Solving Quadratics by Completing the Square

Name: _____	Date: _____	Score: _____ / 24

Quick Review

Completing the square converts a quadratic into vertex form so you can solve by isolating a perfect square. Steps for $x^2 + bx + c = 0$: **(1)** move c to the other side; **(2)** add $\left(\frac{b}{2}\right)^2$ to both sides (this completes the square on the left); **(3)** factor the left as $(x + \frac{b}{2})^2$; **(4)** take square roots of both sides (don't forget the $\pm$); **(5)** solve for x. If the leading coefficient isn't 1, divide first or factor it out. Completing the square always works (unlike factoring), and it's how the quadratic formula is derived.

PRACTICE

Solve each by completing the square.

1. $x^2 + 4x + 3 = 0$ _____

2. $x^2 - 2x - 3 = 0$ _____

3. $x^2 + 6x = 0$ _____

4. $x^2 - 8x + 12 = 0$ _____

5. $x^2 + 2x - 15 = 0$ _____

6. $x^2 - 10x + 9 = 0$ _____

7. $x^2 + 4x - 5 = 0$ _____

8. $x^2 - 6x + 8 = 0$ _____

9. $x^2 + 2x = 24$ _____

10. $x^2 - 4x = 5$ _____

11. $x^2 + 10x + 21 = 0$ _____

12. $x^2 - 12x + 27 = 0$ _____

13. $x^2 + 8x + 7 = 0$ _____

14. $x^2 - 14x + 45 = 0$ _____

15. $x^2 + 6x + 2 = 0$ _____

16. $x^2 - 4x + 1 = 0$ _____

17. $x^2 + 2x + 2 = 0$ _____

18. $2x^2 + 8x - 10 = 0$ _____

19. $x^2 - 6x + 5 = 0$ _____

20. $x^2 + 2x - 8 = 0$ _____

Word Problems

21. A landscape designer's area model leads to $x^2 + 8x + 5 = 0$. Rewrite the equation in completed-square form so the shifted square is clear.

_____

22. A rectangular banner design leads to the equation $x^2 - 10x = -9$. Solve the equation by completing the square.

_____

23. A garden has area 80 m^2 and length 4 more than width. Find the dimensions using completing the square.

_____

24. A profit model is $y = x^2 - 6x + 4$. Convert the model to vertex form and identify the turning point from that

_____

Scan Me

Answer Keys

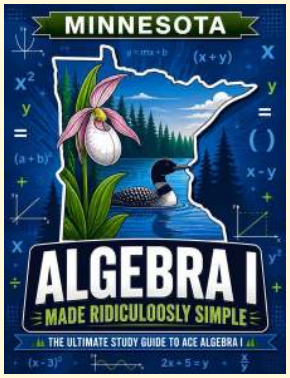
1. $x = -1, -3$
2. $x = 3, -1$
3. $x = 0, -6$
4. $x = 2, 6$
5. $x = 3, -5$
6. $x = 1, 9$
7. $x = 1, -5$
8. $x = 2, 4$
9. $x = 4, -6$
10. $x = 5, -1$
11. $x = -3, -7$
12. $x = 3, 9$
13. $x = -1, -7$
14. $x = 5, 9$
15. $x = -3 \pm \sqrt{7}$
16. $x = 2 \pm \sqrt{3}$
17. no real solution
18. $x = 1, -5$
19. $x = 1, 5$
20. $x = 2, -4$
21. $(x + 4)^2 = 11$
22. $x = 1, 9$
23. $w \approx 7.17$ m, $\ell \approx 11.17$ m
24. $y = (x - 3)^2 - 5$

Step-by-Step Tutor Notes

1. Keep the order of operations in view, then simplify without skipping the sign check. $x^2 + 4x = -3$. Add 4: $(x + 2)^2 = 1$. $x + 2 = \pm 1$. After simplifying, the answer is $x = -1, -3$.
2. Keep the order of operations in view, then simplify without skipping the sign check. $x^2 - 2x = 3$. Add 1: $(x - 1)^2 = 4$. $x - 1 = \pm 2$. After simplifying, the answer is $x = 3, -1$.
3. Read the table by matching the correct row and column first, then use the count or total that fits the question. $x^2 + 6x + 9 = 9 \Rightarrow (x + 3)^2 = 9 \Rightarrow x + 3 = \pm 3$. This gives $x = 0, -6$.
4. Use the labels on the display first; they tell you which count or total belongs in the answer. $x^2 - 8x = -12 \Rightarrow (x - 4)^2 = 4 \Rightarrow x - 4 = \pm 2$. This gives $x = 2, 6$.
5. For a table question, slow down and locate the exact row, column, or cell before calculating. $(x + 1)^2 = 16 \Rightarrow x + 1 = \pm 4$. This gives $x = 3, -5$.
6. Read the table by matching the correct row and column first, then use the count or total that fits the question. $(x - 5)^2 = 16 \Rightarrow x - 5 = \pm 4$. This gives $x = 1, 9$.
7. Use the labels on the display first; they tell you which count or total belongs in the answer. $(x + 2)^2 = 9 \Rightarrow x + 2 = \pm 3$. This gives $x = 1, -5$.
8. For a table question, slow down and locate the exact row, column, or cell before calculating. $(x - 3)^2 = 1 \Rightarrow x - 3 = \pm 1$. This gives $x = 2, 4$.
9. For a table question, slow down and locate the exact row, column, or cell before calculating. $(x + 1)^2 = 25 \Rightarrow x + 1 = \pm 5$. This gives $x = 4, -6$.
10. Read the table by matching the correct row and column first, then use the count or total that fits the question. $(x - 2)^2 = 9 \Rightarrow x - 2 = \pm 3$. This gives $x = 5, -1$.
11. Read the table by matching the correct row and column first, then use the count or total that fits the question. $(x + 5)^2 = 4 \Rightarrow x + 5 = \pm 2$. This gives $x = -3, -7$.
12. Use the labels on the display first; they tell you which count or total belongs in the answer. $(x - 6)^2 = 9 \Rightarrow x - 6 = \pm 3$. This gives $x = 3, 9$.
13. Use the labels on the display first; they tell you which count or total belongs in the answer. $(x + 4)^2 = 9 \Rightarrow x + 4 = \pm 3$. This gives $x = -1, -7$.
14. Read the table by matching the correct row and column first, then use the count or total that fits the question. $(x - 7)^2 = 4 \Rightarrow x - 7 = \pm 2$. This gives $x = 5, 9$.
15. Read the table by matching the correct row and column first, then use the count or total that fits the question. $(x + 3)^2 = 7 \Rightarrow x + 3 = \pm\sqrt{7}$. Irrational answer. This gives $x = -3 \pm \sqrt{7}$.
16. Focus on the main idea of the problem, then simplify carefully. $(x - 2)^2 = 3$. So the answer is $x = 2 \pm \sqrt{3}$.
17. Start with the definition the problem is testing, then apply it directly. $(x + 1)^2 = -1$. Can't take square root of a negative. So the answer is no real solution.
18. Use the labels on the display first; they tell you which count or total belongs in the answer. Divide by 2: $x^2 + 4x - 5 = 0 \Rightarrow (x + 2)^2 = 9$. This gives $x = 1, -5$.
19. Use the labels on the display first; they tell you which count or total belongs in the answer. $(x - 3)^2 = 4 \Rightarrow x - 3 = \pm 2$. This gives $x = 1, 5$.
20. Read the table by matching the correct row and column first, then use the count or total that fits the question. $(x + 1)^2 = 9 \Rightarrow x + 1 = \pm 3$. This gives $x = 2, -4$.
21. Work one inverse operation at a time and keep both sides balanced. Move 5: $x^2 + 8x = -5$. Add 16: $(x + 4)^2 = 11$. After simplifying, the answer is $(x + 4)^2 = 11$.
22. Use the labels on the display first; they tell you which count or total belongs in the answer. Add 25 to both sides: $(x - 5)^2 = 16 \Rightarrow x - 5 = \pm 4$. This gives $x = 1, 9$.
23. $w(w + 4) = 80 \Rightarrow w^2 + 4w - 80 = 0$. Complete: $(w + 2)^2 = 84 \Rightarrow w = -2 + \sqrt{84} \approx 7.17$ m. The length is about 11.17 m.
24. Set up the model from the story, then calculate carefully. $y = x^2 - 6x + 4 = (x^2 - 6x + 9) - 9 + 4 = (x - 3)^2 - 5$.

Scan Me

Want a Full Algebra 1 Textbook? Try Our Minnesota MCA Made Simple Book!



Minnesota MCA Algebra I Made Ridiculously Simple

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

Scan Me

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 MCA 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

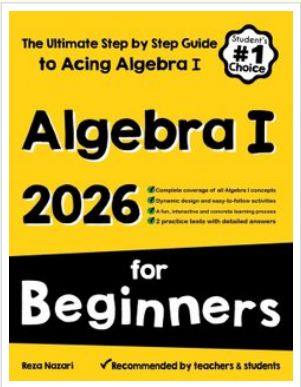
Take your practice to the next level!

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

⋆ STUDENT'S #1 CHOICE ⋆

Teacher-recommended • 12,000+ Happy Students

Start Your Algebra Journey Today! →

↓PDF EDITION

Scan Me

Instant download • any device

☐ PAPERBACK

Scan Me

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