LESSON MAKER PRO

Choose Your Route

Solve quadratic equations with a method that fits.

GRADE 8 · 8A.AF.D.11

8A.AF.D.11 "Select an appropriate method to solve a quadratic equation in one variable. a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions..."

NAME _____ DATE _____

PICK A METHOD

First look for a square you can undo or factors you can use. To complete the square for $x^2 + bx + c = 0$, move c to the other side, then add $(b/2)^2$ to both sides. If a square equals a negative number, the equation has no real solutions.

WORKED EXAMPLE

Solve $x^2 + 14x + 40 = 0$ by completing the square.

1. Move 40: $x^2 + 14x = -40$.
2. Add $(14/2)^2 = 49$ to both sides: $(x + 7)^2 = 9$.
3. Take square roots: $x + 7 = \pm 3$.
4. Subtract 7: $x = -7 \pm 3$.

Answer: x = -4 or x = -10

PRACTICE 6 problems

1 Solve $x^2 = 64$. Name the method you used.

ANSWER _____

2 Solve $(x - 6)^2 = 25$. Name the method you used.

ANSWER _____

3 Solve $x^2 - 7x + 12 = 0$. Name the method you used.

ANSWER _____

4 Solve $x^2 + 10x + 18 = 0$. Name the method you used.

ANSWER _____

5 Solve $2x^2 + 2x - 1 = 0$. Name the method you used.

ANSWER _____

6 Solve $x^2 + 2x + 8 = 0$ in the real number system. Name the method you used.

ANSWER _____

APPLY IT Show your work

1 A player tosses a ball for a highlight video. Its height in feet after x seconds is $-x^2 + 6x + 7$. At what times is the ball 15 feet high?

WORK SPACE

ANSWER _____

2 You sell stickers for $12 each. The cost in dollars of making x stickers is $x^2 + 20$. How many stickers can you sell to make exactly enough money to cover the cost?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Start with $ax^2 + bx + c = 0$, where $a \neq 0$. Complete the square to write it in the form $(x - p)^2 = q$. Then use that form to derive the quadratic formula. What does $b^2 - 4ac < 0$ tell you about real solutions?

WORK SPACE AND ANSWER

ANSWER KEY

Choose Your Route

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Solve $x^2 = 64$. Name the method you used.	**$x = 8$ or $x = -8$; inspection.**
2	Solve $(x - 6)^2 = 25$. Name the method you used.	**$x = 11$ or $x = 1$; taking square roots.**
3	Solve $x^2 - 7x + 12 = 0$. Name the method you used.	**$x = 3$ or $x = 4$; factoring.**
4	Solve $x^2 + 10x + 18 = 0$. Name the method you used.	**$x = -5 \pm \sqrt{7}$; completing the square.**
5	Solve $2x^2 + 2x - 1 = 0$. Name the method you used.	**$x = (-1 \pm \sqrt{3})/2$; quadratic formula.**
6	Solve $x^2 + 2x + 8 = 0$ in the real number system. Name the method you used.	**No real solutions; completing the square gives $(x + 1)^2 = -7$.**

PART 2 · APPLY IT

1. **After 2 seconds and after 4 seconds.** Set $-x^2 + 6x + 7 = 15$. Rearrange and factor: $(x - 2)(x - 4) = 0$.
2. **2 stickers or 10 stickers.** Set sales income equal to cost: $12x = x^2 + 20$. Rearrange and factor: $(x - 2)(x - 10) = 0$.

CHALLENGE

Divide by a and move c/a: $x^2 + (b/a)x = -c/a$. Add $(b/(2a))^2$ to both sides: $(x + b/(2a))^2 = (b^2 - 4ac)/(4a^2)$. Thus $p = -b/(2a)$ and $q = (b^2 - 4ac)/(4a^2)$. Taking square roots and subtracting $b/(2a)$ gives $x = (-b \pm \sqrt{(b^2 - 4ac)})/(2a)$. If $b^2 - 4ac < 0$, there are no real solutions.

Accept any valid method named in the practice problems, including the quadratic formula where another method is shorter. Accept equivalent exact forms of radical answers.