this as an in-class assignment, and have pairs of students report their conclusions.
- Question 8 is a Literacy Connect. Literacy Connect questions offer the opportunity to explore literacy issues in the mathematics classroom and within the context of mathematics. This supports general Think Literacy strategies. For more information, visit http://www.edu.gov.on.ca/eng/studentsuccess/thinkliteracy.
- For question 9, some students may benefit from **BLM T1 *The Geometer's Sketchpad*® 4**.

Extend the Concepts (C)

- Assign the Extend the Concepts questions to students who are not being challenged by questions in Apply the Concepts.
- Extend the Concepts questions can be used as a diagnostic assessment for those students considering a university-level course in grade 11.