MATHEMATICS · GRADES 10-12

Factoring to solve quadratic equations

Difficulty level: Advanced

Mathematics: Grades 10-12

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Overview of the concept

This is how you solve a curving equation by writing it as brackets multiplied to zero. A rocket is at a certain height at two moments, and factoring tells you both of them. If a product is zero, one of the brackets must be zero, and that gives you the answers. It is the direct route from a curve to the moments that matter.



Rule

Zero product property: if two things multiply to zero, at least one of them must be zero.

To solve a quadratic, factor it, set each bracket to zero, and solve each one.

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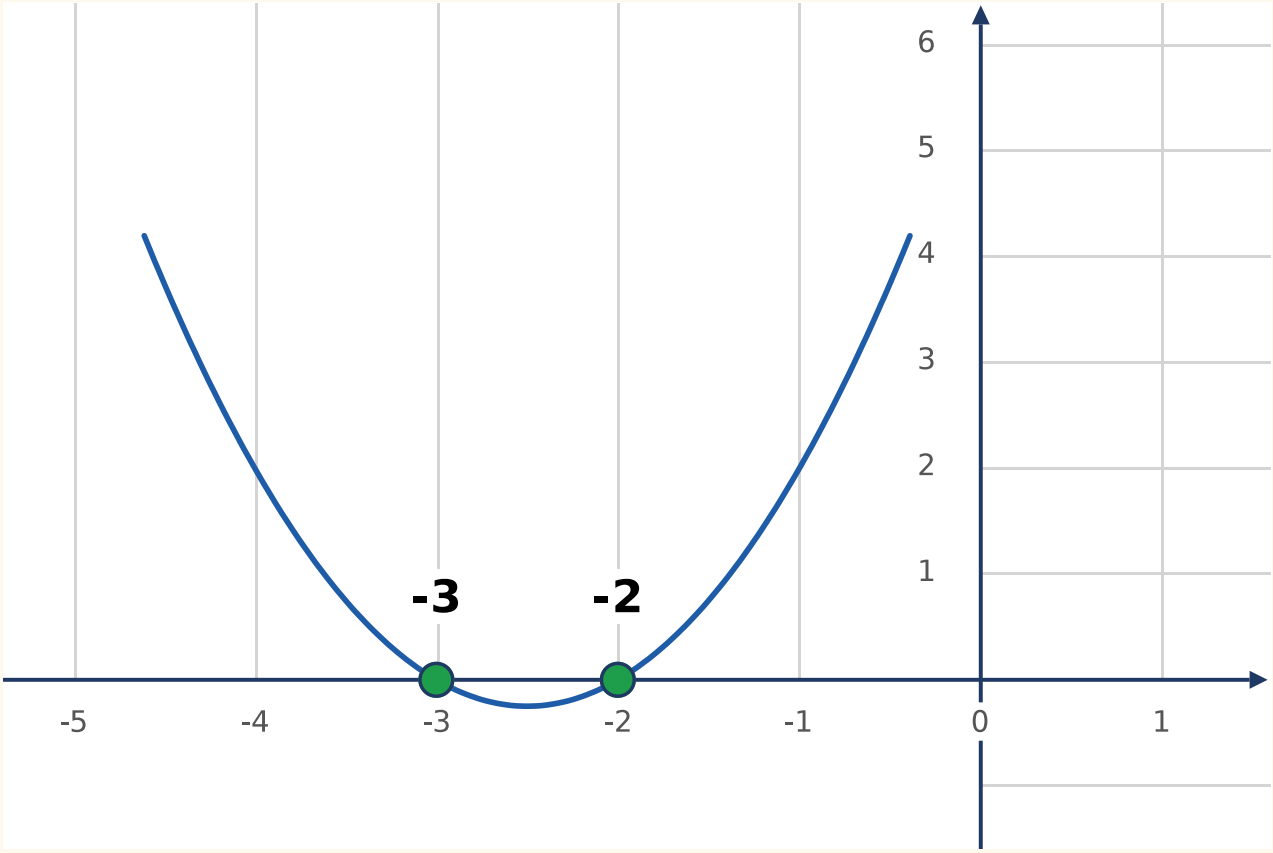
Worked examples

EXAMPLE 1

Q Solve $x^2 + 5x + 6 = 0$



SOLUTION

Factor the left side: $(x + 2)(x + 3) = 0$

Set each bracket to zero: $x + 2 = 0$ or $x + 3 = 0$

Solve each: $x = -2$ or $x = -3$

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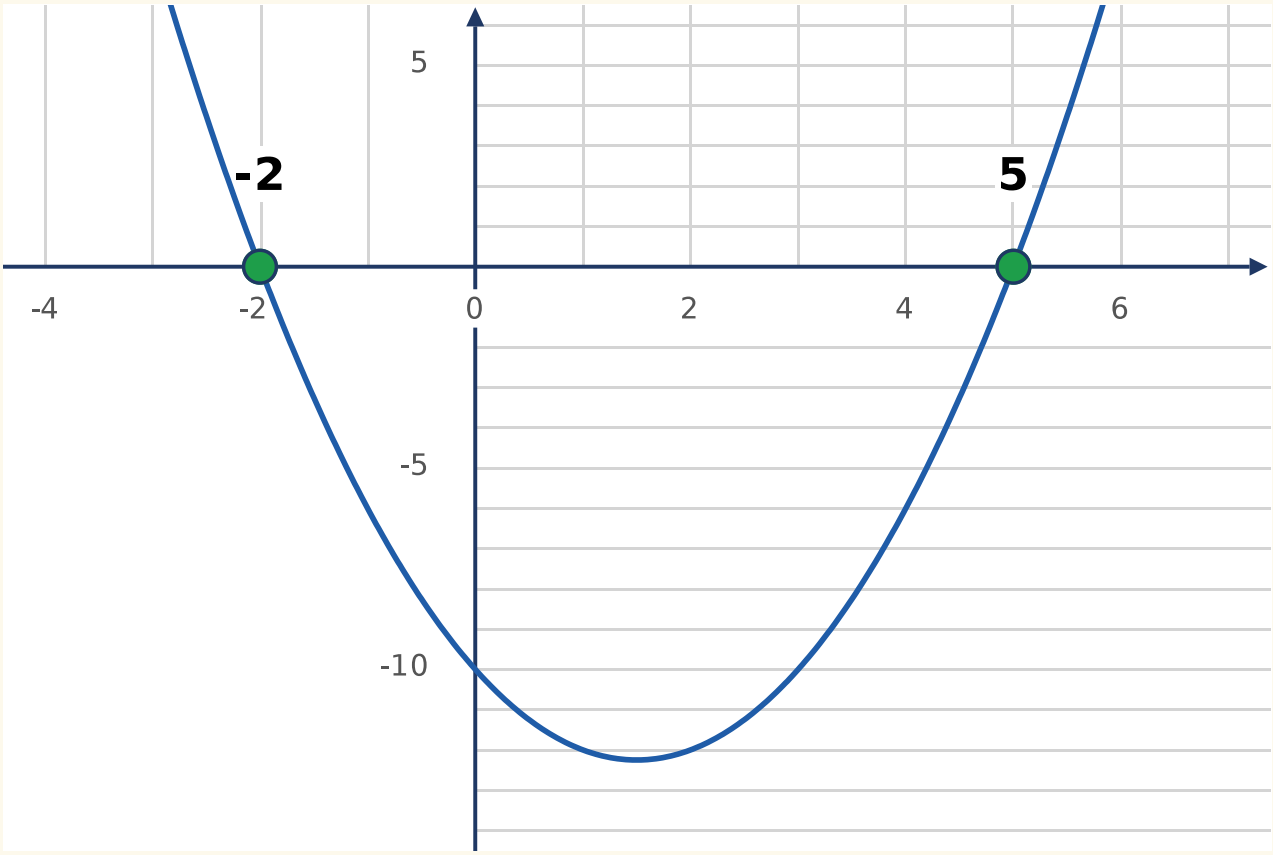
EXAMPLE 2

Q Solve $x^2 - 3x - 10 = 0$



SOLUTION

Factor the left side: $(x - 5)(x + 2) = 0$

Set each bracket to zero: $x - 5 = 0$ or $x + 2 = 0$

Solve each: $x = 5$ or $x = -2$

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Practice questions

1 Solve $x^2 + 4x + 3 = 0$ for x.

- **A** x = 1 or x = 3
- **B** x = -1 or x = 3
- **C** x = -1 or x = -3
- **D** x = 1 or x = -3

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2 Solve $x^2 - 6x + 8 = 0$ for x.

- **A** x = 2 or x = 4
- **B** x = -2 or x = -4
- **C** x = 2 or x = -4
- **D** x = -2 or x = 4

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3 Solve $x^2 + 2x - 15 = 0$ for x.

- **A** x = -3 or x = 5
- **B** x = 3 or x = 5
- **C** x = -3 or x = -5
- **D** x = 3 or x = -5

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4 Solve $x^2 - 9x + 20 = 0$ for x.

- **A** x = -4 or x = -5
- **B** x = 4 or x = 5
- **C** x = 4 or x = -5
- **D** x = -4 or x = 5

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5 Solve $x^2 + 7x + 12 = 0$ for x.

A x = -3 or x = -4

B x = 3 or x = 4

C x = -3 or x = 4

D x = 3 or x = -4

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6 Solve $x^2 - 5x + 6 = 0$ for x.

A x = -2 or x = -3

B x = 2 or x = -3

C x = 2 or x = 3

D x = -2 or x = 3

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7 **A quadratic has solutions $x = 1$ and $x = 6$. Which of these is it?**

- **A** $x^2 - 7x + 6 = 0$
- **B** $x^2 - 5x + 6 = 0$
- **C** $x^2 - 7x + 12 = 0$
- **D** $x^2 - 6x + 5 = 0$

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8 **Jay factors $x^2 + 6x + 8 = 0$ as $(x + 2)(x + 4) = 0$, then writes $x = 2$ or $x = 4$. What did he do wrong?**

- **A** He forgot the minus signs: $x = -2$ or $x = -4$
- **B** He factored wrong: $(x + 2)(x + 4)$ does not make $x^2 + 6x + 8$
- **C** He should have added 2 and 4 to get $x = 6$
- **D** He should have set each bracket equal to 2, not 0

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9 Solve $x^2 + 7x + 10 = 0$

A $x = 2$ or $x = 5$

B $x = -2$ or $x = -5$

C $x = -2$ or $x = 5$

D $x = 2$ or $x = -5$

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10 Which one has a repeated solution?

A $x^2 + 4x + 4 = 0$

B $x^2 + 5x + 6 = 0$

C $x^2 + 6x + 8 = 0$

D $x^2 + 7x + 12 = 0$

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ANSWER KEY

1. $x = -1$ or $x = -3$

2. $x = 2$ or $x = 4$

3. $x = 3$ or $x = -5$

4. $x = 4$ or $x = 5$

5. $x = -3$ or $x = -4$

6. $x = 2$ or $x = 3$

7. $x^2 - 7x + 6 = 0$

8. He forgot the minus signs: $x = -2$ or $x = -4$

9. $x = -2$ or $x = -5$

10. $x^2 + 4x + 4 = 0$

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