

Factoring Special Products

Name: _____

Date: _____

Score: _____ / 24

Q Quick Review

Three patterns to recognize and reverse: **(1) Difference of squares:** $a^2 - b^2 = (a + b)(a - b)$. Look for two perfect squares separated by a minus sign. **(2) Perfect square trinomial (sum form):** $a^2 + 2ab + b^2 = (a + b)^2$. Check that the first and last terms are perfect squares and the middle is $2ab$. **(3) Perfect square trinomial (difference form):** $a^2 - 2ab + b^2 = (a - b)^2$. Same as above but the middle term is negative. **Sum of squares** ($a^2 + b^2$) does *not* factor over the reals — it's prime. Recognizing these patterns saves you the AC-method work.

PRACTICE

Factor each expression using a special-product pattern.

- | | | | |
|---------------------|-------|-------------------------|-------|
| 1. $x^2 - 9$ | _____ | 11. $4x^2 - 12x + 9$ | _____ |
| 2. $x^2 - 25$ | _____ | 12. $x^2 + 16$ | _____ |
| 3. $4x^2 - 1$ | _____ | 13. $100 - x^2$ | _____ |
| 4. $x^2 + 10x + 25$ | _____ | 14. $25x^2 - 16$ | _____ |
| 5. $x^2 - 6x + 9$ | _____ | 15. $x^2 - \frac{1}{4}$ | _____ |
| 6. $9x^2 + 6x + 1$ | _____ | 16. $x^4 - 1$ | _____ |
| 7. $x^2 - 12x + 36$ | _____ | 17. $49 - 4x^2$ | _____ |
| 8. $16x^2 - 9$ | _____ | 18. $x^2 + 2x + 1$ | _____ |
| 9. $x^2 - 49$ | _____ | 19. $16x^4 - 1$ | _____ |
| 10. $x^2 + 8x + 16$ | _____ | 20. $36x^2 - 25y^2$ | _____ |

◆ Word Problems

21. A rectangular garden has area $x^2 - 16$ square meters, and one side is $x + 4$ meters. Factor the expression to find the other side.

22. A square garden has area $x^2 + 10x + 25$ ft². Factor the perfect-square trinomial to find its side length.

23. A square courtyard has area 25 m². Use factoring on $x^2 - 25 = 0$ to find the possible side lengths, then choose the realistic one.

24. A stage backdrop has area model $4x^2 - 9$. Factor the model, then find the values of x that make the area expression equal zero.



Scan Me

Answer Keys

1. $(x + 3)(x - 3)$
2. $(x + 5)(x - 5)$
3. $(2x + 1)(2x - 1)$
4. $(x + 5)^2$
5. $(x - 3)^2$
6. $(3x + 1)^2$
7. $(x - 6)^2$
8. $(4x + 3)(4x - 3)$
9. $(x + 7)(x - 7)$
10. $(x + 4)^2$
11. $(2x - 3)^2$
12. prime

13. $(10 + x)(10 - x)$
14. $(5x + 4)(5x - 4)$
15. $(x + \frac{1}{2})(x - \frac{1}{2})$
16. $(x^2 + 1)(x + 1)(x - 1)$
17. $(7 + 2x)(7 - 2x)$
18. $(x + 1)^2$
19. $(4x^2 + 1)(2x + 1)(2x - 1)$
20. $(6x + 5y)(6x - 5y)$
21. $x - 4$
22. $x + 5$
23. $x = 5$
24. $x = \pm \frac{3}{2}$

Step-by-Step Tutor Notes

1. Focus on the main idea of the problem, then simplify carefully. Difference of squares: x and 3 . So the answer is $(x + 3)(x - 3)$.
2. Take it one clear step at a time and keep the original question in mind. x and 5 . So the answer is $(x + 5)(x - 5)$.
3. This is a good place to slow down, check the notation, and simplify cleanly. $2x$ and 1 . So the answer is $(2x + 1)(2x - 1)$.
4. Take it one clear step at a time and keep the original question in mind. Perfect square sum: middle $2(x)(5) = 10x$. So the answer is $(x + 5)^2$.
5. Take it one clear step at a time and keep the original question in mind. This is a perfect-square trinomial. So the answer is $(x - 3)^2$.
6. Use the clue in the question first, then let the arithmetic finish the job. $(3x)^2 + 2(3x)(1) + 1^2$. So the answer is $(3x + 1)^2$.
7. Take it one clear step at a time and keep the original question in mind. Middle: $2(x)(6) = 12x$, with minus. So the answer is $(x - 6)^2$.
8. Take it one clear step at a time and keep the original question in mind. $4x$ and 3 . So the answer is $(4x + 3)(4x - 3)$.
9. Focus on the main idea of the problem, then simplify carefully. x and 7 . So the answer is $(x + 7)(x - 7)$.
10. Take it one clear step at a time and keep the original question in mind. $(x + 4)^2$ checks: $x^2 + 8x + 16$. So the answer is $(x + 4)^2$.
11. Start with the definition the problem is testing, then apply it directly. $(2x)^2 - 2(2x)(3) + 3^2$. So the answer is $(2x - 3)^2$.
12. Use the structure of the expression to find the important point, then check that it fits the context. Sum of squares doesn't factor. That leads to prime.
13. Focus on the main idea of the problem, then simplify carefully. Difference: $10^2 - x^2$. So the answer is $(10 + x)(10 - x)$.
14. Focus on the main idea of the problem, then simplify carefully. $5x$ and 4 . So the answer is $(5x + 4)(5x - 4)$.
15. Use the clue in the question first, then let the arithmetic finish the job. Difference of squares with $\frac{1}{2}$. So the answer is $(x + \frac{1}{2})(x - \frac{1}{2})$.
16. First $(x^2)^2 - 1^2 = (x^2 + 1)(x^2 - 1)$, then factor $x^2 - 1$ further.
17. Focus on the main idea of the problem, then simplify carefully. Difference: $7^2 - (2x)^2$. So the answer is $(7 + 2x)(7 - 2x)$.
18. Use the clue in the question first, then let the arithmetic finish the job. Middle $2(x)(1)$. So the answer is $(x + 1)^2$.
19. First identify the feature of the graph or equation that matches the wording of the question. $(4x^2)^2 - 1^2 = (4x^2 + 1)(4x^2 - 1)$, then factor the second. That leads to $(4x^2 + 1)(2x + 1)(2x - 1)$.
20. Take it one clear step at a time and keep the original question in mind. Two-variable difference of squares. So the answer is $(6x + 5y)(6x - 5y)$.
21. $x^2 - 16$ is a difference of squares: $(x + 4)(x - 4)$. If one side is $x + 4$, the other side is $x - 4$.
22. Name the quantities first so the model is easy to read. Perfect square: $x^2 + 10x + 25 = (x + 5)^2$. Side = $x + 5$.
23. Factoring gives $(x + 5)(x - 5) = 0$, so the model has solutions $x = -5$ and $x = 5$. A side length must be positive, so $x = 5$ meters.
24. Use the labels on the display first; they tell you which count or total belongs in the answer. $(2x + 3)(2x - 3) = 0 \Rightarrow x = -\frac{3}{2}$ or $x = \frac{3}{2}$. This gives $x = \pm \frac{3}{2}$.



Scan Me

Want a Full Algebra 1 Textbook? Try Our Virginia SOL Made Simple Book!



Virginia SOL Algebra I Made Ridiculously Simple

The friendly, step-by-step Algebra 1 textbook
Plain-English explanations, guided practice, and
review support.



Full Lessons Inside

Concepts
Practice
Mastery

Important: All our test books contain **unique, completely different tests** from each other! Each book offers fresh practice questions—no repeats!

5 Practice Tests

- ✓ 5 complete practice tests with detailed explanations
- ✓ Perfect foundation for SOL test preparation
- ✓ Builds confidence and test-taking skills
- ✓ High-quality questions aligned with state standards

Start your practice journey!

6 Practice Tests

- ✓ 6 complete practice tests with detailed explanations
- ✓ **Unique tests**—different from the 5 tests book
- ✓ Perfect for more practice after mastering 5 tests
- ✓ Builds even more confidence and test-taking skills
- ✓ Same high-quality questions aligned with standards

Take your practice to the next level!

7 Practice Tests

- ✓ 7 complete practice tests for maximum preparation
- ✓ **Unique tests**—different from 5 and 6 tests books
- ✓ The most comprehensive practice for Algebra 1
- ✓ Ideal for students aiming for top scores
- ✓ Extensive practice builds mastery and confidence

Go all the way with comprehensive practice!

STUDENT FAVORITE • Master Algebra I From the Ground Up



Algebra I for Beginners

Written by a top math teacher & aligned with national and state Algebra I courses. From linear equations to graphing quadratics — explained the easy way.

- ✓ **Complete coverage** of every Algebra I concept — perfect companion to these worksheets
- ✓ **Step-by-step explanations** with worked examples on every topic
- ✓ **QR codes in every chapter** for free video lessons & bonus practice
- ✓ **2 full-length practice tests** with detailed answer keys

- ✓ 100% Guaranteed
- ✓ Lifetime Support
- ✓ Trusted by Teachers

Start Your Algebra
Journey Today! →

★ STUDENT'S #1 CHOICE ★

Teacher-recommended • 12,000+ Happy Students

PDF EDITION



Instant download • any device

PAPERBACK



Paperback on Amazon

Hold it in your hands

Pair these free worksheets with *Algebra I for Beginners* and you have a complete self-paced course — concept lessons, daily practice, and full exam-style reviews, all in one path. →

EffortlessMath.com/product/algebra-i-for-beginners