5.4

Factor Trinomials of the Form $ax^2 + bx + c$

Student Text Pages
256–263

Suggested Timing
80 min

Tools
- grid paper

Related Resources
BLM 5-7 Section 5.4 Factor Trinomials of the Form $ax^2 + bx + c$
BLM 5-8 Section 5.4 Achievement Check Rubric
BLM G-3 Four Quadrant Grids

Link to Prerequisite Skills

Students should complete question 4 and questions 10 to 14 prior to beginning this section.

Warm-Up

1. Factor.

a) $x^2 + 17x + 30$ **b)** $x^2 - 81$ **c)** $x^2 - 32x$

Warm-Up Answers

1. a) $(x + 15)(x + 2)$ **b)** $(x + 9)(x - 9)$ **c)** $x(x - 32)$

Teaching Suggestions

- In this course, the curriculum expectations explicitly state that the value of a in $ax^2 + bx + c$ is a common factor only. That is, no method of decomposition should be needed, although it is presented as an extension.

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.

Section Opener

- Read the introduction aloud. You may wish to ask students to look for other examples in which a seemingly minor mathematical error had a great impact.

Investigate

- Have students work in pairs to complete the Investigate.
- The trinomials in **question 5** can be factored but most students will not recognize the factors. Factoring this type of trinomial is beyond the scope of the course. Some students will state that these trinomials cannot be factored, others will remove the factor a, and a few may find the binomial factors.

Investigate Answers (pages 256–257)

1.

Trinomial	Common Factored Form	Fully Factored Form
$3x^2 + 21x + 36$	$3(x^2 + 7x + 12)$	$3(x + 2)(x + 5)$
$2x^2 + 2x - 12$	$2(x^2 + x - 6)$	$2(x + 3)(x - 2)$
$5x^2 - 30x + 40$	$5(x^2 - 6x + 8)$	$5(x - 2)(x - 4)$
$-7x^2 - 21x - 14$	$-7(x^2 + 3x + 2)$	$-7(x + 1)(x + 2)$

2. a) $4(x + 1)(x + 1)$ **b)** $5(x + 2)(x - 3)$ **c)** $-2(x + 5)(x - 2)$ **d)** $-(x - 1)(x - 4)$

3. a) $3(x - 3)(x + 2)$ **b)** $2(x - 7)(x - 2)$

4. Once I factored out the common factor a, the other factor was a trinomial of the form $x^2 + bx + c$, which could be factored into two binomials.

5. a) Cannot be factored or $3(x^2 + \frac{13}{3}x - \frac{10}{3})$ or $(3x - 2)(x + 5)$.

b) Cannot be factored or $12(x^2 + \frac{11}{12}x + \frac{1}{6})$ or $(3x + 2)(4x + 1)$.

6. For the trinomials in question 5, removing the common factor a gave a trinomial that I was not able to factor.

7. Answers may vary.

Examples

- Remind students to factor out the a-value before they factor the trinomial.
- In Example 2, part b), the value of a is –4.9. Students should always start by trying to factor out the coefficient of x^2, regardless of whether it is a whole number or not.

Key Concepts

- Review the Key Concepts with students.

Discuss the Concepts

- Have students discuss these questions in small groups and take them up as a class before assigning the exercises.

Discuss the Concepts Suggested Answers (page 259)

D1. $0.5(x + 2)(x + 6)$; similar to factoring a trinomial with $a > 1$, first factor out the common factor, and then express the trinomial factor as a product of binomial factors.

D2. Answers may vary.

Practise (A)

- Encourage students to review the Examples before asking for assistance.
- For **questions 1** to **6**, remind students to factor out the common factor first before they factor the trinomial.
- For **question 7**, encourage students to factor the trinomials in the first column rather than expanding and simplifying the expressions in the second column.

Apply (B)

- For **questions 8** and **9**, remind students their answers may be slightly different depending on the number of decimal places they use for π.
- **Question 11** links to the Chapter Problem. Remind students to keep the solution to this question handy as the methods they used may help them with the Chapter Problem Wrap-Up.

Common Errors

- Given a trinomial of the form $ax^2 + bx + c$, some students may simply try to find two numbers that multiply to get c and add to get b.

R_x Remind students to factor out the common factor, a, first before trying to factor the trinomial.

Accommodations

Memory—provide a review of common factoring with simple expressions, such as $3x - 9$

Motor—reduce the number of exercises assigned

- **Question 12** is an Achievement Check question. It can be used as a diagnostic or formative assessment, or assigned as a small summative assessment piece. You may wish to use **BLM 5-8 Section 5.4 Achievement Check Rubric** to assist you in assessing your students.

Extend (C)

- Assign the Extend questions to students who are not being challenged by the Apply questions.
- In **question 15**, students learn a method for factoring trinomials of the form $ax^2 + bx + c$ in which a is not a common factor.
- Students who complete **question 16** should get a sense of how the factors of a trinomial are related to the x-intercepts of the parabola. Distribute copies of **BLM G-3 Four Quadrant Grids**, or have students use graphing calculators.

Achievement Check Answers (page 262)

12. a–c)

Diagram	Number of Squares	First Differences	Second Differences
1	2		
2	12	10	
3	30	18	8
4	56	26	8
5	90	34	8

Yes, it is quadratic, since the second differences are constant.

d) Number of squares $= 4d^2 - 2d$, where d is the diagram number

e) $2d(2d - 1)$

f) The factors, $2d$ and $2d - 1$, represent the side lengths of the rectangles.

Mathematical Process Expectations

Process Expectation	Questions
Problem Solving	12
Reasoning and Proving	8, 16
Reflecting	1–6, 10, 12, 16
Selecting Tools and Computational Strategies	1–15
Connecting	8, 9
Representing	16
Communicating	7, 8, 10, 12

Extra Practice

- Use **BLM 5-7 Section 5.4 Factor Trinomials of the Form $ax^2 + bx + c$** for remediation or extra practice.