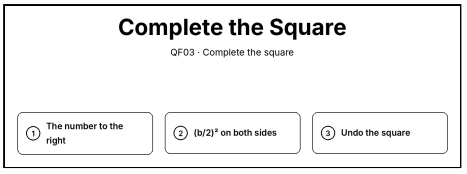
Complete the Square: teacher script

QF03-V1 · QF03 Complete the square · teachers only. Without a screen, read each Say line and draw each Draw step on the board. About 98 seconds as a video.

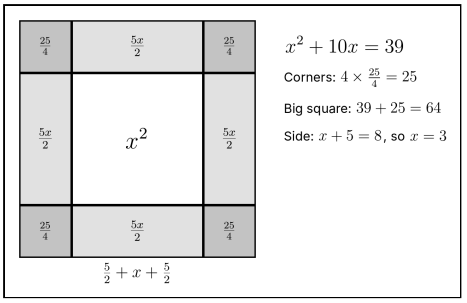
01



Say. Complete the square. First move the number to the right. Then add half the coefficient of x, squared, to both sides. Then undo the square.

Draw. Write the title “Complete the Square” and the steps: 1. The number to the right; 2. (b/2)² on both sides; 3. Undo the square.

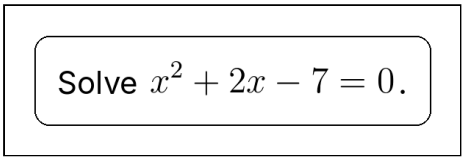
02



Say. About twelve hundred years ago, al-Khwarizmi solved x squared plus 10 x equals 39 with a picture. Start with a square of side x. Put four rectangles round it, each x by 5 halves: together they make 10 x, so the whole shape has area 39. Now fill in the four corners. Each is 5 halves by 5 halves, and the four together make 25, so add 25 to both sides. The big square has area 64, so its side is 8. That side is x plus 5, so x is 3. He missed the second root, negative 13: a negative side made no sense to him.

Draw. Clear the board. Draw a square and write x² in it. On each of its four sides draw a rectangle, x by 5/2, and write 5x/2 in each. Then fill the four corners with squares of side 5/2, and write 25/4 in each. Beside the picture, write “x^2 + 10x = 39”. Beside the picture, write “Corners: 4 × 25/4 = 25”. Beside the picture, write “Big square: 39 + 25 = 64”. Beside the picture, write “Side: x + 5 = 8, so x = 3”.

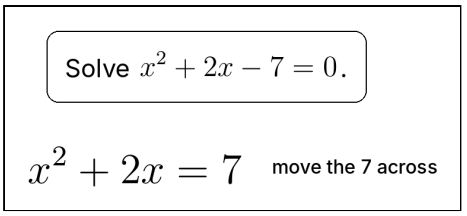
03



Say. Now with symbols. Solve x squared plus 2 x minus 7 equals 0.

Draw. Clear the board. Write “Solve x² + 2x − 7 = 0.” in a box at the top.

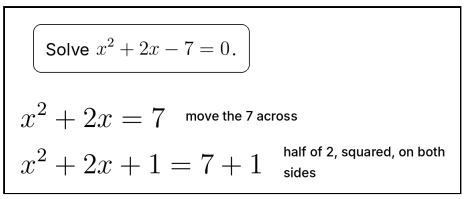
04



Say. Move the 7 across: x squared plus 2 x equals 7.

Draw. Write x² + 2x = 7 on the next line. Beside it, write “move the 7 across”.

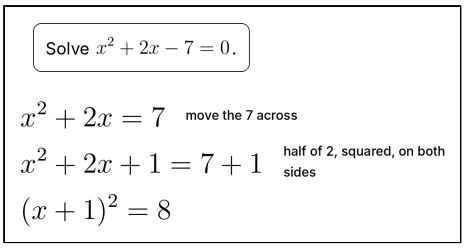
05



Say. Half of 2 is 1, and 1 squared is 1. Add 1 to both sides.

Draw. Write x² + 2x + 1 = 7 + 1 on the next line. Beside it, write “half of 2, squared, on both sides”.

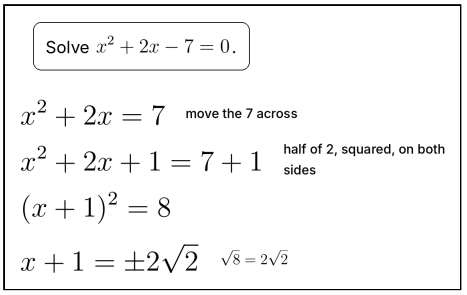
06



Say. The left side is x plus 1, all squared, and it equals 8.

Draw. Write (x + 1)² = 8 on the next line.

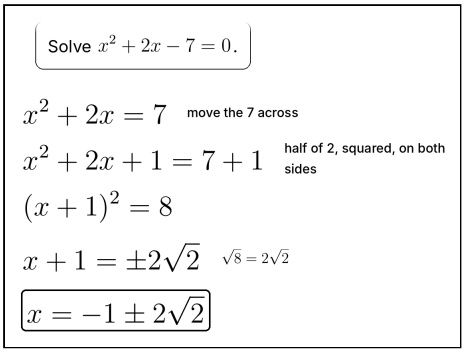
07



Say. Undo the square: x plus 1 equals plus or minus root 8, which is 2 root 2.

Draw. Write x + 1 = ± 2√2 on the next line. Beside it, write “√8 = 2√2”.

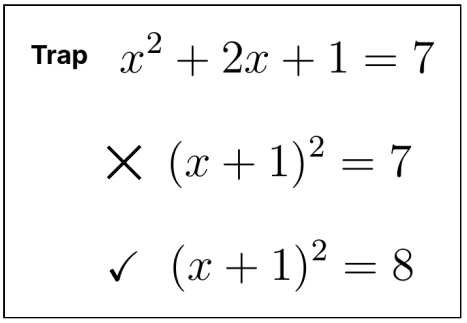
08



Say. Subtract 1: x equals negative 1, plus or minus 2 root 2.

Draw. Write x = −1 ± 2√2 and box it on the next line.

09



Say. Watch for the trap. Add the 1 to one side only, and every root after it is wrong. Add it to both sides.

Draw. Clear the board. Write “Trap” and x² + 2x + 1 = 7. Below, write (x + 1)² = 7 and cross it out ×. Then write (x + 1)² = 8 with a tick ✓.

10

Your turn

The number to the right.

$(b/2)^2$ on both sides.

Undo the square.

Say. Now it is your turn. Move the number across, add half the coefficient of x, squared, to both sides, and undo the square.

Draw. Point to today's activity: The number to the right. $(b/2)^2$ on both sides. Undo the square.